

# Thematic Piece: Food Security and Climate Change

## Joint Programming Initiative on Agriculture, Food Security and Climate Change FACCEJPI.NET

*In this series of thematic pieces, we spotlight FACCE-JPI projects on a specific theme. This piece will centre on projects with the theme of food security and climate change.*

### What is food security and how is it affected by climate change?

Food security is generally defined as existing for “**all people**, at **all times**, have physical and economic **access** to sufficient, **safe** and **nutritious** food that meets their dietary needs and food preferences for an active and healthy life”.

Food security is affected by climate change through increasing temperatures, changing precipitation patterns, and greater frequency of extreme events. Future food production will have to deal with high temperatures, dryness, increased salinity, damage from extreme events and disruption in supply chains. Both mitigation of emissions from agriculture and adaptation to climate change will be needed.

### [An integrated approach to the challenge of sustainable food systems: adaptive and mitigatory strategies to address climate change and malnutrition \(SYSTEMIC\)](#)

Knowledge Hub on Food and Nutrition Security call

Duration: July 1, 2020 - June 30, 2023

#### *Short description of the project*

The overall aim of the SYSTEMIC project is to implement adaptive strategies for sustainable food production, consumption, and public health by addressing the diverse impact of climate change on nutrition quality and composition of food and defining standards to achieve food and nutrition security. The project aims to address the challenges of the impacts of climate change on food systems and encourage healthy, environmentally sustainable diets.

*Key insights related to food security and climate change:*

- The current state of knowledge about **the effect of climate and its change on the biophysical environment of food and nutrition systems** is needed
- Productivity and efficiency of resource use can be affected by socio-economic factors.
- **Meal plans** can be optimised to reduce environmental impact and ensure adequate nutritional intake, affordable prices, and cultural acceptability.
- Modeling is a tool to optimise meal plans and analyse their impacts on the environment and cost.

#### *Major publications*

Benvenuti, Luca, Alberto De Santis, and Paola Cacchione. "Multi-indicator design and assessment of sustainable diet plans." *Journal of Cleaner Production* 313 (2021): 127699.

<https://doi.org/10.1016/j.jclepro.2021.127699>

Dibari, Camilla, et al. "Climate change impacts on the Alpine, Continental and Mediterranean grassland systems of Italy: A review." *Italian Journal of Agronomy* (2021). <https://doi.org/10.4081/ija.2021.1843>

Benvenuti, Luca, and Alberto De Santis. "Making a sustainable diet acceptable: an emerging programming model with applications to schools and nursing homes menus." *Frontiers in Nutrition* 7 (2020): 562833.

<https://doi.org/10.3389/fnut.2020.562833>

### [Delivering food security on limited land \(DEVIL\)](#)

FACCE-JPI /Belmont Forum

Duration: February 1, 2015 — January 31, 2018

#### *Short description of the project*

DEVIL envisions solutions to feed a growing population with limited land resources by examining feedbacks and interactions between land-use change and food security dynamics.

This project aims to propose an integrated modelling system that will examine a range of scenarios, including production-side measures and demand-side measures to improve food security. Also, the global feedbacks of these scenarios on land use, food supply, and the differential impacts in three regions: South America, Sub-Saharan Africa, and South Asia.

#### *Key insights related to food security and climate change*

- Further development of **state-of-art databases** on crops, livestock, food production and nutrition, agricultural inputs and environmental impacts.
- Projected increase in population and food demand would require more land and have disastrous consequences on global climate change, biodiversity and other environmental aspects.
- **Sustainable intensifications** could limit the adverse impacts of projected population increase and dietary transitions, but they would not be eliminated.
- **Reduction in overconsumption of livestock products and reduced per- and post-consumer food waste** is necessary to deliver nutrition security in a globally sustainable manner.

#### *Major publications*

Molotoks, Amy, et al. "Comparing the impact of future cropland expansion on global biodiversity and carbon storage across models and scenarios." *Philosophical Transactions of the Royal Society B* 375.1794 (2020): 20190189. <https://doi.org/10.1098/rstb.2019.0189>

Balmford, Andrew, et al. "The environmental costs and benefits of high-yield farming." *Nature sustainability* 1.9 (2018): 477-485. <https://doi.org/10.1038/s41893-018-0138-5>

Smith, Pete, et al. "Impacts on terrestrial biodiversity of moving from a 2°C to a 1.5°C target." *Philosophical Transactions of the Royal Society A* 376 (2018): 20160456 <https://doi.org/10.1098/rsta.2016.0456>

## **AFGROLAND**

FACCE-JPI/Belmont Forum

Duration: March 1, 2015 — September 30, 2018

#### *Short description of the project*

Global agro-food-energy system changes impact on the countries in Africa, particularly with regards to sustainable land management, agricultural production, food security, socio-economic outcomes, pressure on land and natural resources, and subsequently the governance. This project aims to identify drivers of change within the global agro-food-energy systems, how they impact on and in return are shaped by governance changes at the regional, national, and local levels.

#### *Key insights related to food security and climate change*

- Large Agricultural Investments (LAIs) **shifted smallholder farms to commercial agriculture** and led to changes in status of socio-economic, food security, and environment in Kenya, Madagascar, and Mozambique.
- LAIs contributed to deforestation in Mozambique, and water shortage and pollution in Kenya.
- Impacts of LAIs on food security varied. Engaged household in LAIs was more food secure than non-engaged household.
- Commercial agriculture can be a component in **sustainable development strategies** under certain conditions (i.e. business models and governance).

#### *Major publications*

Oberlack, Christoph, et al. "Why do large-scale agricultural investments induce different socio-economic, food security, and environmental impacts? Evidence from Kenya, Madagascar, and Mozambique" *Ecology and Society* 16.4 (2021): 18. <https://doi.org/10.5751/ES-12653-260418>

Zaehringer, Julie G et al. "Large-scale agricultural investments in Eastern Africa: consequences for small-scale farmers and the environment" *Ecosystem and People* 17.1 (2021): 342-357. <https://doi.org/10.1080/26395916.2021.1939789>

Fitawek, Wegayehu and Sheryl L Hendriks, "Evaluating the Impact of Large-Scale Agricultural Investments on Household Food Security Using an Endogenous Switching Regression Model" *Land* 10.3 (2021): 323. <https://doi.org/10.3390/land10030323>

Want to have an overview of all FACCE-JPI projects? Check the [project wheel](#) which has all 148 projects funded by FACCE-JPI. It includes both past and currently running projects.

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