

# ENABLING INFRASTRUCTURE FOR INCLUSIVE AGRIFOOD SYSTEMS: EVIDENCE AND IMPLICATIONS FROM THE GLOBAL SOUTH<sup>1</sup>

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To answer the question of what investments and policies have the potential to accelerate the symbiotic co-development of cSSPs and MSMEs, and the inclusion effects of that dynamic?- INCATA's fourth research question, we conducted a structured evidence review of policies and investments targeting specific segments of agrifood value chains. This review informs a series of four policy papers, each addressing key findings and implications related to one of the three main domains of agrifood value chain interventions:

- (i) Public Goods, particularly infrastructure that enables systemic function;
- (ii) Producers, focusing on smallholder-oriented interventions; and
- (iii) the hidden middle, comprising services and institutional arrangements that facilitate connectivity along the chain.

A fourth policy paper builds on a complementary study, which concentrates on the limited body of research focused on the hidden middle, highlighting significant evidence gaps.



**INCATA: Linked Farms and Enterprises for Inclusive Agricultural Transformation in Africa and Asia**  
Project funded by the Gates Foundation and implemented by Rimisp, MSU, IFPRI-Asia and Tegemeo Institute

## Project objective

The INCATA initiative examines the relationship between commercial small-scale producers (cSSPs) and micro, small, and medium enterprises (MSMEs) in the hidden middle of agrifood value chains to explain how it underpins and contributes to an inclusive agricultural transformation.

## Work streams

The project works around two work streams, (i) LSMS-ISA data analyses for six African countries, and (ii) Horticulture and aquaculture value chain analyses in Kenya (led by Tegemeo Institute) and in Odisha, India (led by IFPRI), and aims to answer four research questions:

## Research questions

1. What are the prevailing patterns of commercialization among small-scale producers (SSPs) and the key policy- and non-policy-related factors that shape their engagement with "hidden-middle" MSMEs?
2. Which cSSPs and MSMEs succeed in raising incomes, investing, adopting new technologies, and accessing larger or higher-value markets during the transformation process—and why do others lag?
3. To what extent does a greater commercialization of SSPs and the expansion of MSMEs translate into poverty reduction and advances in women's economic empowerment (WEE)?
4. **Which investments and policies have the most significant potential to accelerate the symbiotic co-development of cSSPs and MSMEs?**

<sup>1</sup>Policy brief based on the INCATA working document: Espinoza, Trivelli & Fuica (2025) "Overlooked and Understudied Evidence on Policies for Strengthening the Hidden Middle in the Global South".

**This policy paper focuses on the evidence on which policies and investments aimed at supplying public goods that support the entire agrifood system—from production to consumption—and are key for inclusive agricultural transformation.**

It synthesizes the most relevant findings from the evidence review, identifies promising interventions, and outlines practical recommendations to guide future policies in this area. The analysis of interventions in the Global South shows that investments in rural electrification, roads, large-scale irrigation systems, and regulatory frameworks can have varying levels of positive impact on agricultural development, particularly when implemented alongside complementary policies and institutional support for each specific context.

## METHODOLOGY

The review screened over 1,200 abstracts, eventually retaining 276 documents (229 impact evaluations and 47 systematic reviews) based on rigorous methodological standards. Studies were identified through public databases such as 3ie, IFPRI, CGIAR, OECD, and the World Bank, supplemented by targeted searches on Google Scholar. Priority was given to studies published from 2010 onward. While offering robust insights, the review is constrained by regional concentration (notably in Sub-Saharan Africa), potential publication bias, and difficulty in isolating the effects of multi-component interventions.

## RURAL ELECTRIFICATION

Rural electrification is considered necessary but not sufficient for inclusive development. Its benefits depend on bundling with complementary policies—mainly credit access, training, and institutional reform—and vary significantly across contexts.

Where does electrification show a positive impact?

