

MAKING SUSTAINABLE INTENSIFICATION WORK IN NORTHERN GHANA: TARGETING PRACTICES TO LOCAL AGROECOLOGICAL AND SOCIOECONOMIC CONDITIONS



Key messages



- ❖ Integrated Soil Fertility Management (ISFM) can simultaneously improve maize productivity, profitability, and environmental outcomes in northern Ghana, but its benefits depend on local agroecological conditions and farmers' access to labor and inputs, requiring context-specific targeting rather than uniform promotion.
- ❖ How land is managed matters as much as which practice is adopted, with insect diversity declining heavily under conventional intensification due to post-harvest residue burning, while being conserved under ISFM.
- ❖ Earth Observation, field measurement, and modelling used together can help determine where ISFM is likely to work, giving a practical basis for targeting.
- ❖ Farmers' uptake of sustainable intensification depends on both technical performance and socioeconomic conditions.

The Challenge: Making Sustainable Intensification Work in Diverse Farming Contexts

Smallholder farming systems in West Africa face the challenge of increasing agricultural production and sustaining rural livelihoods while addressing land degradation and growing climate-related risks. The diversity of these systems means that sustainable intensification must contend with differences in agroecological conditions, farm resources, production systems, and farmers' capacity to invest and manage risk. Even where promising practices exist, their wider uptake can be constrained by financial limitations, production risks, and other socioeconomic and institutional conditions.

The project “Co-developing Innovations for Sustainable Land Management in West African Smallholder Farming Systems” (COINS) was implemented from 2022–2026 to develop context-specific, scalable, and climate-resilient pathways for sustainable intensification (SI) in northern Ghana and northern Senegal. The project focused on Integrated Soil Fertility Management (ISFM) in northern Ghana and the System of Rice Intensification (SRI) in northern Senegal, working with farmers and other stakeholders through participatory Innovation and Living Labs.

Within COINS, the Targeting research examined the conditions under which sustainable intensification can deliver desirable outcomes. It brought together socioeconomic assessments, crop modelling, Earth Observation (EO), biodiversity assessments, climate-risk analysis, and farmers' perceptions, coping strategies, and social cohesion mechanisms. This evidence highlights an important policy challenge: how to account for differences in agroecological and socioeconomic conditions when promoting and investing in sustainable intensification practices such as ISFM, rather than assuming that the same practices or combinations will perform equally well across different farming contexts.

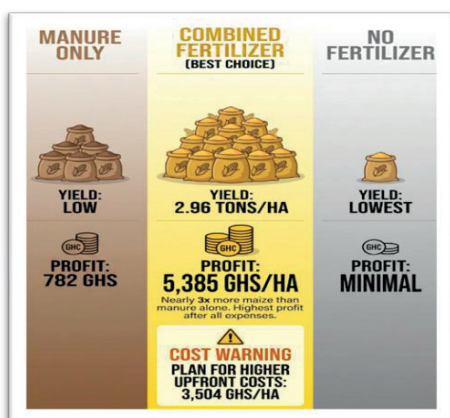
What Does the COINS Evidence Tell Us About Making Sustainable Intensification Work in Northern Ghana?

The COINS Targeting research combined agronomic and crop-modelling analyses, Earth Observation, soil and biodiversity assessments, and socioeconomic research to better understand the performance of sustainable intensification practices under different farming conditions. The findings below demonstrate the potential benefits of sustainable intensification while highlighting the importance of local agroecological conditions, management choices, and farmers' socioeconomic circumstances in shaping performance and feasibility. As most of the evidence was generated in selected COINS study locations in Tolon, Savelugu, and Mion districts, the findings should not be interpreted as a definitive prescription of which SI practices will perform best across all locations.

1. ISFM can deliver productivity, profitability, and environmental benefits

In northern Ghana, crop modelling results revealed that combining organic and inorganic fertilizers under ISFM produced nearly three times the maize yield of manure alone, delivered the highest gross margins (5,385 GHS/Ha), and achieved strong overall sustainability performance, despite requiring higher upfront costs (3504 GHS/Ha) (Figure 1). ISFM also improved topsoil quality and conserved substantially more insect diversity than conventional farming (Figure 2), showing that productivity gains can be achieved alongside important environmental benefits.

2. ISFM performance and suitability are strongly shaped by local conditions



Productivity & economic benefits of ISFM:
AI generated infographic presented to farmers.

Crop-modelling and spatial analyses showed that ISFM performance and suitability vary across northern Ghana. Yield benefits are influenced by soil conditions, climate, and planting time, while suitability is also shaped by labor availability and access to inputs. Areas closer to urban settlements tended to be more suitable due to greater labor availability and better road networks. These findings highlight the need to consider both agroecological and access-related factors when targeting ISFM.

3. Management decisions strongly influence sustainability outcomes

Biodiversity monitoring showed a 53.3% overall decline in insect diversity under conventional intensification, compared with broadly conserved diversity under ISFM (+4.9%). The post-harvest period was particularly critical: residue burning under conventional management resulted in a much greater biodiversity decline than under ISFM. Fallow-period results also highlighted the importance of improving dry-season surface management under ISFM.

