Discussant comments on "Climate change and agricultural adaptation"

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I am immensely pleased to be invited to Stanford University. I am particularly happy to be given this opportunity to respond to the presentation of the very prolific and esteemed professor, David Lobell.

I have listened attentively to David's presentation. His arguments on the intersection between food security and climate change and food policy make sense and resonate with the experiences that I have seen across Africa.

Let me start with this premise: Climate change is reinforcing and multiplying known threats to development – poverty, malnutrition, and disease. If climate risks are not mastered, they will derail hard won development achievements. The irony is that Africa is a basket case where all these problems are already conspiring to threaten the economic prosperity, social welfare, and environmental security of millions of people.

David's talk provides some answers on areas where our understanding of science and knowledge can serve as a buffer. This understandably will help vulnerable communities cushion the many blows that are associated with climate variability and change. He has provided us with arguments that can help us understand the distinction between climate variability and change. He has also mentioned the potential dangers in conflating every threat to climate change, especially non-climatic factors that contribute to food insecurity.

The central thrust of David's presentation on current and future climate trends, and their cumulative impacts on local and global productivity are arguments that few will disagree with.

However, I do have a couple of observations. I place a lot of emphasis on a word that David mentioned once – and that word is "transformation".

My first observation is that biophysical processes and social vulnerability are intricately linked, and both will need strong institutions to arrive at a transformational change. I start with what can be called institutional transformation. For many of the changes that David referred to, robust institutions will be necessary to manage and maintain resilience to climate change at different levels, scales, and time horizons. Institutions sit at the intersection of social and ecological resilience, and the ways in which these changes can be managed.

David places lots of emphasis on food production, which is one element of food security. Access and use, as well as the stability of production, is relatively problematic to many smallholder farmers in Africa. Institutions tend to influence many of the long-term impacts that David mentioned with regard to local productivity, i.e. health of local economies, rural infrastructure, assets, and risks. Without strong institutions, the processes of achieving ecological and social resilience will become disabled. Equally, the current financial landscape and the different funds (e.g. the adaptation and green funds) will all require management and delivery mechanisms that have strong institutional underpinnings. In addition, David's point on adaptation and mitigation as an essential part of the climate equation cannot be fully exploited in the absence of strong institutional and transparent governance mechanisms.

Many of the biophysical processes that David describes that can enhance soil fertility, crop production and growth will also need institutions that will create incentive structures that will give people choices to make strategic and sustainable decisions in terms of their farming practices. All of this is quite complex and does not fit into linear patterns of thought. However, climate change has allowed us to understand the complexity of the governance systems; its challenges and limitations, and difficulties in understanding the interrelationships between adaptation and mitigation. It is true that we cannot soldier on with our weak institutions until the bitter end – they may not make it to the finish line. We need to capacitate existing ones, and we also need to build new ones. We need to see how we can retrofit or customize current institutions to match our institutional aspirations, and to gravitate towards institutional renewal in order to deal with new and emerging risks.

My second observation is that the tension between the advocates of agricultural intensification and proponents of agricultural diversification can find some middle ground, but if only we expand and explore both adaptation and mitigation options as an optimal mix. We are gradually coalescing to this central point that focusing on adaptation or mitigation separately as response strategies is only reinforcing the flawed development system that we have. It runs the risk of distancing us from a sustainable development pathway. Agriculture is a key contributor to greenhouse gas emissions. Equally, the agricultural sector can play an avant-garde role by showing us the efficacy and potential opportunities of bringing both adaptation and mitigation together.

The notions that risks are interconnected and that addressing climate risks in an integrated manner can create multiple benefits are valid. How can we use climate change as a pretext to stimulate transformational changes in agriculture and food systems? By increasing the content of soil carbon, we can increase the productivity of many agricultural systems. Carbon sequestration and good crop management practices can help increase agricultural productivity. These practices have mitigation benefits by reducing emissions and they have many co-benefits related to improving soil carbon retention, enhancing soil fertility, reducing the use of nitrous oxide and methane, and discouraging unsustainable practices such as slash and burn agriculture and the burning of crop residue.

Sustainable and organic agriculture can offer multiple win-win solutions in terms of reducing greenhouse gas emissions, but also in increasing soil nutrient, conserving and improving diversity by using different crops and encouraging mixed farming strategies. Many of these technical solutions are not new, e.g., agroforestry, rotational grazing, composting and mulching. However, they provide new incentives and rationale for why they need to be done. Transformational change can be reached through the understanding and exploration of opportunities for both adaptation and mitigation in the agricultural sector.

My third and final observation is that while David has intuitively referred to Africa's plight with reduced production, degrading environmental conditions, and failure of the market system, he needs to stress more that human security is at stake. This plight is about ecosystems and services – but it is especially about people. Hence, the third type of transformation is transformation from adaptation and mitigation to sustainable development. It is becoming increasingly obvious that the fight against climate change is increasingly about development choices and the development pathways that are chosen. Climate change is a threat to sustainable development because it challenges the three core principles of sustainable development: economic prosperity,

environmental preservation, and social equity. Our first challenge is to ensure that we do not repeat the same historical mistakes. Although the Green Revolution was transformational in many ways it did not sufficiently take notice of local and indigenous knowledge as foundational. Adaptation processes cannot ignore what people know and are already doing.

Knowledge is a fundamental tool in the development toolbox, but this knowledge needs to be tested, challenged and strengthened. We cannot take it for granted under a changing climate. Our second challenge is to ensure that smallholder farmers do not become further peripheralised by climate trends and uncertain economic futures. Strong institutions are needed to ensure that smallholder farmers are key agents in the transformations they seek. Smallholder farmers need to be key brokers in important climate funds and investment flows that will bring changes to their welfare and security.

Our last challenge is that women, who are key agents in the agriculture sector and the food production chain, do not get "short changed" through exclusionary processes that lock them out of strategic decisions and technologies that will further affect their livelihood structures. Women's nutritional security and access to production systems are constantly under threat, and we need to create buffers that will afford them sufficient capacity to make good, sustainable choices.

I want to end with saying that science is both the problem and the solution. We want to arrive at a science that reinforces the good features inherent in the world economy: one that acts as a regulator, that leads to incremental steps and small transitions, where both the quality of process and outcomes matter, and that impacts positively on the lives of the peripheralised masses - the millions of small holder farmers who continue to live on the margins of poverty. This is the magnitude of our challenge. Transformational change needs to come full circle by integrating the scale of climate change in biophysical terms with understanding and resolution of the complex tensions between nature and society.