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Challenges to scenario-guided adaptive action on food security under climate change

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ABSTRACT

This paper examines the development and use of scenarios as an approach to guide action in multi-level, multi-actor adaptation contexts such as food security under climate change. Three challenges are highlighted: (1) ensuring the appropriate scope for action; (2) moving beyond intervention-based decision guidance; and (3) developing long-term shared capacity for strategic planning. To overcome these challenges we have applied explorative scenarios and normative back-casting with stakeholders from different sectors at the regional level in East Africa. We then applied lessons about appropriate scope, enabling adaptation pathways, and developing strategic planning capacity to scenarios processes in multiple global regions. Scenarios were created to have a broad enough scope to be relevant to diverse actors, and then adapted by different actor groups to ensure their salience in specific decision contexts. The initial strategy for using the scenarios by bringing a range of actors together to explore new collaborative proposals had limitations as well as strengths versus the application of scenarios for specific actor groups and existing decision pathways. Scenarios development and use transitioned from an intervention-based process to an embedded process characterized by continuous engagement. Feasibility and long-term sustainability could be ensured by having decision makers own the process and focusing on developing strategic planning capacity within their home organizations.

1. Introduction

Climate change is a significant driver of change for food security in the developing world, because it threatens food production and its stability as well as other aspects of food systems such as storage, food access and utilization (Wheeler and Von Braun, 2013). The impacts of climate change interact with other change dynamics across economic, political, temporal and biophysical dimensions and from local to global levels (Ericksen et al., 2009). These changes are marked by uncertainties that confound attempts to develop linear and unilateral policies (Funtowicz and Ravetz, 1993; Kriegler et al., 2012; van der Sluijs, 2005).

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Facing these uncertainties are actor groups operating in different sectors and at multiple levels, with often widely divergent interests (Ingram et al., 2010). The challenges around ensuring sustainable food security are systemic, and therefore require system-wide actions from decision-makers (Ericksen et al., 2009; Vermeulen et al., 2013). For instance, national policies, global food prices, or competition between land use types may restrict or enable adaptation for local actors such as small-scale farmers or poor urban communities (Mandemaker et al., 2011). Similarly, a lack of local-level mechanisms and resources for adaptation and innovation can make large-scale policies or investments ineffective (Bourgeois et al., 2012).

There is an increasing recognition of the urgent need for science focusing on food security in the developing world to overcome its relative inability to play a role in decision-making that leads to positive impact (Vermeulen et al., 2013). This need is now broadly recognized by stakeholders providing support for development and adaptation research. They are urging researchers to critically re-examine how their work seeks to engage decision-making and practice. In the context of adaptation planning, social-ecological systems science has the potential to help decision makers consider a wide range of interacting stressors and to help them explore adaptation pathways (Folke et al., 2010). However, a number of challenges exist for such research to make a difference. First, attending to what is the relevant scope for collaborative action for actors with diverse perspectives is important. There is a need to engage stakeholders at different levels and from different sectors with diverse and often contesting types of expertise, experience, values and interests, between whom power differences exist and who have incentives to behave strategically (Flood and Jackson, 1991; Jasanoff, 2004; Kristjanson et al., 2009). The perceived credibility, legitimacy, salience and timeliness of science changes depend on the actor groups involved (Cash et al., 2003; Ostrom, 2010). Secondly, rather than focusing on single interventions and single adaptation actions, researchers should engage decision-makers in a demand-driven fashion to help co-manage change along continuously adaptive pathways, attending to diverse and shifting contextual challenges (Kristjanson et al., 2009; Reid et al., 2009; Stafford Smith et al., 2011). Finally, there is a need to develop long-term capacity for collaborative decision making. Attempts to guide actors and decision-making from different sectors and across different system levels can run into serious feasibility challenges when the aim is to develop shared strategic capacity in the longer term (Gibbons, 1999; Wilkinson and Eidinow, 2008).

This paper presents an effort to tackle these challenges through the development and use of explorative multi-stakeholder scenarios (Wilkinson and Eidinow, 2008) around agriculture and food systems at the sub-continental level in multiple global regions initiated by the CGIAR, a global agricultural development partnership (Vermeulen et al., 2012, 2013).