- **Household income and employment:** through household cost savings (e.g., reduced kerosene use) and access to new income-generating activities.
- **Education:** through improved lighting and access to information technologies, which support school attendance and completion, but evidence on actual learning gains is still limited.
- **Female empowerment:** by reducing the time burden of domestic chores, potentially freeing up time for education or paid work, particularly in programs with gender-sensitive design.
- **Economic diversification:** when paired with supportive infrastructure, market access, and adequately sized systems like mini-grids, it can catalyze midstream and downstream economic activities—such as agro-processing, informal commerce, and other non-farm enterprises. Without coordinated design, however, it risks reinforcing existing inequalities.

Commercial small-scale producers and MSMEs in the hidden middle can maximize their development outcomes with an adequate system size and technological choices. Meta-analyses show that hybrid mini-grid systems outperform small-scale solar home systems, while grid expansion tends to be less cost-effective in mountainous or sparsely populated areas. Targeting mechanisms are also necessary to prevent benefits from concentrating in

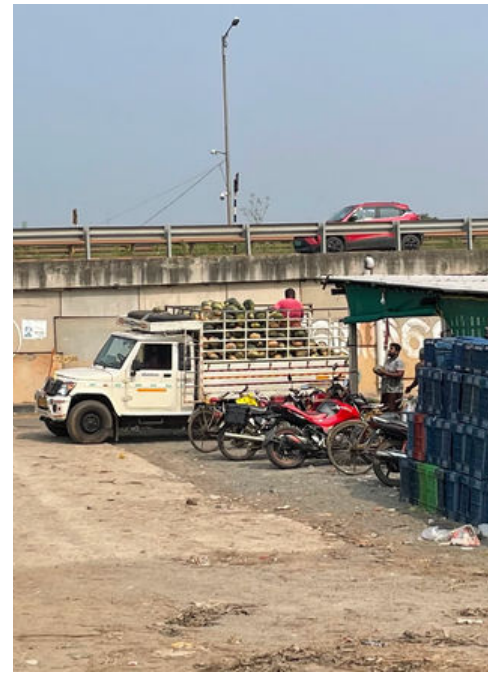


better-off sectors and reinforcing existing inequalities. For instance, while electrification can reduce the time spent on domestic work, the gains may favor men over women unless gender-specific components are included in program design. Similarly, without subsidies or explicit pro-poor components, wealthier households are more likely to capture the benefits.

Nonetheless, some effects remain underexplored. Better longitudinal evaluations are needed, especially in low-income African countries, to assess the impact of electricity access on economic resilience, gender empowerment, and climate outcomes.

## RURAL ROADS

Evidence highlights the developmental potential of rural roads—both construction and rehabilitation—especially when implemented in lagging regions and complemented by policies such as credit access and irrigation. However, their impact is highly context-dependent and often heterogeneous, shaped by geography, household characteristics, and the broader policy environment. In Vietnam, for example, road improvements led to shifts in labor patterns rather than productivity gains. In India, transitions to non-farm work had limited effects on poverty and wage employment, underscoring the need for complementary services like irrigation and market access. Impacts tend to be stronger in previously disconnected areas and among poorer households, though gender-based barriers to capital and labor can constrain results. Unintended consequences have also been documented, including falling prices, lower life satisfaction due to increased competition, and growing inequality driven by income gains. In some cases, excluded communities experienced negative spillovers, such as higher rates of disease transmission (e.g., HIV).



Where do rural roads show a positive impact?

- **Income, poverty, and employment:** by reducing transport costs, improving access to services, cropping intensity, and shifting labor toward higher-return and non-agricultural jobs.
- **Agricultural productivity:** through raising output, market integration of disconnected regions, and access to improved prices and agricultural technologies.

Despite strong evidence on productivity and welfare gains, existing evaluations rarely examine the role of rural roads in enabling midstream value chain activities, such as storage, wholesale markets, processing, or aggregation. Specific evidence on value chain transformation and related infrastructure remains limited, highlighting a critical gap for future research and policy design.

