STRENGTHENING PRODUCERS FOR AGRIFOOD TRANSFORMATION: EVIDENCE ON INPUTS, IRRIGATION, ORGANIZATIONS, AND INNOVATION[1]

AUGUST 2025

This policy paper focuses on evidence-based interventions that strengthen agrifood systems by improving productivity, resilience, and market participation among smallholder producers. The analysis covers inputs and finance, irrigation infrastructure, midstream enablers (such as storage, processing, certifications, and producer organizations), and cross-cutting R&D interventions (including training, information and ICT, and innovation platforms). Evidence shows that individual interventions often have limited or short-lived effects when implemented in isolation. Instead, sustained impact depends on bundling complementary services, tailoring interventions to local contexts, and reinforcing delivery systems with inclusive, participatory institutions.

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?**

[1]Policy brief based on the INCATA working document: Espinoza, Trivelli & Fuica (2025) "Overlooked and Understudied Evidence on Policies for Strengthening the Hidden Middele in the Global South".

INPUTS AND FINANCE

Interventions aimed at improving access to inputs, such as improved seeds, fertilizers, and production technologies, consistently increase adoption; however, their impact on productivity, income, and food security depends on the quality of delivery, effective targeting, and integration with complementary services. Without training, market access, or affordability, gains are often limited or short-lived.

- Fertilizer and subsidy programs contribute to short-term food security, but they rarely have a greater impact on their own.
- Improved seeds can raise productivity, income, and reduce poverty through higher yields, faster maturation, and stress tolerance—but their impact varies by context, crop, and household profile.

Input technologies rarely deliver inclusive or lasting results on their own. Effective implementation requires locally grounded governance, community-based targeting, and coordination. Without these, benefits often concentrate among larger or politically connected farmers. Programs are more effective when proper distribution channels are addressed, and in value chain interventions where inputs are embedded in broader support packages—including complementary services, credit, and guaranteed markets.

Sustained adoption depends on affordability and the ability to reinvest productivity gains. Hence, financial inclusion instruments—credit, savings, price risk management, and insurance—may contribute through different mechanisms:

- Agricultural productivity: through credits and insurance that enable investment in higher-return (and often higher-risk) crops, productive technologies, and inputs.
- Income and market participation: by supporting off-season sales of perishable or price-volatile commodities and improving the timing of market entry.
- Risk management: through insurance and savings that protect producers from shocks and help farmers to delay sales and invest more in production.

As with inputs, financial services implemented in isolation tend to show muted or no effects: off-season sales are not possible without adequate storage; riskier investments require services such as training, technology, and infrastructure to maximize their benefits; and even well-designed programs may be insufficient if trust in lenders is low or if risks are perceived to be too high.

Bundled financial packages that are aligned with cropping cycles and tailored to farmers' risk profiles tend to perform better. Loans offered through community-based groups have improved access to vulnerable populations. Those associated with women's financial literacy and access to funds, paired with training and savings, have been shown to improve women's empowerment.

The success of financial tools depends on integration within a broader support ecosystem, where trust in institutions and lenders is essential. Financial tools that are delivered on time, aligned with crop cycles, and embedded in programs that include training and infrastructure consistently show better results.

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.

SMALLHOLDER IRRIGATION

Smallholder irrigation technologies, such as tubewells, treadle pumps, and solar irrigation systems, have expanded through both formal and informal channels. While adoption has grown, it remains uneven in areas lacking financing, technical support, or maintenance systems. Still, these technologies have demonstrated benefits in:

- **Productivity:** higher yields, cropping intensity, and profitability, particularly with treadle and solar pumps. These gains translate into income and poverty reduction when irrigation is combined with extension services, inputs, or electricity.
- **Food security and resilience:** by increasing food availability, crop diversity, household income, and productive assets.
- **Gender empowerment:** systems designed to include women through ownership and training, reduce domestic burdens and improve women's control over income and time.

Irrigation alone rarely delivers sustained or equitable outcomes. Its effectiveness depends on complementary measures such as training, technical support, land conservation, financing, and access to agricultural inputs. Participatory governance arrangements, such as water user associations, enhance sustainability and contribute to the equitable distribution of benefits.

However, institutional and structural barriers persist. Small landholdings, weak extension systems, and underfunded maintenance undermine performance, while uncoordinated informal systems can lead to overuse and reinforce inequalities. As with other interventions, long-term success requires reliable financing, consistent maintenance, and behavioral change. Infrastructure investment must be embedded in a broader support ecosystem to avoid underperformance and unintended disparities.

