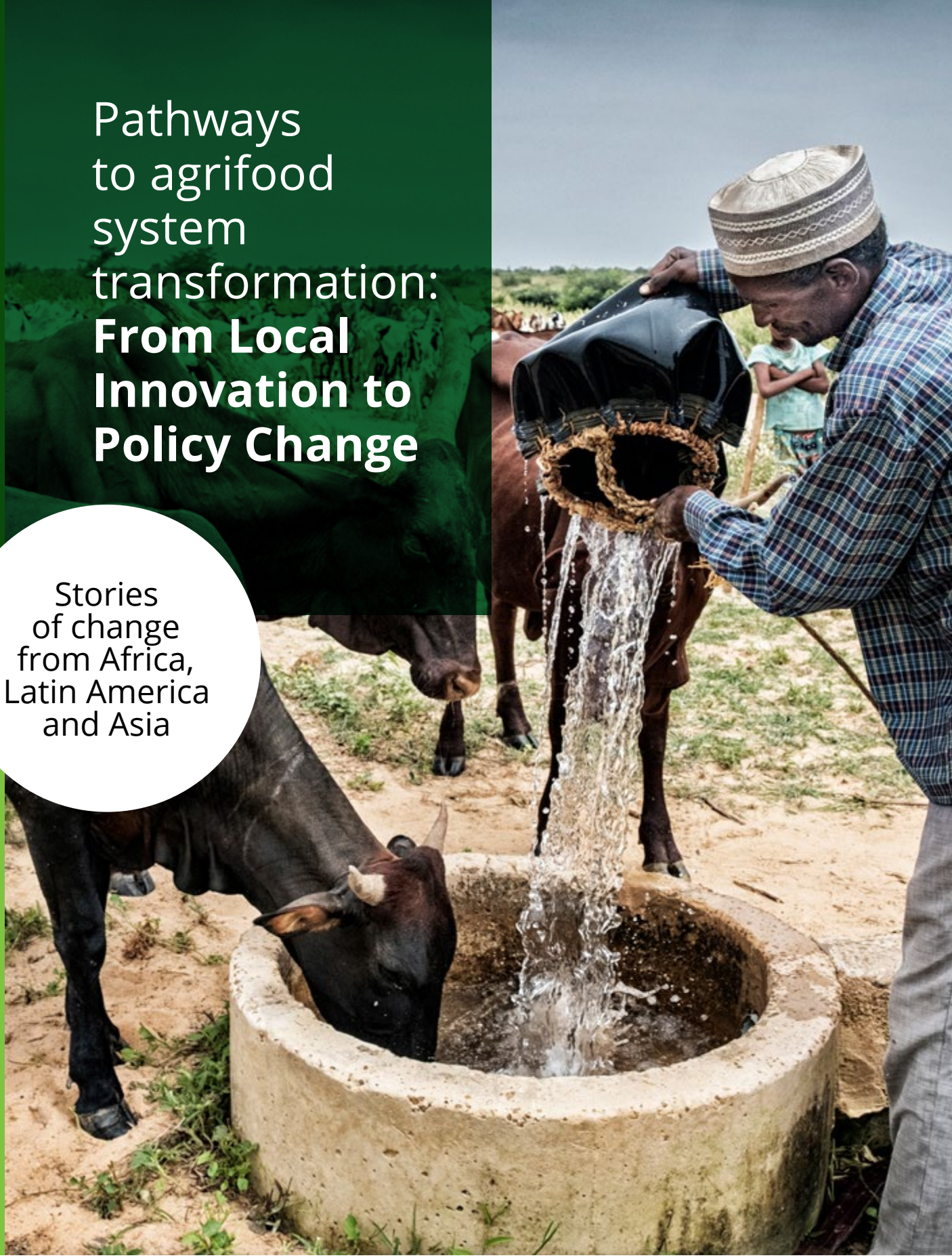
Pathways to agrifood system transformation: **From Local Innovation to Policy Change**

Stories of change from Africa, Latin America and Asia



DeSIRA LIFT

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PREFACE

Stories of Change
to capture innovation journeys and invisible transformative changes

The DeSIRA initiative is a portfolio of 80 research and innovation (R&I) projects run in over 65 countries across three continents between 2019 and 2026, supported by a European Union contribution of €340 million. DeSIRA aims to enhance the contribution of R&I in addressing complex issues relating to sustainability transitions and agrifood system (AFS) transformation, towards achieving the Sustainable Development Goals, in low- and middle-income countries.[1]

The DeSIRA initiative is a model-in-the making on how to provoke and accelerate AFS transformations toward sustainability through action-research in partnerships, multidimensional innovations, multi-actor and system approaches, within project-based approaches.

"Food system transformations refer to significant re-configurations of the assemblage of food system activities, actors, outcomes, and relationships (dynamics) to move away from the current globalized industrial model and ensure sustainable, resilient, and just models of production and consumption. These transformative processes demand the collective and inclusive re-designing (from re-imagining to re-governing) of food system components through platforms where governance, practices, power, and value-change can be debated and enacted at multiple scales. Food system re-design should therefore be seen as an ethico-political process that needs to be collectively stewarded and nurtured in an adaptive, engaged, and creative way. This also means that strategies (pathways) and tools need to respond to and resonate with current contextual needs and features, while also being future-proof and proactive (anticipatory)." (Juri et al., 2024)

The first book of Stories of Change from DeSIRA projects, *Activating agricultural transitions to sustainability through participatory research and co-innovation,* published in September 2024,[2] illustrates how 12 DeSIRA projects co-developed strategies to enhance R&I in the specific contexts where they operate.

