



Special Issue: Transforming agri-food systems for sustainability and rural vitalization

EDITORIAL

Rui Mao^a, Chen Ji^a, Xin Jin^a, Tetsushi Sonobe^b, and Dil Rahut^c^①

^a*Professor, China Academy for Rural Development and Lab of Inclusive & Smart Governance for Urban-Rural Integration, Zhejiang University, 866 Yuhangtang Road, Hangzhou 310058, P.R. China*

^b*Professor, National Graduate Institute for Policy Studies (GRIPS), 7-22-1 Roppongi, Minato-ku, Tokyo 106-0032, Japan*

^c*Vice Chair, Asian Development Bank Institute, Kasumigaseki Building 8F, 3-2-5 Kasumigaseki, Chiyoda-ku, Tokyo 100-6008, Japan*

Abstract

Global agri-food systems face unprecedented volatility, which necessitates a transition towards systemic robustness. This special issue, developed in collaboration with the Asian Development Bank Institute, addresses critical research gaps regarding both spatial and structural interdependencies in food systems. Centered on two pillars of transformation, i.e., inter-regional connectivity and urban-rural integration, the collection presents eight papers spanning advanced and emerging countries. The research explores diverse areas of resilience, ranging from macro-level disruptions such as the global fertilizer crisis, trade barriers to agricultural intermediates, and the systemic impacts of emerging trade wars, to micro-level challenges such as digital adaptation, supply chain bottlenecks, and climate shocks to nutritional security. The research findings offer insights for both scholars and practitioners to foster sustainable, inclusive, and resilient agri-food transformations amid persistent exogenous shocks.

Keywords: agri-food systems transformation, rural vitalization, inter-regional connectivity, urban-rural integration

JEL code: Q13, Q17, Q18, O18, R11

^①Corresponding author: drahut@adbi.org

Global agri-food systems are operating in an era of unprecedented volatility, where compounding effects of climate change, geopolitical fragmentation, and demographic shifts have rendered traditional production-centric models inadequate. While agri-food economics and management studies historically prioritized farm-level productivity and food security, the recent frequency of exogenous shocks, ranging from pandemic-driven logistics failures to regional conflicts, indicates that systemic robustness is increasingly contingent on the connectivity of food systems. Despite this importance, the spatial and structural interdependencies that determine how food systems can absorb shocks and redistribute value creation remain under-examined in the current literature.

The IFAMR Special Issue ‘Transforming Agri-food Systems for Sustainability and Rural Vitalization’ seeks to bridge this gap by centering the academic discourse on two critical levers of transformation. First, it investigates the essential role of inter-regional connectivity — encompassing trade protocols, logistical infrastructure, and coordination of global value chains — as a mechanism to mitigate market fragmentation and stabilize supply. Second, it explores urban-rural economic integration as the essential framework for ‘rural vitalization’. With the transition from isolated agricultural production toward integrated value chains, these studies contribute to the literature by highlighting how technology diffusion and market access would catalyze rural income growth and foster regionally balanced development.

Supported by the Global Research Network on Agri-food Systems for Sustainable Transformation (GreNAST), the China Academy for Rural Development (CARD), and the School of Public Affairs of Zhejiang University, IFAMR presents this collection of eight evidence-based works in collaboration with the Asian Development Bank Institute (ADBI). The following papers provide a joint platform for scholars and practitioners to redefine transformative drivers of inclusive, resilient, and sustainable agri-food systems in both advanced and developing economies.

The paper ‘Impacts of the Global Fertilizer Crisis in Africa: Insights from Country-Level Studies’ by Samuel Njoroge, Esther Mugi-Ngenga, Pauline Chivenge, Hakim Boulal, Pamela Pali, Shamie Zingore, and Kaushik Majumdar adopts a comparative case study approach, combining primary and secondary evidence to investigate impacts and stakeholder responses along fertilizer supply chains across Morocco, Ghana, and Kenya. The COVID-19 pandemic and the Russia–Ukraine conflict triggered the most severe disruption to global fertilizer markets in decades. Due to Africa’s structural dependence on imported fertilizers, the continent experienced pronounced exposure to these shocks. The paper finds across cases, local fertilizer prices rose two- to threefold, undermining affordability, availability, and application rates, with substantial heterogeneities within and between countries. At the macro level, government-financed subsidies emerged as a common mitigation instrument, complemented by country-specific measures. At the farm level, smallholders reduced fertilizer use and cropped area, while some relied on savings, credit, or extended travels to secure inputs. This study offers policy-relevant insights for strengthening resilience to future fertilizer supply shocks.