HIDDEN MIDDLE

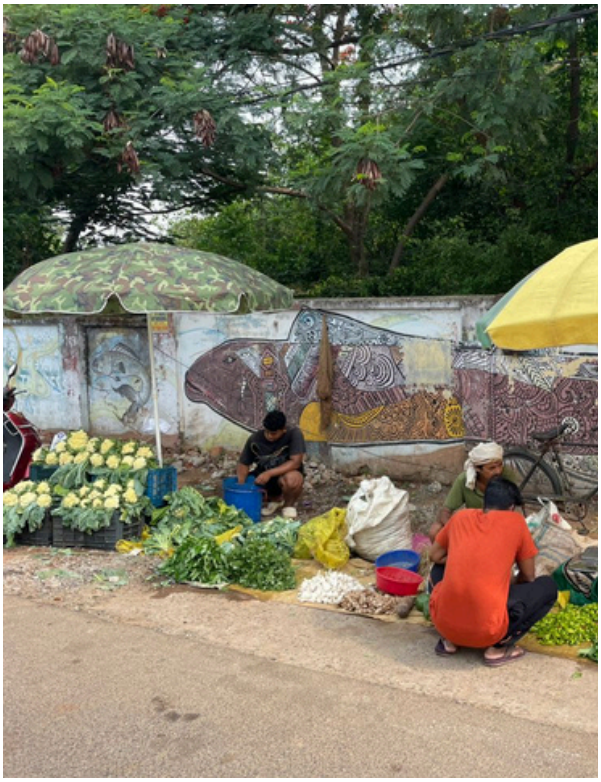
A set of midstream interventions—storage, processing, producer organizations, and certifications—offer significant opportunities to improve smallholder resilience, incomes, and market participation. These interventions are most effective when combined with complementary services, integrated into institutional support structures, and tailored to local contexts. Although their impact depends on strong governance, sustainability of delivery systems, and long-term investment, under the right conditions, positive results have been identified in the following areas:

- **More productivity and reduced losses:** through storage practices that maintain quality of the product, processing interventions that minimize spoilage, and the dissemination of better practices through producers' organizations.
- **Sales and access to markets:** producer's organizations allow for collective negotiations in markets, while processing products and certification standards expand the market opportunities for commercialization, and storage allows for sales in lean seasons.

Evidence shows that storage practices (such as hermetic bags, silos, and granaries) are cost-effective interventions. Hermetic bags reduce post-harvest losses, pest damage, and pesticide use, while improving grain quality. Broader impacts on productivity occur when individual storage is complemented by collective initiatives or public infrastructure, though sustained effects depend on reliable market supply and locally tailored subsidies.

Similar results are seen in interventions aimed at processing agricultural products. Solar dryers, smokehouses, cold storage and market facilities can increase food availability, reduce spoilage and improve access to markets, but enabling conditions and systemic barriers mediate these effects. When technological availability is paired with local training, institutional support, and community-led interventions integrated into the market, these strategies can have a positive impact on income diversification, dietary diversity, and women's empowerment. Long-term effectiveness has some challenges to overcome, as early development of these transformations is prone to shocks and lacks the employment capacity to make it sustainable.

Collective action facilitates overcoming these and other challenges for producers. Organizations such as cooperatives, farmer associations, and grassroots groups can strengthen access to internal and external markets, agricultural inputs, and other services through collective sales, price negotiation and coordination with buyers. Likewise, the adoption of improved practices through training and knowledge dissemination (bettering product quality) is possible through these platforms.



However, the success of producer organizations is conditional on governance. Weak internal structures often facilitate elite capture, with wealthier farmers dominating leadership roles and excluding women and young people. Sustainability depends on internal capacity, inclusive governance models, and continued external support from governments, NGOs, or value chain partners when organizations are embedded in broader market strategies but retain their grassroots orientation, their potential to deliver long-term, equitable impact increases.

A strong and inclusive system of producer organizations may also enhance the impact of voluntary certifications and sustainability standards, such as Fairtrade and organic, on the market. These improve prices and lead to better management practices (less pesticides, enhanced soil conservation, increased biodiversity). Yet, benefits remain modest and uneven, as the increase in production costs and the potential capture of these benefits by intermediaries may pose a barrier for less fortunate and small farmers. Without strong organizations and complementary services, such as training, input support, long-term buyer relationships, and income incentives for sustainability, certification alone tends to yield limited returns.

RESEARCH AND DEVELOPMENT

Training, innovation platforms, and digital tools can play a catalytic role in agrifood systems, but only when integrated into broader support systems. These rarely generate farmers' behavioral change on their own: the effectiveness depends on bundling with physical resources (inputs, finance, tools), tailoring to local needs, and being embedded in institutions that farmers trust.

Where do these interventions show a positive impact?

- **Productivity and adoption:** Participatory training and peer-led models enhance the uptake of inputs and techniques, particularly when these inputs are provided.
- **Food safety and nutrition:** integrated training and practical tools reduce contamination and improve dietary diversity.
- **Knowledge diffusion:** digital mechanisms can lower information barriers, and peer-to-peer networks and social learning facilitate the spread of practices, even among non-direct participants.

But these outcomes are not automatic. Training that relies solely on information transfer (without repetition, physical tools, or structural support) often fails to produce lasting behavioral change. Innovation platforms that ignore farmer priorities or rely on top-down delivery tend to see poor adoption. And standalone digital tools, such as SMS alerts or apps, have limited reach and sometimes lead to unintended consequences, because they rely on farmers correctly understanding transmitted information, and vulnerable populations (considering gender, age, and connectivity) still face digital connectivity and legibility challenges. These strategies must support broader interventions.

Strong results are seen when innovations are co-developed with farmers, delivered iteratively, and aligned with their risk profiles and daily realities. For example, a fertilizer advisory app in Nigeria improved profits when tied to timely advice, while in Tanzania, farmer-to-farmer learning cascades boosted yields, even among those who were not directly trained. Nonetheless, the scalability of quality in-person interventions remains expensive and challenging to sustain.

When well-designed, training can increase the adoption of innovative techniques, such as biofortified crops; however, broader effects on nutrition and income depend on complementary incentives and trusted intermediaries. The presence of participatory institutions and iterative feedback mechanisms helps in this regard, but assuring the quality of training and facilitators is a crucial variable to consider.
In sum, behavior change takes time, and delivery systems (analog or digital) must be embedded in structures farmers recognize, believe in, and can access consistently.