1. World Bank. World Bank Country and Lending Groups. Available online: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups (accessed on 14 June 2024)
2. www.desiraliftcommunity.org/stories-of-change/

This second book further illustrates stories of innovation, with a view to narrate the contributions of the DeSIRA initiative to AFS transformation, and how DeSIRA projects created or reinforced changes that produced initial outcomes and thus built conditions for impact at scale with:

- a focus on the nature and the transformative potential of changes provoked and the gaps filled by DeSIRA projects within agricultural innovation systems through the novelties that they brought;
- a critical reflection on how, and by whom, the innovations were selected and bundled for addressing sustainability challenges, who ends up owning these innovations and who can help scaling them.

The strategies developed by projects and the project set-ups discussed in the first book are part of these conditions and enablers. They combine:

- engagement of researchers and research organisations **with innovation stakeholders** as a regular practice at all stages of an action-research initiative, coupled with continuous **capacity development** through action-learning and reward systems that recognise open and responsible innovation and collaborative science;
- openness to new **organisational modalities** that break silos, widen geographic coverage, intersect across scales, and produce systems change with **transdisciplinary work**, where the different perspectives of an innovation are baked into the collaboration from the start;
- early attention to **readiness for scaling** and/or sustainability of their actions supported by **monitoring and evaluation systems** that privilege learning, evidence generation and support **adaptive management** to respond to context changes and inevitable re-adjustments from initial plans;
- attention to markets, especially to market viability of the novelties developed or adapted with farmer communities, in close collaboration with farmer organisations;
- investment in evidence generation and updating of knowledge systems in support of new types of AFS and sustainability transitions, with a view to facilitate decision making, open new options, disseminate successful proof of concepts;
- **engagement with policy actors through dialogues** to enhance visioning, innovation prioritisation, decision making and co-design of scaling strategies, to adjust regulations to emerging technologies, to maximise environmental, financial, equity and social benefits from innovations nurtured by researchers and their partners.

The collection of stories in this book will walk the reader through these enabling conditions and modalities that have helped producing innovations of different natures, often in combination, that call for different scaling approaches and modalities. The stories show how project teams have forged networks of collaboration with diverse actors and have woven outcome trajectories over longer periods than project duration in order to ensure continuity in the changes they have triggered.

INTRODUCTION

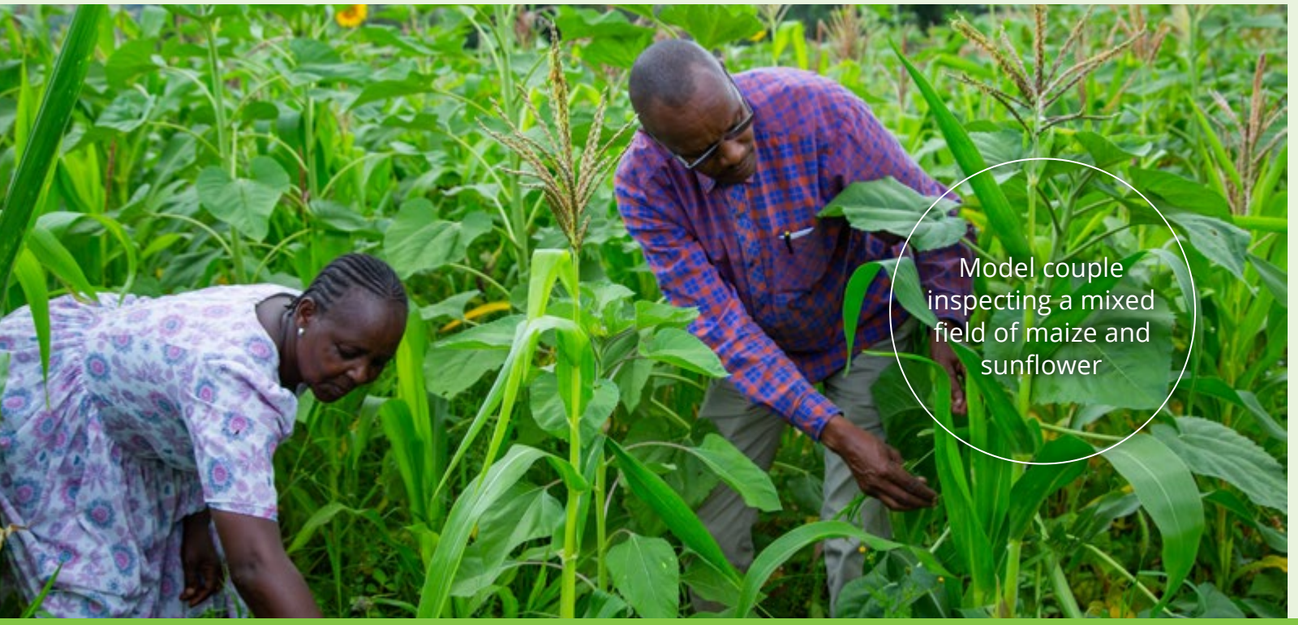
Scaling DeSIRA innovations for large-scale impacts

In the pursuit of its objectives, the DeSIRA initiative has fostered various types and forms of innovations across multiple levels of agricultural innovation systems (AIS) through 80 research and innovation (R&I) projects run in over 65 countries across three continents between 2019 and 2026.

In the face of the multidimensional grand challenges they were addressing (climate change, biodiversity loss, poverty), only few DeSIRA projects contributed to significant impact - in the sense of systemic and paradigmatic irreversible and positive effects - but all projects did contribute to varied and substantial outcomes that provide answers to several of those grand challenges and their combination paves the way towards future large-scale impact.

Sustaining the outcomes of DeSIRA projects over the long term is therefore critical. It requires analysing and reflecting on the outcomes of DeSIRA projects, the actual nature and dimensions of their innovations (social, technical, organizational), their readiness for scaling (Sartas et al. 2020) and what the conditions for this scaling would be (Gebreyes et al., 2021; Schut et al. 2020).