The paper ‘Instant Effects Decay: Re-Examining the Impact of Information Intervention on Consumers’ Food Date Label Cognition and Food Waste Behavior’ by Shujun Cheng, Shuhua Gao, Yanjun Ren, Ziqing Tian, Minjuan Zhao, and Xiaohua Yu addresses the critical research gap in understanding the long-term effects of information interventions on consumer food waste behavior. While consumer misunderstanding of food date labels is a known driver of food waste, existing evidence is predominantly short-term and derived from developed economies. This study collects three-stage balanced panel data and demonstrates that although information interventions significantly improve consumers’ label cognition and immediately reduce waste behavior, these effects decay substantially over 1.5 years. Notably, the study reveals heterogeneous decay patterns, with faster behavioral reversion among female consumers and those in warmer regions and for perishable foods. These findings provide empirical evidence for designing more effective, sustained intervention programs to improve date-label interpretation and reduce food waste, thereby achieving United Nations Sustainable Development Goal 12.3 ‘Halve Food Waste’ before 2030.

The paper ‘Intermediate Trade Barriers, Global Value Chains and Agricultural Development’ by Rui Mao and Shibin Wen systematically examines the impact of agricultural intermediate trade barriers on global value chains (GVC) and agricultural development. Using a composite measure of trade barriers in bilateral trade flows of agricultural intermediates, with both tariff and non-tariff measure data detailed at the HS6-digit product level for 76 countries from 1995 to 2020, the paper finds that a 1% increase in trade barriers reduces agri-food GVC trade by approximately 1.67%, with greater impacts on the forward participation, food sector, and developing countries. Furthermore, GVC trade significantly promotes agricultural development by increasing per capita agricultural GDP and fostering inclusive distribution, as reflected in lower urban-rural gaps, lower Gini coefficients, and lower poverty rates. Mechanism tests identify technology spillovers, trade gains, and industrial upgrades as key pathways. The study highlights the need to reduce intermediate trade barriers and deepen GVC engagement to foster agricultural development.

The paper ‘Can Participation in Agricultural Division of Labor Facilitate Green Production Behavior of Smallholder Farmers in China?’ by Xinjie Shi, Xu Wang, and Kangwei Ma examines how smallholder farmers’ participation in horizontal (crop specialization) and vertical (outsourced services) divisions of labor affects green production behavior from a capital endowment perspective. Using three-wave panel data from the Chinese Family Database (CFD) and China Household Finance Survey (CHFS), and a finite mixture model, the paper finds that horizontal division of labor (HDL) significantly reduces green production behavior, whereas vertical division of labor (VDL) promotes it. Mechanism analysis reveals that VDL enhances green production by alleviating physical capital constraints, compensating for human capital limitations, and strengthening social capital through embedded service networks. Heterogeneity analysis shows HDL’s negative effects are more pronounced among small-scale farmers and non-users of digital finance, while VDL’s benefits are strongest in low-precipitation regions and resource-constrained households. Notably, the study identifies a synergistic effect between HDL and VDL, in which deepening one mitigates the limitations of the other. The findings provide important implications for designing integrated policies to facilitate smallholders’ green transition through coordinated horizontal specialization and vertical service development.

The paper ‘Do Supply Chain Bottlenecks Affect Perishable Commodity Price? Evidence from COVID-19 Lockdown in India’ by Mukta Mukherjee examines how COVID-19 lockdown-induced supply chain bottlenecks affected perishable vegetable prices in India’s major producing states, West Bengal and Uttar Pradesh. Using daily wholesale market data from 2018 to 2021 and an interactive fixed-effects panel model, the paper finds that a doubling of lockdown stringency increases prices of highly perishable vegetables (7-day storage) by 3%, while reducing prices of low-perishable vegetables (365-day storage) by 1%. Further, the market’s location matters: being in major production areas buffers price shocks. Cold storage facilities, better logistics infrastructure, and market reforms significantly attenuate the stringency effect, though multi-purpose cold storage remains insufficient. The study advances the literature by disaggregating vegetables by storage days and distinguishing between producer and consumer regions, revealing heterogeneous price responses that are often masked in aggregate analyses. Policy implications include developing green corridors, expanding multi-purpose cold storage, and advancing market deregulation to enhance supply chain resilience against future disruptions.

