Info Note

Surveillance of Climate-smart Agriculture for Nutrition (SCAN)

Innovations for monitoring climate, agriculture and nutrition at scale

Todd Rosenstock, Christine Lamanna, Brian DeRenzi, Sabrina Chesterman, Suneetha Kadiyala, Mary Ng'endo, Kayokwa Chibuye, Ngonidzashe Choga, and Mark van Wijk

JUNE 2016

Key messages

- Climate change will affect the ability to deliver not only the quantity but also the type and quality of food necessary for nutritious diets
- Global and regional 'climate-smart agriculture' initiatives offer an opportunity to mitigate climate impacts and improve nutrition outcomes at scale
- SCAN develops new ways to acquire, integrate and analyze data to help determine what is climate-smart and nutrition-sensitive

Climate change will affect agriculture and human nutrition in profound ways. Without adaptation, predicted changes in temperature, precipitation, seasonality and the frequency and severity of extreme events have the potential to decrease crop and livestock production significantly in the near future and disrupt supply chains. Nutrient-rich foods including animal products and fruits and vegetable are particularly vulnerable. The most significant impacts are likely to coincide with regions already struggling with chronic malnutrition such as Sub-Saharan Africa. Climate change presents an existential crisis for nutrition-sensitive development and threatens the ability to meet the Sustainable Development Goals of Zero Poverty and No Hunger. Recognition of these plausible scenarios has catalyzed the development of climate-smart agriculture for nutrition.

What is climate-smart agriculture?

Climate-smart agriculture (CSA) refers to agriculture and food systems that increase production, build resilience and adaptive capacity of food system and reduce emissions or sequester carbon—where appropriate. In contrast to previous development agendas, CSA integrates climate and development goals together and explicitly targets the objectives and not the mechanisms to achieve them. This orientation means that CSA includes diverse interventions ranging from the micro- to the macro-level such as improved feeding of cattle or agroforestry to extension services and markets, respectively.

Emerging CSA partnerships and investments have the ambition to affect agricultural and nutrition outcomes at scale. For example, the African Union's New Economic Partnership for Africa's Development (NEPAD) and the Global Alliance for Climate-Smart Agriculture (GACSA) aim to reach 25 and 500 million smallholder farmers with CSA, respectively. Simultaneously, billions of US dollars in investments are being planned to scale up CSA in Africa and Asia.

Figure 1. Kenyan farmer using a mobile phone to receive a seasonal weather forecast, an example of a CSA intervention. N. Palmer, CCAFS.

Why SCAN?

CSA intends to sustainably increase production and improve the resilience of food systems under climate change. However, the evidence base on the linkages among climate, agriculture and nutrition ('C-A-N') is complex and limited (Figure 2). With the rapid increase in CSA programming, it is essential to monitor and learn what works to improve the evidence base, increase programming effectiveness and outcomes for farmers.