R&I projects targeting climate smart solutions, including agroecological approaches, to transform agrifood systems have been ongoing for 15 years since the concept of climate smart agriculture was coined in 2010 (FAO, 2010). The effects and challenges of climate-smart agriculture approaches have been widely documented and discussed (Lipper and Zilberman, 2018). With many of the organisations involved in their implementation



Model couple inspecting a mixed field of maize and sunflower

being part of this worldwide endeavour, DeSIRA project consortia built on outcome trajectories "made of multiple types of outcomes (effects) all combined to serve a change" (Douthwaite et al., 2025) to which they added a contribution.

A major element of scaling readiness therefore lies in the ownership of the results of DeSIRA projects by these consortia organisations and their commitment to sustain their efforts with strengthened research capacities and research governance, which was an objective of the DeSIRA initiative.

As illustrated in our first book of Stories of Change (Toillier et al., 2024), DeSIRA projects provided innovative ways of doing research with new organisational modalities, in particular multi-stakeholder mechanisms that favoured collaboration based on trust, co-design of context-relevant innovations thanks to participatory and transdisciplinary work, and strengthening functional capacities to support innovation development and ownership. These co-innovation approaches were crucial to develop needs-based and demand-driven innovations in their specific contexts, hence avoiding the pitfall of transfer of technology that struggles to meet end-users.

A closer look at the outcomes of DeSIRA projects shows that they developed a variety of innovative responses to four main challenges: livestock sector development, improvement of soil health, increase in agricultural productivity, and supply chain development.

Some 72% of DeSIRA innovations have a technological component, 85 % are multidimensional innovations (a combination of new technologies, new organisations or services and/or new policies) and 70% form part of a portfolio of several bundled innovations.

However, most of these innovations are pilot exploration and experiments, corresponding to the first phase of an innovation process. They provide proofs of concepts that will need to be continued and scaled, either by organisations currently involved or by development partners, when projects will stop. It raises questions about the conditions needed to be put in place by project consortia to ensure this continuity.

This book reviews the status of these DeSIRA innovations as the closure of projects approaches, through 15 Stories of Change. It provides insights into the strategies deployed by project teams to ensure their continuity, as well as reflections on how these strategies could be brought to scale.

Part One examines social innovations at the level of individuals and communities, which relate to new behaviours, mechanisms and thinking, typically involving the emergence of champions and leadership to guide adaptation and transformation. These innovations generated changes that often form the foundation upon which broader systemic change can be pursued and achieved. Communities equipped with new capacities and organizational structures have demonstrated increased agency in engaging with other stakeholders and in advocating for their interests.

Part Two focuses on technological and supply chain innovations, a key component of the majority of DeSIRA projects, based on which they have generated outcomes. These have focused on developing climate-smart and nature-based solutions that contribute to sustainable agriculture. These innovations are frequently knowledge-intensive and result from co-designed processes focusing on plot and farm level experiments or value chain agreements. Projects have also sought to build conditions for economic return of innovations, particularly through value chains.

Part Three explores policy innovations, whether intended from the outset or emerging as necessary enablers of change, which have been achieved through a careful combination of evidence generation, capacity building, and policy dialogues. Projects have contributed to policy outcomes by building on previous initiatives, aligning with government priorities, facilitating multi-stakeholder platforms, and adapting to changing contexts.

These three types of innovations are deeply interconnected and often bundled within the projects' innovation portfolios. Changes in individual mindsets and community organization often unlock the potential for technological adoption and policy influence. Similarly, policy changes can create the enabling environment necessary for technological innovations to scale, while successful technological innovations can inspire policy support and community engagement.

Innovation bundling has been used by projects to ensure systemic changes but made the approaches even more complex and difficult to be sustained beyond project duration by a sole local organization, especially in contexts where policy frameworks are not sufficient to enable innovation scaling. The three chapters give an overview of what needs to be scaled beyond project duration and what scaling effort should be pursued, especially through country governments' action.

1 PART 1

Social innovations
in the individuals–communities-organisations continuum

By Ricardo Ramírez, Bernard Triomphe and Renaud Guillonnet

Why social innovations are needed

This chapter focuses on social innovations developed by DeSIRA projects at the level of individuals and communities, and what they generated at the organizational level. Organisational changes were achieved either as the main results desired or as corollaries to other innovations that they contributed to, such as technological or policy ones. As such, they form a basis upon which broader systemic change can be pursued and achieved. The chapter highlights how such innovations reinforced the ability of local stakeholders to organise, with increased agency or through more formal structures, and eventually rippled into other levels of national agricultural innovation systems they participate in.

Innovations at the level of individuals relate to new behaviour and thinking, typically involving the emergence of champions and leadership to guide adaptation and transformation (Keys et al., 2009). Innovations at the level of communities or specific groups within communities relate to their ability to organise, make decisions and interreact with other stakeholders, including decision and policy makers. They also illustrate the mechanisms and factors by which individual changes permeate communities.

Communities, in the context of DeSIRA projects mostly refer to rural communities where farming is the predominant economic activity and with whom projects seek to develop innovations. These innovations often target the development of local responses to broader problems, such as climate change, soil degradation or biodiversity loss, affecting these communities. Resolving knowledge and resource asymmetries and supporting these communities to equip themselves with autonomous thinking to contribute to innovations is key. This requires empowerment and capacity building, particularly with regards to soft skills and functional capacities (Tropical Agriculture Platform, 2016) that can unlock the ability of individuals and communities to be direct actors, and not simple beneficiaries, of innovations. Multi-stakeholder mechanisms have been privileged in DeSIRA projects, often linking communities with stakeholders at regional and national levels as exemplified in the first volume of our Stories of Change (Toillier et al., 2024).

Within these multi-stakeholder mechanisms, knowledge is shared, processed, hybridized with local experience and eventually owned by individuals who in turn act as ambassadors of change within and at times outside their communities. Change however happens when a sufficient number of individuals are involved and take ownership to push their communities through thresholds. This is the essence behind the notion of co-design (Busse et al., 2023). Among the DeSIRA projects, these changes at the community level are often characterised by new organisations with a mandate, given or agreed to by the community, to move beyond those starting points and ensure the innovations take root. While these organisations possess different degrees of formalization (farmer groups, associations, cooperatives, platforms, committees,) they usually include among their aims to improve collective governance and decision-making. At the same time, they reinforce the visibility of communities and innovations, and they enhance their legitimacy to interact with third parties, including policy makers.