## LARGE-SCALE IRRIGATION (LSI)

The evidence on large-scale irrigation, defined as government- or donor-financed infrastructure projects serving areas larger than 100 hectares, presents less promising results. While these systems have historically contributed to expanding irrigated areas and increasing agricultural productivity, their benefits tend to be marginal, short-lived, and regressive, negatively impacting poor, tail-end farmers, as well as the environment and biodiversity. Small-scale alternatives and a stronger institutional framework may improve the sustainability and the benefits of irrigation systems.

Where does LSI show a positive impact?

- **Agricultural productivity:** boosted productivity during the Green Revolution by enabling high-yielding varieties, fertilizer use, and expansion into higher-value crops—but gains depended on access to inputs and extension services, often favoring wealthier farmers.
- **Poverty and food security:** through food production, job creation, and price stabilization, but its pro-poor effectiveness has declined due to rising costs, resource scarcity, and weak targeting.

Despite these benefits, especially during the Green Revolution, the pro-poor and the cost-effectiveness of LSI systems have proven difficult to sustain. Experience from Sub-Saharan Africa shows that high construction costs and underinvestment in upkeep make long-term economic returns hard to achieve. As land and water resources become scarcer and project costs rise, marginal returns continue to decline.

In contrast, smallholder-oriented systems have demonstrated greater efficiency and stronger results in improving marginalized groups' livelihoods. Gains from large systems are often unevenly distributed and captured by wealthier farmers with political connections, showing their regressive nature. Tail-end users frequently receive insufficient or degraded, lower-quality water flows, while unequal landholding structures tend to widen the gap that benefits larger farmers.

These large infrastructure projects often carry negative externalities on the environment, such as soil salinization, waterlogging, contamination from agrochemicals, and depletion of groundwater resources. Large dams and canal system construction disrupt downstream sediment flows, degrade wetland, and negatively impact biodiversity, particularly when environmental planning was absent and adequate drainage infrastructure was not implemented.

The limited success of these systems can be partially explained by institutional weaknesses that undermine long-term sustainability. Decision-making processes often exclude farmer participation and lack adequate accountability mechanisms. Implementing agencies frequently face coordination challenges, and maintenance regimes tend to be underfunded. Future investments should be guided by clear strategies to ensure inclusiveness and promote environmental resilience.

## REGULATIONS

Institutional frameworks shape the performance and inclusiveness of agrifood systems. Regulatory interventions (such as trade policy, legal reforms, and market governance) have the potential to transform labor markets, food security, and rural livelihoods when designed and implemented effectively. Evidence cautions against deregulation efforts that weaken market institutions, as these can undermine sustained development.

Trade policies have shown mixed effects across countries. In Brazil, liberalization narrowed gender employment gaps, though this was driven more by job losses among men in tradable sectors than by employment gains for women. In Mexico, it contributed to structural dietary shifts, increasing the consumption of animal-source foods while reducing that of pulses. Market regulations have also yielded varied outcomes. Dairy import tariffs in Indonesia supported domestic supply by raising prices and production, though they slightly dampened demand. In Mexico, guaranteed price policies for smallholder maize farmers had positive distributional effects, increasing incomes and slowing the decline in cultivated area. Regulated prices can also reduce long-term price volatility, as illustrated by China's experience with apple futures.

Legal reforms expanding women's economic rights—such as Ethiopia's Family Law reform—have shown substantial transformative impacts, increasing female participation in full-time, paid, off-farm work by 15–24% in areas where they have been enacted. Finally, evidence from India shows that stronger implementation of post-harvest marketing laws under the APMC Act is associated with increased agricultural growth and technology adoption, underscoring the importance of regulatory governance in sustaining rural development. Overall, these findings emphasize the importance of context-specific, inclusive, and well-enforced regulatory frameworks to balance efficiency and equity in agrifood systems.