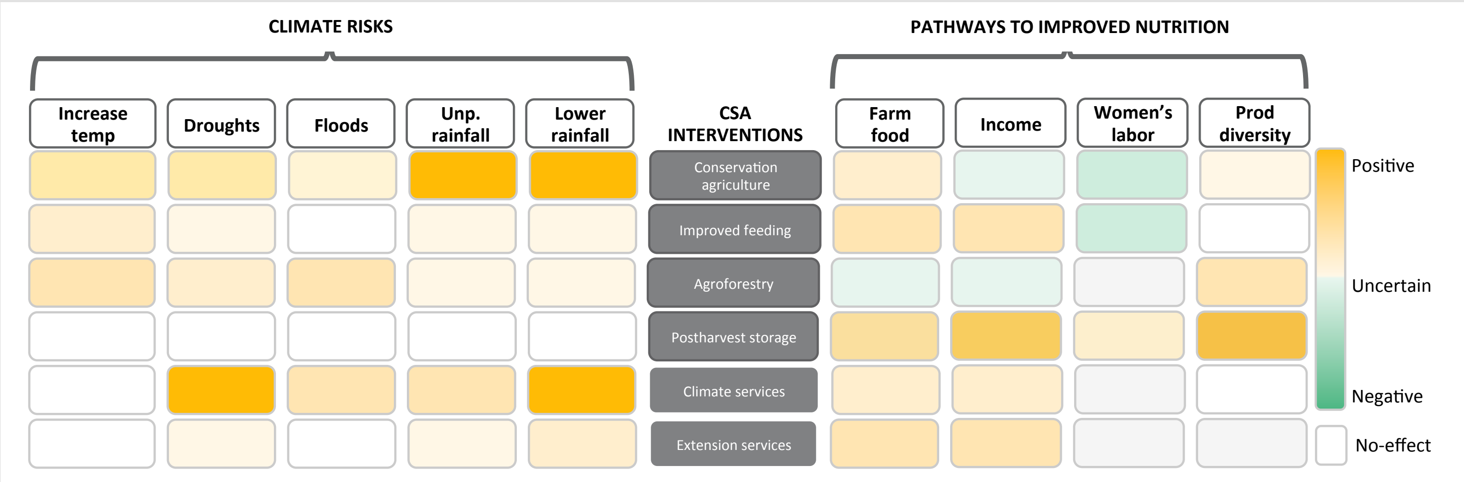

Figure 2. Possible ways that CSA interventions (grey boxes) buffer against climate risks and build resilience (left) and affect nutrition outcomes (right).

Innovation

SCAN will develop metrics, monitoring techniques and analytics capable of generating information describing the C-A-N pathways. The premise underlying this project is that innovative methods and metrics used in computer science, decision science and ecology can increase the information available to understand the linkages among C-A-N and facilitate use of that evidence in programming.

SCAN's research addresses three interrelated themes of data acquisition, integration and analysis. Examples of SCAN research questions:

- **Data acquisition**: What are the theoretical limits for conducting surveys using Android-based surveys, call centers, SMS or voice-based recordings?
- **Data integration**: Can we develop probabilistic approaches to compile information from disparate sources for monitoring C-A-N metrics and outcomes?
- **Data analysis**: Do alternative statistical techniques such as 'hypervolumes' provide new means to interpret and visualize multi-dimensional C-A-N relationships?

Field research activities will start in October 2016. At that time, SCAN will work with NGO partners in Zambia to integrate existing data and data newly acquired through the pilot Android-based system into a database and analytical engine. In Kenya, SCAN will use the same rapid assessment approach applied in Zambia at sites that cross a climate gradient and evaluate ICT approaches to collect time series data.

SCAN is a pilot interdisciplinary research project embedded within large-scale development processes. Results will help determine the optimal infrastructure to build coherent and harmonized datasets and support monitoring and decision making around C-A-N and CSA. We welcome feedback and additional collaborations in this work.

Further Reading

- Global Panel. 2015. Climate-smart food systems for enhanced nutrition. Policy Brief: London.
- Phalkey et al. 2015. Systematic review of current efforts to quantify the impacts of climate change on undernutrition. PNAS, 4522-E4529.
- Lipper et al. 2014. Climate-smart agriculture for food security. Nature Climate Change, 4:1068-1
- Rosenstock et al. 2015. What is the scientific basis of climate-smart agriculture? CCAFS InfoNote: Nairobi.
- Hammond et al. 2016. The Rural Household Multi-Indicator Survey (RHoMIS) for rapid characterization of households to inform climate smart agriculture interventions: Description and applications in East Africa and Central America. Ag Systems.
- Bonder et al. 2014. The *n*-dimensional hypervolume. Glob. Ecol. Biog., 23, 595-609.

SCAN is principally funded by UK AID through the Innovative Methods and Metrics for Agriculture and Nutrition Action (IMMANA) program. CCAFS has provided supplemental funding. ***Todd Rosenstock** is an Agroecologist at ICRAF in Kenya (t.rosenstock@cgiar.org). **Christine Lamanna** is a Climate Change Decision Scientist at ICRAF in Kenya. **Brian DeRenzi** is a Computer Scientist at the University of Cape Town (UCT), South Africa. **Sabrina Chesterman** is a PhD student at the London School of Hygiene and Tropical Medicine (LSHTM) in London, UK. **Suneetha Kadiyala** is a Lecturer at LSHTM and Senior Researcher at the Leverhulme Centre for Integrative Research on Agriculture and Health in UK. **Mary Ng'endo** is a Nutritionist at ICRAF in Kenya.* **Kayokwa Chibuye** and **Ngonidzashe Choga** are MSc Students in Computer Science at UCT in South Africa. ***Mark van Wijk** is a Farming Systems Ecologist at ILRI in Costa Rica.*