What have we learnt?

Building capacities of individuals favours the co-creation of knowledge and the dissemination of innovation in the individuals-community-organization continuum

Many, if not most, DeSIRA projects have produced innovations or innovative behaviours among individuals and communities. This was achieved by combining capacity building, knowledge and joint experiments which contributed to the emergence of local champions, equipped with different thinking and attitudes, and the ability and drive to individually or collectively engage in and advocate for change (Klerkx and Aarts, 2013; Magala et al.; 2018). Individuals express their new attitudes and values and their new competencies in the context of community groups and other spaces for dialogue, such as multi-stakeholder platforms where they broaden their network of contacts. Such spaces allow them to benefit from peer support and encouragement to cement the new behaviours (Ebrahim, 2003).

The Story of Change from FORI Tanzania shows how, thanks to training and mentoring, a number of husbands and wives started to form ‘model couples’. Women were allowed to innovate and got their husbands to support them - This brought such noticeable benefits to the livelihood of the household that both spouses subsequently became advocates for gender equality and women empowerment. This helped to turning the tide of predominant thinking and practices on land ownership, agricultural strategies and financial decisions. Empowered women subsequently engaged in community networks totalling up to 600 members in 15 farmer groups who now disseminate agroecological knowledge and practices.

The Santés & Territoires Story of Change illustrates how the establishment of a living lab in Cambodia, created a space for farmers to interact with researchers, a local non-governmental organisation, a health centre, and representatives from two ministries. Farmers not only contributed to defining the nature and the focus of the living lab, by proposing a local definition and co-constructing the central question to solve (“How to improve soil and water quality to ensure a good health of people, animals and the environment?”), under the banner of the One Health approach, but were also invited to lead the evaluation of its performance and to decide how the evaluation results will be used. By adopting a living lab approach incorporating evaluation methods derived from utilisation-focused and developmental evaluation, local stakeholders have been equipped with effective tools to better assess their situation and to make and own decisions about adjusting the course of collective action to achieve their goals. This in turn fosters the

widening of interactions between members of the living lab and possibly beyond as *"lots of actors outlined the fact that this collective action was important to them, and that they appreciated an opportunity to speak with very different people."*

Facilitated practical approaches and tools allow communities to design and adopt complex innovative mechanisms

The cases in both Cambodia and Tanzania, show a gradual shift from introducing new ideas to developing individual and community capacities that, with the push from motivated champions, cement into a collective space conducive to behavioural changes and engaged governance. In addition, the stories from Central America, Colombia and Guinee Bissau and illustrate how similar mechanisms, when articulated around tools and methodologies that facilitated joint problem and solution mapping by multiple stakeholders, have lowered mistrust and confrontation, and identified avenues for collaboration into resolving structural problems for communities. In a variety of contexts – geographic, socioeconomic, climatic, agricultural - projects provided conditions under which individuals and communities became able to address complex situations. In the specific case of Colombia, the project team was able to combine technological, social, political and economic issues, and catalyse the design of collective holistic responses to complex challenges such as landscape planning. In other words, they moved beyond the conventional transfer of technology approaches that fail to address such complex challenges.

The IDeas project in Colombia was able to convene multistakeholder platforms in two distinct regions of the country that have experienced decades of armed conflict and share rich natural resources that are under threat. It stresses the important role of facilitating organisations with committed individuals equipped with adequate tools to promote discussion among all stakeholders and strengthen innovation processes. IDeas introduced a collaborative planning methodology to focus stakeholders' attention on desirable strategies that combined an improvement in livelihoods along with forest resource conservation. Cross learning between different ethnic or social groups backed by researchers took place. This allowed individuals and communities to share and blend initially competing agricultural approaches or social visions into optimal responses. In doing so, they gained a sense of belonging and a sense of agency, with the potential to advocate for supporting policies by local government agencies.

AGRO-INNOVA aims to improve food security, productive development and climate resilience of highly vulnerable smallholder producers in the Central American Dry Corridor, who face severe challenges to grow their basic foods. This situation negatively impacts people's livelihoods, food security and nutrition. The project builds on more than 50 years of organisational collaboration. It has reinforced collaboration between farmer organisations, with territorial and national research and innovation organisations in each country, and regional research and development entities. A key approach has been the field testing and adaptation of the multistrata agroforestry system models (MASM). The project established national working groups in each country, each of them having adopted a unique approach to designing and testing MASM adaptations suited to their conditions and criteria. Facilitating innovation processes starts by understanding the needs, challenges and opportunities faced by smallholder farmers. Project partners adapted the generic MASM to their local conditions. This Story of Change emphasises "co-learning" as a key component of co-design approaches (Busse et al., 2023), as it provides the foundation for collaborative research and innovation.

A critical role of researchers in innovation processes is that of facilitators, helping to catalyse connections among local stakeholders (Woodhill et al., 2012), along with fulfilling other key functions. The Story of Change from MALMON in Guinea Bissau tells how researchers took on a facilitation role by creating spaces for knowledge exchange and experimentation between two ethnic groups – the Balanta and Diola – who applied different practices and developed different techniques around rice farming. Within the facilitated spaces, the two groups were able to share their experiences and perspectives on rice production, specifically around dike design and planting density. MALMON also trained farmers in record keeping to help them make decisions on labour expenses for preparing dykes. The farmers took the data to the village community to inform decisions on hiring labourers. Farmers are now equipped with a new useful capacity that will hopefully be applied to other issues and decisions from now on. As local farmers were given a role of farmer-researchers by the project and encouraged to co-design farm experiments, they left the project empowered as scientific contributors and with the sense of agency, that should help them advance their farming techniques further.