The paper ‘Does Internet Use Help Smallholders Weather Extreme Weather Shock? The Critical Roles of Digital Literacy and Community Ties’ by Chunyan Zhang, Jorge Ruiz-Menjivar, and Lu Zhang examines whether internet use can enhance smallholder resilience to climate-induced yield losses, amid the rising frequency and intensity of extreme weather events in China. Drawing on survey data from 1,602 rice farmers in major grain-producing areas, the authors employ a fixed-effects framework to estimate the impact of internet use on yield outcomes under weather shocks. The findings show that internet use is significantly associated with reduced yield losses, primarily by enabling the timely adoption of adaptive technologies and improved farm management responses. The effects vary according to shock types: the mitigating role of internet use is strongest under high temperatures and drought, but limited in the case of floods, likely due to their sudden onset and restricted scope for adjustment. Moreover, farmers with low digital literacy benefit

less directly, although spillover effects emerge through peer learning. The study highlights the importance of rural digital infrastructure and capacity building in strengthening climate adaptation.

The paper ‘The Impacts of the 2025 Trade Wars on Global Agricultural Markets and US Agricultural Trade’ by Jianwei Ai, Minghao Li, Tiejue Zhang, and Wendong Zhang assesses the economic consequences of 2025 U.S. “reciprocal tariffs” on global agri-food markets. By using a multi-region, multi-sector computable general equilibrium (CGE) model, the authors evaluate macroeconomic and sectoral effects across alternative tariff scenarios. The results indicate that the imposition of uniform tariffs generates substantial welfare losses for the U.S. (0.63%) and China (1.28%), with corresponding declines in GDP. Findings quantify higher consumer prices for key U.S. agri-food products, including vegetables (6.05%), crops (7.48%), and cattle (4.13%). Notably, China’s oilseed imports from the U.S. decreased by 38.32%, while imports from Canada and Brazil increased, highlighting pronounced trade diversion. The study links these protectionist shifts to strategic protection for agricultural constituencies and the Stolper-Samuelson framework. This work provides a rigorous quantitative framework for redefining transformation drivers in global value chains and underscores the need for targeted trade aid to mitigate negative effects on vulnerable agricultural sectors.

The paper ‘Linking climate shocks to nutritional outcomes: how extreme weather affects dietary quality in rural China’ by Yuqi Mei, Ting Meng, and Shenggen Fan investigates the critical nexus between climate resilience and nutritional security. Using the Climate Physical Risk Database and longitudinal household food consumption data (2005–2022), the authors employ a fixed-effects model to estimate the relationship between extreme weather and rural dietary quality. Empirical results demonstrate that extreme weather significantly reduces intakes of carbohydrates, fats, and proteins, while paradoxically increasing dietary diversity through substitution toward alternative food sources. Mechanistic analyses reveal a tripartite transmission mechanism: climate shocks disrupt agricultural production, trigger price volatility, and depress rural household incomes, collectively degrading dietary quality by altering consumption budget constraints. By identifying heightened vulnerability among populations in Western China and production-consumption balanced regions, this study advocates for strengthening early-warning systems and implementing targeted dietary subsidies to fortify the resilience of vulnerable rural agri-food systems.

Acknowledgements

The guest editors would like to thank the Editor-in-Chief, Kevin Chen, and all the authors and reviewers. This Special Issue emerged from the conference ‘Transforming Agri-food Systems for Sustainability and Rural Vitalization’ held jointly by the Asian Development Bank Institute and Zhejiang University in Tokyo, Japan, on July 31 and August 1, 2025. We would also like to thank Raja Rajendra Timilsina, Ngawang Dendup, Mami Nomoto, and Chiisye Toki for their relentless support in organizing the conference. Both institutes provided support to cover open-access publication fees for selected papers, reflecting a shared commitment to making research freely accessible to practitioners, policymakers, and scholars worldwide. We also want to thank the National Fund of Philosophy and Social Science (23ZDA035), Ministry of Education (2024JZDZ061, 22JJD790078), National Natural Science Foundation (72273123, 72473128), Major Project of Zhejiang Provincial Philosophy and Social Sciences Planning (25SYS11ZD), and the Soft Science Research Program of Zhejiang Province (2026C35096) of China for financial support.