



One Planet Fellowship's scientific framework

The One Planet Fellowship Initiative seeks to build a vibrant, highly connected and intergenerational network of African and European scientists to lead research on the multi-dimensional impacts of climate change on agriculture and food systems while also identifying and developing innovative solutions to effectively respond to the challenges, needs, and priorities of diverse population groups across Africa. The One Planet Fellowship's scientific framework derives its inspiration from and builds on the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5). The *Communiqué* of the historic COP21 Meeting in Paris in 2015 cites "*the fundamental priority of safeguarding food security and the vulnerabilities of food production systems to the adverse impacts of climate change*" which is a direct recognition of the centrality of food security regionally and globally. Significant inter-disciplinary departures in the food security chapter were recognition of factors, other than food production, including food distribution, nutrition aspects, social that should be included. All these components of food security are particularly relevant for African agriculture's adaptation to climate change. Relevant executive summary points on adaptation from the IPCC AR5 Chapter on Africa were:

- Managing risks to food production require research on the strengthening of communication systems for anticipating and responding to climate risks and increased coping strategies in agriculture to strengthen adaptive capacities for climate change.
- A wide array of conservation agriculture practices, including agroforestry and farmer-managed natural tree regeneration, conservation tillage, contouring and terracing, and mulching, are being increasingly adopted in Africa to strengthen the resilience of the agricultural base. Many practices also have direct adaptation-mitigation co-benefits.
- A wide range of data and research gaps constrain decision making in processes to reduce vulnerability, build resilience, and plan and implement adaptation strategies at different levels in Africa. Research gaps identified include:
 - data management and monitoring of climate parameters and development of climate change scenarios
 - monitoring systems to address climate change impacts in the different sectors
 - research and improved methodologies to assess and quantify the effects of climate change on different sectors and systems
 - socioeconomic consequences of the loss of ecosystems, of economic activities, of certain mitigation choices such as biofuels, and adaptation strategies.

The above points highlight the need for applied research and innovative agriculture-related technologies to solve the many challenges and threats that climate change poses to African agriculture and food systems. Based on this, the One Planet Fellowship's integrative scientific framework is articulated around the following main five themes, each of them covering impact, adaptation and mitigation issues:

- 1) **Monitoring and assessment:** This theme includes data generation, data disaggregation from different socio-economic aspects, access, and management, monitoring of climate change parameters, its impact on African society and in various sectors. It also includes the development and use of assessment framework (including statistical tools to analyze long term changes) of climate change adaptation and mitigation practice and strategies in the agricultural domain. Monitoring and assessment will mobilize farmers' knowledge and agricultural surveys as well as Earth observation technologies (in the field and from satellite) and modeling capacities for agricultural and climate monitoring.

Sample research questions:

- How will climate change impact people with various vulnerabilities, including gender, age, health, education, differently? How could we track and measure the effects (short term) and impact (long term) of climate change on people with different socio-economic characteristics, including gender, age, status, health, etc.?
- When do heat stress and rainfall become significant for productivity in Sub-Saharan Africa and for which crops/ livestock systems?
- What type of assessment framework for climate change adaptation and mitigation practice and strategies in the agricultural domain can be developed and used?
- How can numerical climate models and approaches including General Circulation Model (GCM) projections be downscaled to levels relevant for people, food security, adaptation, and mitigation to make more locally based assessments?
- How to bridge the gap between global scale and regional scale climate information resulting from different international programmes and how can these be translated into knowledge and guidance, accompanied with the development of "regional laboratories" for facilitating capacity building and climate services?

- 2) **Agricultural practices for managing variability and adaptation:** This theme includes management of agrobiodiversity, forestry, plant, and animal breeding (both traditional and modern/biotechnology approaches), crop and livestock protection against climate change related pathogens and bio-aggressors, water management, soil management, and carbon storage, the adaptation of farming practices. This theme also embraces both family farming and agribusiness, while considering farmers' perception and knowledge as well as individual and collective strategies. It should be recognized that farmers can adapt to some changes, but there is a limit to what can be managed. As per IPCC's AR5, adaptive capacity is projected to be exceeded in regions closest to the equator if temperatures increase by 3°C or more. The agricultural sector's interests are best served by aggressively targeted approaches for adaptation and emissions reduction.

