Thematic Piece: Trade and Telecoupling

Joint Programming Initiative on Agriculture, Food Security and Climate Change

FACCEJPI.NET

This series of thematic pieces spotlight FACCE-JPI projects on a specific theme. This piece will centre on projects with the theme of trade and telecoupling.

Why is studying trade important for sustainable agriculture in a changing climate?

Food systems have become increasingly interconnected. The distance between where an agricultural product is grown and where it is processed and ultimately consumed can be quite large, allowing for geographically distant human and natural systems to become increasingly connected. Climate change can also affect food production in one region and disrupt food availability and food security in other regions.

The socioeconomic and environmental interactions between distant coupled human and natural systems can be integrated into the framework of "telecoupling". Telecoupling is a conceptual framework that helps to understand complex interactions and feedback between different socio-ecological systems across distances. It recognises that social and ecological systems are increasingly interconnected through flows of information, goods, people, and environmental impacts.

It recognises that actions in one geographical location can have significant effects in distant locations, creating a network of relationships and interdependencies. Studying trade and telecoupling can explore the risks of climate change on agriculture. Additionally, using the telecoupling framework can be useful to analyse effective research and policy within agriculture and wider food systems.

Food Security and Land Use: The Telecoupling Challenge (ABC Telecoupling)

FACCE-JPI/Belmont Forum

Duration: November 1, 2014-October 31, 2019

Short description of the project

ABC Telecoupling aimed to enhance the capacity to predict effects from shifts in food flows and land use; deliver tools to facilitate policy changes to improve food security, while ensuring a more sustainable environment; increase cooperation among significant research and stakeholder groups in major food production and consuming countries; and train young scientists to minimise negative consequences from land-use change worldwide. The project provided a comprehensive framework, complex systems modelling approach and a web-based decision support system to find solutions that enhance food security for all while ensuring sustainability.

Key insights related to trade and telecoupling

- **Telecouplings operate through market mechanisms** such as international trade of agricultural inputs (e.g., fertilisers) and products (e.g., soybean).
- **Natural suitability** (e.g. topography, soil, temperature, precipitations), **demands on ecosystem services, and the international policy context** (e.g. current trade tariffs) can dictate telecouplings and decision-making processes across distances.
- **Telecouplings matter for local decisions**. For example, changes in diets in China can have impacts on local land use and land-cover change in Brazil through the telecoupled trade of soybean
- **Spillover systems (systems affected beyond sending and receiving systems) are affected by the flows of agricultural commodities**. For example, spillover systems based on trade agreements foster sustainable soybean/cattle production in the Brazilian Amazon.

Major publications

- Tonini, Francesco and Liu, Jianguo. "Telecoupling Toolbox: spatially explicit tools for studying telecoupled human and natural systems". Ecology & Society 35 (2017): 11. https://doi.org/10.5751/ES-09696-220411
- Silva, Ramon Felipe Bicudo da et al. "The Sino-Brazilian Telecoupled Soybean System and Cascading Effects for the Exporting Country". Land 6 (3) (2017): 53. https://doi.org/10.3390/land6030053
- Sun, Jing et al. "Importing food damages domestic environment: Evidence from global soybean trade". PNAS 115 (2018): 21. https://doi.org/10.1073/pnas.1718153115
- Liu, Jianguo et al. "Spillover systems in a telecoupled Anthropocene: typology, methods, and governance for global sustainability". Current Opinion in Environmental Sustainability 33 (2018): 58-69. https://doi.org/10.1016/j.cosust.2018.04.009

Cross-Border Climate Vulnerabilities and Remote Impacts of Food Systems of the EU, Turkey and Africa: Trade, Climate Risk and Adaptation (CREATE)

FOSC

Duration: June 1, 2021 – May 1, 2024

Short description of the project

Most climate risk and impact assessments of food systems focus on production within a specific geographic area. Consequently, knowledge and research on cross-border climate vulnerabilities of food systems have hardly received any attention. CREATE aims to develop a novel cross-border climate risk/impact assessment methodology for food value chains based on embedded resources (e.g. water, land, carbon) using a trade concept that maps representative connections between European socio-economic activities and remote climatic hazards in Africa and Turkey. CREATE's climate assessment starts at the farm level in producing regions in Africa and Turkey, focusing on crop yield changes under different climatic stressors and translates these impacts, in a cascading way, to food systems and value chains in the EU as vulnerabilities. It also looks at the socio-economic and environmental impacts of these trade relations.

Key insights related to trade and telecoupling :

- **Cross-border climate risk assessment** can increase awareness of climate change's risks to the agro-food trade and the economy.
- The **consequences of climate change on agro-food trade** can be mitigated by improving water efficiency and productivity.
- **European agri-food systems have an impact on Africa** through the import of products from water-scarce areas. Climate change is expected to reduce water availability in these areas further.
- **Eliminating food waste** at the consumer level, **minimising losses** in manufacturing and transportation **and sourcing products locally** instead of importing from African countries where water may be scarce, have a considerable reduction in the water and carbon footprint of imported products.

Major publications

Schults, T., C. Nolet. 2023. Climate Risk Assessment of Key Crops for the Agri-food Trade Between Europe, Africa, and Turkey. FutureWater Report 245. https://www.futurewater.nl/wp-content/uploads/2023/03/CREATE_WP3_FW245.pdf

Ercin, E. et al. "Cross-border environmental impacts of agri-food systems and potential solutions towards sustainability: a case study of trade between Europe and Africa." EGU General Assembly (2023), Vienna, Austria https://doi.org/10.5194/egusphere-egu23-16316

Capar, G. et al. 2022. Investigation of climate change impacts on agricultural production in Turkey using volumetric water footprint approach. Sustainable Production and Consumption 35: 605-623 (2023). https://doi.org/10.1016/j.spc.2022.12.013

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