Scaling community level innovations, some conditions

Innovations at the level of individuals and communities in DesIRA projects are often referred to as pre-conditions, *"in the sense of new skills, products and practices, as well as new attitudes and values"* (Bock, 2012). This is the case of the "model couple" in FO-RI Tanzania where the core intended innovation is improvement of the sunflower value chain. The starting point of the innovation are new social relations, basically around gender issues, which in turn contribute to production improvements. The economic empowerment and inclusion of women provide a foundation for future impact at scale, both for livelihoods and broader nutrition outcomes.

The virtue of these social changes relies in their capacity to trigger and enhance other innovations, such as those depicted in Chapters 2 and 3 of this book. Once individuals gain ownership of innovation, their achievements will inspire all actors to replicate and scale them. This in turns raises the question of the conditions and drivers for scaling and the role that these champions play in the process. Social innovations, given their collective nature, are regarded as public goods, making them eligible for continued support from public funding for their dissemination.

In this regard, the pivotal role of innovation support services to ensure that community-level innovation and enabling policies are connected is key. This role, temporarily played by projects during their lifetime (in the form of facilitation, connection, funding, etc.), needs to be carried forward by existing organisations involved in projects or new ones emerging from them. Strengthening the governance of collective action and multistakeholder mechanisms and spaces constitutes one key way to enhance the effective functioning of partnerships across scales from local to national and contribute to eventual scaling and impact (Edlmann et al., 2021).

In conclusion, the stories in this chapter illustrate how empowered individuals and community groups are important enabling factors to sustain and achieve wider impact.

STORY 1:
Breaking traditional roles: the "model couple" approach to promote gender equality in the sunflower value chain in Tanzania

STORY 2:
Joining the pen with the plough: transdisciplinary collaboration and learning in mangrove swamp rice farming in Guinea-Bissau

STORY 3:
Building a local One Health approach: participatory evaluation in a living lab

STORY 4:
Community leadership and agroforestry systems in Colombia: a commitment to forest conservation from a social perspective

STORY 5:
What is behind the dynamism in the Central American Dry Corridor? Multistrata agroforestry in action

Breaking traditional roles: the "model couple" approach to promote gender equality in the sunflower value chain in Tanzania

Authors: Joseph Kataka, Project Leader, We Effect, Tanzania, joe.kataka@weeffect.org and Katja Vuori, CEO, AgriCord, Brussels, katja.vuori@agricord.org

In Tanzania's sunflower fields, a transformation is taking root that goes far deeper than the soil. While a million farmers cultivate this drought-resistant crop across the country's varied landscapes, it's not just agricultural practices that are evolving – it's the very profound tissue of rural households. Through a collaborative effort, the partners of the FO-RI project have put in place an innovative approach which recognises the power of embracing gender equality: couples discover that when traditional gender roles shift, both farms and families flourish. Their story reveals how breaking down barriers at home can lead to breakthrough innovations in the field.

In Tanzania, as in many other African countries, women play a central role in agricultural production, but gender inequality often limits their participation in decision-making processes. In sunflower farming in particular, women are responsible for a wide range of tasks, including planting, weeding and harvesting. In some regions, women also manage sunflower oil production, adding value to the crop and creating additional sources of income for their households (Leavens, Gugerty and Anderson, 2019). However, despite their significant contributions, women often face considerable barriers to accessing land, credit and other resources, which limits their ability to fully participate in the agricultural economy. This is where the Farmer-led Research and Innovation (FO-RI) project, managed by AgriCord[1] and led by MVIWAARUSHA[2] and We Effect[3] is making significant strides to encourage gender equality, sustainable farming and knowledge sharing.

There are a million farmers producing sunflowers, which provides steady incomes for smallholder farmers in the Arusha, Karatu, Monduli and Singida regions. The high tolerance to drought and erratic weather makes this crop a climate-resilient option suitable for most of Tanzania's agroecological zones (Kihupi et al., 2015). However, many smallholder farmers experience low yields in their monocropping systems, due to poor soil fertility, pests and diseases. There is very limited access to seeds and fertilisers, extension services, agricultural-friendly loans and markets. Hundreds of small seed processors do not work at capacity due to a shortage of raw materials.

1] AgriCord is a global alliance of agri-agencies mandated by farmer organisations and their cooperative businesses from countries in Africa, Asia, Canada, the European Union and Latin America. 2] MVIWAARUSHA is a network of farmers and pastoralist groups in the Arusha region focusing on strengthening and mobilising farmers' groups, facilitating communication between networks and advocating for farmers' interests. 3] We Effect is a Swedish cooperative movement organisation, working to combat poverty through sustainable development initiatives with farmer cooperatives.

1 THE SUNFLOWER VALUE CHAIN IN TANZANIA

To improve the situation, the FO-RI project has implemented a farmer-led research approach targeting 4 200 smallholder farmers, aiming at (1) determining best crop and post-harvest management practices for sunflower production, and (2) enhancing gender equality and participation of women in the sunflower value chain. FO-RI's approach uses not only on-farm experimentation and co-creation, but also a comprehensive approach for gender equality.

Advancing gender equality: the "model couple" approach

FO-RI uses the "model couple" approach to break and redefine gender roles,and promotes equal participation by empowering women. The "model couple" approach unfolds in several key stages:

1. **Selection of model couples:** the couples serve as role models in their communities and are selected using several criteria: being committed to gender equality; having a track record of supporting and advocating for equitable practices; having excellent interpersonal and communication skills; being able to inspire and mobilise others; and possessing experience as community leaders, trainers or advocates. Couples range between 25 and 55 years of age.
2. **Training in gender equality and agroecology:** model couples receive training in the gender transformation approach which encourages shared decision making and equal participation. They are also trained in agroecological practices.
3. **Shared responsibilities:** couples are encouraged through training and coaching to work together on farming activities such as planting, harvesting and commercialisation.
4. **Community advocacy:** model couples become advocates for gender equality and sustainable farming in their communities. They organise workshops, participate in media programmes and share their experiences to inspire others.
5. **Ongoing monitoring and support:** facilitators from the FO-RI project regularly support the couples, providing capacity-building opportunities on key topics such as identification of gender issues, skills for mobilisation and sensitisation, facilitation, advocacy and knowledge sharing. The facilitators also provide coaching during the rollout of the gender training events and support the couples in researching gender issues and advocating using the Farmers Advocacy Consultation Tool (FACT).
6. **Scaling in the community:** as successful models, these couples influence others, creating a ripple effect that encourages broader adoption of gender-sensitive and agroecological sunflower farming practices.