Sample research questions:

- What are the major pests/ diseases/ weeds that are anticipated to pose more of a threat to climate change in different African sub-regions? How will these impact core crop and livestock commodities in these areas? How will these impact the spread and vectors of zoonotic diseases? What does an effective surveillance and response system to mitigate these threats look like (i.e., key players, roles for government, the private sector, etc.)?
- Given anticipated climate change impacts in different African sub-regions, how can smallholder farmers effectively diversify to mitigate risk and what are the optimal farming systems including crops and livestock in each agricultural or agro-ecological system?
- What are the significant advancements, technologies or practices that can help mitigate emissions from the livestock sector?

- 3) **Food systems and climate change:** The food systems and climate change theme cover more elements than crop and livestock production. It includes, among others, the vulnerability to and impacts of climate change on food transportation, processing, storage, marketing, and consumption (including food styles/habits, obesity/malnutrition, etc.). It also covers access to food as calories and nutrients for all sections of civil society as well as impacts on non-production elements which have hardly been considered in climate change studies to date. A crucial research topic would be to extend impacts, adaptation and mitigation research in the food system to include the non-production elements of food security.

Sample research questions:

- Given the demographic shifts in different sub-regions in Africa (and in other continents), what are the impacts of climate change on urban and peri-urban food security (including food quality, prices, and reliability of delivery), and the options to adapt rural-urban linkages to climate change?

- What are the various adaptation options for African food and agriculture sector (e.g., regarding developing new crop varieties adapted to changes in CO₂, temperature, and drought; enhancing the capacity for climate risk management, and offsetting economic impacts of land use change)? How can direct and indirect Greenhouse gas (GHG) emissions from food systems be minimized, if not entirely avoided?
- How will major (cereals and core commodities) agricultural value chains be threatened with anticipated impacts of climate change?

- 4) **Social and economic issues related to climate change and agriculture:** This theme includes impacts of climate change on agriculture and strategies for adaptation that are major societal issues in the different sub-regions in Africa. This theme also addresses questions related to risk management strategies at the farm, village, and regional levels; vulnerability of rural populations regarding food security and nutritional status; increase in poverty inducing migration towards cities or abroad, particularly Europe; competition on resources and needs for collective management of land, water, agrobiodiversity.

Sample research questions:

- What role could crop/livestock insurance and financial services (e.g., food price subsidies, direct cash transfers, subsidized agricultural insurance premiums, etc.) have in improving resilience for smallholder farmers against climate change?
- As temperature increases, the production of staples such as wheat, maize, and rice are affected. What economic instruments/measures could cushion the projected increase in price volatility for agricultural commodities?
- An important and yet overlooked aspect in this area is the on-farm behavioral economics of climate change. As the climate changes, farmers will adjust; what does that mean for the agriculture sector in their region? How does that affect their ability to take up mitigation or adaptation technologies/practices? How will this differ between groups of farmers (including the less advantaged ones)?
- What are the socioeconomic consequences of the loss of ecosystems, of economic activities, of certain mitigation choices such as biofuels, and adaptation strategies?
- What regions will economically benefit from climate change? Where are the opportunities located?

- 5) **Organizations, institutions and policy framework supporting climate change adaptation and mitigation in agriculture:** Beyond the evolution of agricultural practices, a range of policy actions including local and territorial governance, national and international public policies, corporate/private sector action frames and value chains organizations, may contribute to orientate and stimulate agriculture adaptation to climate change (for instance evolution of a carbon-market price for agricultural products). Topics may include knowledge sharing and experience in the design of these policies in the agricultural, social, environmental domains, their implementation and the assessment of their impact regarding initially expected impact: It will involve all ranges of stakeholders.

Sample research questions:

- How do governments develop effective climate adaptation plans? What does best in class look like? What are the metrics for measuring readiness and resilience?
- What institutional innovations are feasible and can be promoted at local to regional levels to facilitate agriculture adaptation to climate change?
- What local, national and regional policies or trade reforms are needed to improve and expand the agricultural market and improve the predictability and reliability of a trading system that could result in reduced market volatility and help manage food supply shortages caused by climate change?
- Dealing with climate change and avoiding its worst effects requires, first and foremost, a 'solidly built people.' How to merge the 'Nordic Secret' with the 'African Secret' and how this might enable Africa to deal with climate change?