The objective of this paper is a critical appraisal, based on iterative learning, of the potential of multi-stakeholder scenarios for decision-making to overcome the above challenges in agriculture and food security in the face of climate change interacting with other stressors at multiple levels. We will first provide a theoretical background on scenarios development and use, with a specific focus on the role of scenarios in a multi-stakeholder, multi-level, multi-dimensional context (Section 2). Initial results from the development and use of scenarios for East Africa will be presented (3), followed by the lessons learned through that process and how these lessons have been applied in multiple global regions (4). Finally, we will discuss these learning steps and their outputs, and what they show about the ability and challenges of scenarios development and use to tackle the challenges of scope and collaboration, engaging in adaptation pathways and developing long-term strategic capacity (5).

2. Concepts: the development and use of scenarios in multi-level, multi-stakeholder contexts

Explorative scenarios are defined here as "multiple plausible futures described in words, numbers and/or images" (van Notten et al., 2003). Scenarios methodology is based in systems science and seeks to recognize and explore uncertainty and complexity in the decision-makers' context rather than limiting or simplifying that context with the pretence of providing a single forecast when such prediction is not possible (Kok et al., 2006; van der Sluijs, 2005). More linear sense- and decision-making processes that do not incorporate multiple scenarios still have underlying assumptions about the future, effectively operating from a single scenario that is not examined. This failure of traditional planning to engage with uncertainty has proven to be problematic in complex systems (van der Sluijs, 2005; Wilkinson and Eidinow, 2008).

In multi-stakeholder contexts, exploratory scenarios can engage multiple legitimate perspectives involved in framing and addressing messy challenges such as food security and sustainability (Reilly and Willenbockel, 2010). Bourgeois et al. (2012) give an extensive overview of scenarios used in the context of agriculture and food security. Scenarios generated by groups of stakeholders will naturally be biased towards the perspectives of those groups (Schoemaker, 1993). In addition, there may be aspects of future developments that the groups have difficulty exploring or producing, such as biophysical processes (e.g. climate change) or detailed land use change dynamics responding to international markets. Quantitative simulation modelling can provide a complementary perspective against which stakeholders can test their ideas about plausible futures. Simulation modelling has several benefits for this purpose. It can outline the scenarios in numbers that can be used for more concrete analysis of the consequences of the scenarios, as well as the impacts of policies, investments and strategies tested against the scenarios. Simulation modelling can test the coherence of stakeholder assumptions and help point out contradictory elements in the scenarios. Through the application of a consistent set of assumptions, simulation models can generate counter-intuitive effects of the scenarios not originally imagined by the participants. However, simulation models are characterized by their own assumptions about systems. Whereas exploratory scenarios, developed as narratives and other formats, are able to incorporate a wide range of different factors and interactions, the scope of simulation models is pre-defined. Moreover, the models are developed in reference to the past and present and may not be able to adequately represent transformative scenarios (Reilly and Willenbockel, 2010). Therefore, stakeholder-generated scenarios can and should also challenge the assumptions of models.

Explorative scenarios are suited for the exploration of multi-dimensional and multi-level aspects of decision contexts (Herrero et al., 2014; Wilkinson, 2009). Zurek and Henrichs (2007) outline different ways in which scenarios processes as well as scenarios themselves can be integrated across geographical levels.

A number of researcher-generated explorative scenario sets, notably the SRES scenarios (Nakicenovic, 2000) and the Millennium Ecosystems Assessment (2005) scenarios, have been adapted across multiple geographic levels and yet their use in decision-making has been limited (Wells et al., 2006). The combination of exploratory scenarios with normative back-casting can link contexts to decision pathways (Kok et al., 2011; Robinson et al., 2011). Normative back-casting is distinct from explorative back-casting used to develop explorative scenarios. Both types of back-casting work from an end point back to the present. However, normative back-casting starts with a desired goal and then works out what needs to happen before that goal is achieved, until the present is reached. Normative back-casting has been used by

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