As part of the strategy, the project uses male champions who are trained in the gender transformation approach and who promote this approach and work closely with innovative farmers and researchers to enhance women participation in action research. The focus on agroecological transition includes training in climate resilience practices (soil fertility, water management, seed selection, pest and disease management, and other topics). Training men and women, households and farming groups, contributes to better informed and collaborative decision making about resource allocation, crop management and investments. All members of the farmer organisation are trained, but the majority are women as they are recognised key community protagonists.

Juliana and Deonist: a successful couple in gender transformation

Before the FO-RI programme, Juliana and Deonist cooperated very little on financial matters. Each had their own money and Juliana, not being involved in any economic activity, often struggled to meet the family's basic needs. The community's belief that women should stay at home and not engage in business or social activities held her back; in this traditional setup, Juliana's contributions were mostly limited to domestic duties.

Juliana was selected as a "gender champion" and was trained in the gender transformation approach. During this period, she became involved in sunflower research on agroecological practices with support from the Tanzania Agricultural Research Institute (TARI), an institutional project partner. She asked her husband for a piece of land to grow sunflowers and Deonist gave her a plot of fertile land. Juliana used agroecological farming techniques, resulting in a significantly better harvest than before, going from harvesting two to five bags of sunflower seeds. This is a clear indication that involving women in farming can indeed promote agroecological practices, as women often bring valuable, gender-specific knowledge related to sustainable farming methods.

Juliana encouraged her husband to attend the gender transformation approach training, where Deonist learnt about the barriers faced by Juliana and realised how traditional gender norms were restricting her and other women from benefitting from agriculture. As a result, Deonist embraced the role of gender champion himself and committed to changing his own attitudes and those of others. He began to challenge the harmful traditions that had previously limited Juliana and other women from engaging in selling family farm produce, taking a leadership role, and making decisions about the use of the land.

Empowered and with her husband's support, Juliana opened a tailor shop where she now sews various types of clothing, earning up to 400 000 Tanzanian shillings (about US$1701) per month. They now work together, pooling their income and making joint decisions about how to spend their money.

Because of her pro-activeness, MVIWAARUSHA invited Juliana to participate in radio programmes on Mega FM Arusha and TV shows to raise awareness about gender issues and agroecological matters. These platforms gave her the opportunity to share her insights and experiences. Her contributions were recognised, leading to invitations from other media outlets, allowing her to expand her reach, connect with more community members and inspire change on a larger scale.

Juliana's involvement in leadership has also expanded beyond her family. Inspired by these changes, Juliana ran for a position in the village council alongside eight other women. This involvement in local politics has given her a platform to advocate for the rights of women in her community. Juliana summarises her experience: *"The training in gender transformation approaches has completely changed our lives. I no longer feel like I am just a housewife; I am a businesswoman, a farmer and an active member of my community. My husband and I make decisions together, and this has brought us closer and made our family stronger."*

This experience has also changed Deonist's behaviour. He used to come home late, but now he makes an effort to return early so he can spend quality time with Juliana. The couple now manages their resources more effectively, storing their farm's produce in a shared warehouse at home, to which both have the keys, ensuring transparency and mutual trust. In addition, in a further effort to support Juliana's work, Deonist installed a water pipeline at their home to reduce the time Juliana previously spent fetching water, which has given her more time for her business. Deonist shares: *"I never before realised how much potential my wife had. After learning about gender, I understood the importance of supporting her. Now she contributes so much to our family. We are both proud of the progress we have made together."*

Today, Juliana and Deonist are a role model couple in their community, with a deep sense of shared responsibility and partnership. Their relationship is based on mutual respect and equality, which has led to a more harmonious family life. They now manage their agricultural and business activities together, make joint financial decisions and work toward common goals.

Agroforestry arrangement, FO-RI Tanzania

"The training in gender transformation approaches has completely changed our lives. I no longer feel like I am just a housewife; I am a businesswoman, a farmer and an active member of my community. My husband and I make decisions together, and this has brought us closer and made our family stronger."

Hawa and Adhumani: empowering the community

Hawa Akyoo and her husband Adhumani Hashimu Nkya cultivate sunflowers and maize. Like Juliana, Hawa struggled for years with the cultural barriers that prevented her from participating in decision making, which was her husband's domain. While she worked in the fields and at home, Hawa's voice remained unheard in key family matters, including farming plans and the use of their income.

Everything changed when Hawa attended a gender awareness workshop organised by MVIWAARUSHA and the FO-RI project. Inspired by what she learnt, Hawa realised the need to break free from the constraints of traditional gender roles and returned home with a newfound purpose. Her mindset transformed and Hawa began sharing her new knowledge with Adhumani, who was initially resistant. Also, he had no knowledge about agroecological techniques and their benefits, as traditional practices and local customs had always influenced his farming decisions. However, by Hawa's persistence, coupled with the stories of other successful partners, he slowly began to open his eyes. Over time, they started engaging in honest conversations about gender equality and the value of shared responsibilities. Their relationship transformed as her husband embraced these ideas. He began participating in household responsibilities, including cooking, cleaning and caring for their children. Hawa, in turn, was invited to take an active role in decisions about their farm production and marketing strategies, which has improved the couples' agricultural practices and productivity in several ways. Hawa's active participation increases motivation and care, directly influencing productivity. Now they plan their farming activities, allocate resources and explore markets for their produce together. Working as a team, Hawa ensures that decisions are informed by her unique insights, experiences and preferences, leading to more comprehensive and adaptive farming.