4. Earth Observation reveals important spatial and within-field heterogeneity

EO analyses in Ghana revealed substantial variation in crop types, field and parcel characteristics, cropping intensity, vegetation conditions, and within-field biophysical characteristics. These results demonstrate the value of EO, particularly when combined with field observations and modelling, for understanding the heterogeneous conditions under which sustainable intensification is implemented.

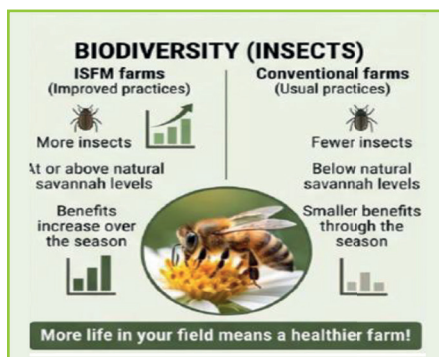
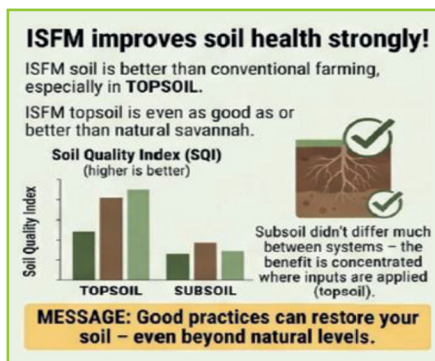
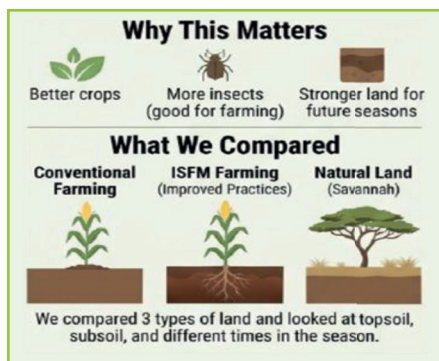


Figure 2 : Biodiversity conservation and soil restoration benefits of ISFM : AI generated infographic presented to the farmers.

5. Socioeconomic conditions shape the feasibility and uptake of sustainable intensification

Evidence from 1,000 farmers in Mion, Tolon, and Savelugu showed strong recognition of the environmental, economic, and social benefits of ISFM, but also persistent barriers related to access to finance, equipment, inputs, and information. Farmers' investment decisions are also shaped by production risks and the timing of expected benefits, demonstrating that technical performance alone does not determine whether a practice is feasible or attractive to farmers.

What the Findings Mean: Taken together, the COINS Targeting findings show that sustainable intensification is not a one-size-fits-all proposition. Practices such as ISFM can generate important productivity, economic, and environmental benefits, but their performance and feasibility are shaped by local conditions, management decisions, and farmers' circumstances. The evidence, therefore, supports a more context-sensitive approach to sustainable intensification, in which biophysical, environmental, and socioeconomic evidence is considered together when informing agricultural policies and investments.

What Should Policymakers Do?

Drawing on the COINS Targeting findings, the following recommendations highlight priority actions for making sustainable intensification more responsive to local agroecological, management, and socioeconomic conditions.



1. Target sustainable intensification according to local conditions.

Move away from uniform approaches and account for differences in soil conditions, warming, planting time, labor availability, and access to inputs when targeting ISFM. These factors influence where ISFM is suitable and how well it performs.



2. Consider productivity, profitability, and environmental outcomes together.

Agricultural policies and investments should assess sustainable intensification beyond productivity alone. The COINS findings show that ISFM can increase maize yields and gross margins while improving topsoil quality and conserving insect diversity.



3. Give greater attention to how sustainable intensification practices are managed.

Management decisions should be considered alongside practice adoption. In particular, the findings highlight planting time, post-harvest residue management, and dry-season surface management as important factors influencing ISFM performance and sustainability outcomes.



4. Combine Earth Observation, field measurements, and modelling to strengthen targeting.

Use these complementary sources of evidence to identify spatial and within-field differences in agricultural conditions and better understand the heterogeneous contexts in which sustainable intensification is implemented.



5. Make farmers' socioeconomic circumstances part of targeting and investment decisions. Facilitate access to targeted innovation support services (ISS) – including finance, equipment, inputs, knowledge and information – while considering production risks and the timing of expected benefits when assessing the feasibility of sustainable intensification. Providing easy and affordable access to insurance products for market-oriented farmers could be a pathway to higher ISFM adoption. Recognition of ISFM's benefits alone does not determine whether farmers are able or willing to adopt it.

Conclusion



The COINS Targeting research shows that sustainable intensification requires a context-sensitive approach. While ISFM can deliver productivity, economic, and environmental benefits, its performance and feasibility depend on local agroecological conditions, management decisions, and farmers' socioeconomic circumstances. Agricultural policies and investments should therefore integrate biophysical, environmental, and socioeconomic evidence to better target sustainable intensification

Additional information

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