With better planning and shared labour, they maximised their resources and reduced inefficiencies. One of the most significant milestones was the 23% increase in their farm's productivity since adopting agroecological practices. Hawa's active involvement in research and decision making ensures that their agroecological farming methods are sustainable and aligned with best practices. This couple also used their story to inspire other farmers to adopt agroecological methods: by integrating training on these practices into their community meetings, they helped families understand how sustainable farming brings so many benefits.

Hawa has emerged as a passionate advocate for gender equality in her community, using radio programmes and village assemblies to raise awareness and mobilise her neighbours. Despite facing scepticism from village leaders who doubted her efforts, she persevered with determination and clear messaging. Through consistent engagement and compelling advocacy, Hawa gradually gained the trust and support of her community, sparking meaningful conversations about gender issues. Her leadership qualities and ability to inspire others led to her election as the Chairperson of the local network MVIWAKO, one of the prominent networks under MVIWAARUSHA. In this role, Hawa now leads over 15 farmer groups, representing more than 600 members, driving initiatives to enhance agroecological practices, financial inclusion and community awareness on gender issues.

Recognising the profound impact of their own transformation, Hawa and Adhumani were selected by the project team to be a model couple. They started by reaching out to 78 couples in their community, conducting informal meetings to discuss the benefits of gender equality. They organised local network meetings and farmer group discussions, addressing the negative impacts of harmful traditional norms and gender-based violence. Over time, they reached 98 individuals and families, sensitising them to the importance of breaking free from negative norms. Their training sessions

emphasised the importance of financial inclusion and involving all family members in farming activities. For Hawa, the journey has been transformative not just for her family, but for her community. "Equality is not just about fairness," she says. "It is about creating opportunities for everyone to thrive. When we work together, we achieve more than we ever could do alone." Adhumani proudly shared their transformative journey, stating: *"The education and awareness we got, let's transfer it to other members for their economic and social development."*

Some ideas for scaling

Profound transformations in peoples' beliefs, attitudes and behaviours to others in the community are the foundation for innovation and transformation of agriculture and food systems. Katja Vuori, CEO of AgriCord, is convinced that the technologies and practices tested, adapted and/or adopted by farmers can be scaled up with the support of committed organisations in a facilitating role. At the same time, the innovation processes provide the perfect setting for achieving gender equality, as demonstrated by the two model couples featured in this story. Katja says: "Farmer organisations provide a good structure for scaling, as innovations such as those for agroecological transition will be replicated amongst different member groups. Also, We Effect is accompanying farmer organisations in over 20 countries in Africa, Asia, Europe and Latin America, and can share this Tanzanian experience within their network." She continues reinforcing the influential role of facilitating organisations in sharing these lessons: *"This way of working on gender relations within farming households will also be shared with the 12 other agri-agencies in our gender and inclusion working group, and the ones interested can organise learning exchanges with MVIWAARUSHA and We Effect. The potential reach is more than 600 farmer organisations and the agri-agencies they are working with globally."*

Katja is clear in highlighting the conditions needed for scaling: *"The good thing about these kinds of social innovations is that scaling them widely does not necessarily require many financial resources. The challenge is that they are very culture sensitive and adapting the approach to the local community context requires considerable cultural sensitivity, and strong facilitation and conflict management skills that need to be available or developed within farmer organisations committed to engaging in gender transformation changes."*

Model couple from FO-RI Tanzania

Joining the pen with the plough: **transdisciplinary collaboration and learning** in mangrove swamp rice farming in Guinea-Bissau

Authors: Marina Padrão Temudo, ISA Lisbon, Lead Researcher; Joseph Sandoval; Merlin Leunda Martiarena; Matilda Merkohasanaj; Viriato Cossa and Gabriel Garbanzo

Mangrove swamp rice farming in Guinea-Bissau, a traditional yet labour-intensive farming system, faces mounting challenges due to climate change, urban migration and shifting agricultural preferences. Through action research, the MALMON project brought together local farmers, young farmer-researchers, university students and international PhD candidates to foster knowledge exchange. It was not a calm nor a straightforward journey, but these collaborations proved worth it as they challenged assumptions, strengthened resilience and demonstrated the power of combining traditional expertise with scientific research to navigate evolving challenges.

What does it mean to "collaborate" and "learn" in transdisciplinary research? This is a big question with little answers. We, the authors, share our experiences in conducting action research and the challenges we encountered during "collaboration" and "learning". We are a group of researchers from diverse academic disciplines (e.g. agronomy and soil sciences, engineering, anthropology) and geographic representations (six countries and four continents), who worked closely with mangrove swamp rice (MSR) farmers from different ethnic groups and regions in Guinea-Bissau, within the framework of the MALMON project.

MSR, a smallholder farming system found along the Upper Guinea coast, West Africa, is vital to the economies, food security and socio-cultural identities of Guinea-Bissau. In this rain-fed system, farmers manually cut mangroves and build earthen dikes to reclaim rice polders. Rice-growing related activities, such as ploughing and sowing, are calibrated to predictable rainfall patterns observed over many years. Situated where the land meets the sea, MSR farming comes with environmental risks, including estuary water inundation, and soil salinisation and acidification. Farmers cope with these risks through regular dike monitoring and maintenance, and soil acids and salt leaching. Over the last half century, MSR farming has faced challenges brought by social transformations and climate change. Urban migration and de-agrarianisation have led to decreased labour availability and, in turn, increased labour costs, while changing rainfall patterns and rising sea levels have disrupted farming activities and increased labour requirements. Due to these challenges, MSR farmers, including those who used to produce surplus for the market, struggle to meet sustenance.

Among more than 20 ethnic groups in the country, only the Balanta and Diola farmers remain the major producers and are heavily reliant on MSR farming, as others have greatly diminished or abandoned the practice due to a complex set of factors, including high

labour requirements, shifting crop preferences, lack of government support and influx of cheap imported rice from Asia. The Balanta people are from the Oio (the central part) and Tombali (south) regions, while the Diola people are found in the Cacheu region (northwest). The MALMON project vitalised a network of 30 young farmer-researchers from the communities involved in the project (all but one man due to women's reduced access to education), 20 local university students and eight international PhD students. Through collegial and actor-oriented research, MALMON attempted to bridge scientific knowledge and the diverse local knowledges on MSR farming. We narrate stories of collaboration and learning, from the perspectives of both young farmer-researchers, senior farmer specialists, early-career researchers and the lead researcher.

Djunta mon *(joining hands)*

High labour costs are among the major constraints faced by MSR farmers. Costs increased as more people moved to cities, and village labour groups demanded – in addition to the labour fee – very expensive food items, tobacco and a diversity of alcoholic beverages. While farmers acknowledged the costs, they were unaware of the precise figures nor of the exact size of their economic loss incurred following failed harvests, frequent in the past years. Therefore, the MALMON project asked young farmer-researchers to keep records of these costs and compare them with their diminishing harvests. After seeing the figures, some farmer-researchers took action. *"To keep records helped us a lot,"* said Pedro na Onça, Psole na Sau and Canha N'ferele of Malafu village. *"We decided to gather all the village youth and convince them that we cannot continue to pay so much for the labour groups. Now, we pay a small fee for the labour group and each worker brings their own food."* All villagers collectively agreed to rekindle the Bissau-Guinean spirit of reciprocity and mutual help (djunta mon in Guinea-Bissau creole, literally "to join hands"), that got forgotten following social transformation in the villages, and ploughing is now performed by labour groups in rotation among households. Pedro, Psole and Canha's story of social and technological transformation is further illustrated in a YouTube video, filmed by themselves.

Djunta cabeça *(joining heads)*

In order to tame the sea, MSR farmers have developed sophisticated and holistic knowledge and skills on dike management. However, as sea levels rise and labour becomes scarce, some farmers struggle to adapt and dikes become more vulnerable to overflows and ruptures, which could lead to harvest loss, and, in extreme cases, abandonment of fields and houses. Since the late 20th century, these precarious scenarios have been unfolding in some villages in the Cacheu region. MALMON conducted three collaborative dike building activities in two Diola villages, bringing Balanta farmer-researchers (Oio and Tombali) and Balanta "engineers" (Tombali), who are those regarded by their peers as experts in dam and dike construction. Our main objective was for the villagers, farmer-researchers and farmer-specialists to brainstorm (djunta cabeça in creole, literally "to join heads") on how to tackle village-specific dike challenges.

During the first dike-building activity, however, the brainstorming sessions were marked by tense discussions because the Balanta farmers believed their knowledge and labour ethics on dike building were superior. Diola farmers do not compress the mud and build the dikes in a gradual, multiyear process, which were opposite

" We decided to gather all the village youth and convince them that we cannot continue to pay so much for the labour groups. Now, we pay a small fee for the labour group and each worker brings their own food."

Young rice farmers in their fields Guinea Bissau

of Balanta techniques. The Balanta farmers saw these choices as "lazy" and "ineffective". These interactions necessitated that we, together with Ansumane Dabó (a Nalu farmer-researcher), intervene as facilitators, easing tensions and creating a space for dialogue. Ansumane came up with the idea that for the succeeding activities, the Balanta farmers should be allowed to construct a dike section using their techniques, so that the Diola farmers could observe and evaluate them, during and after the activities. In the second dike-building activity in the same Diola village, Sumras Na Branca, a Balanta farmer-specialist, observed that the mud in Diola villages is "lighter" and "less sticky", which are less favourable soil characteristics to build sturdy dikes. Nonetheless, the Balanta farmers continuously insisted on the need to compress the mud and to build the dike within one year. Their perspective shifted when the dike section they built during the activity was partially destroyed by spring tides a few months later, acknowledging that their technique was not so effective in Diola fields. In the last collaborative activity, conducted in a different Diola village, compressing the mud remained a main point of discussion, but this time when repairing ruptures in dikes. The Balanta farmers, led by Armando Tote, another Balanta farmer-specialist, repaired a burst dike section of a Diola farmer. Armando explained to the Diola farmer and some villagers, who were assisting in the repair, the importance of compressing the mud. The villagers were doubtful of its effectiveness but, a year later, most of them recognised that compressing mud could be more effective. These stories of Balanta and Diola farmers joining heads to address dike-related challenges are narrated in another YouTube video.

Djunta radi ku caneta *(joining the plough and the pen)*

The plough (radi), associated with hard agricultural labour, and the pen (caneta), associated with intellectual endeavour, are not commonly seen together in Guinea-Bissau. An objective of MALMON is to stimulate analytical and critical thinking of MSR farmers, equipping them with skills and tools to adapt to the changing environment. This was achieved through collaborative experiments involving young farmer-researchers, PhD researchers and the lead researcher on MSR issues, including tilling, planting density, and soil salinity and fertility. These activities were not only meaningful for the farmers but also challenged pre-conceived ideas of our PhD researchers.

Viriato, a Mozambican PhD student and agronomist, observed two Balanta farming views and choices unusual to him: (1) farmers do not till some of their fields, allowing them to be filled with weeds, for a couple of years and claim that it does not adversely impact yield; and (2) women farmers, tasked with transplanting, place over 50 seedlings in a hill. He was in disbelief on how these choices could be beneficial or effective for rice production as these choices do not align with conventional agronomic principles. Viriato and some young farmer-researchers jointly conducted field trials on tilling versus non-tilling and on different planting densities, ranging from scientific recommendations (two to three seedlings per hill) to actual transplanting densities. At harvest they concluded that not tilling in selected fields has no negative impact on yield. The "weeds" he saw in untilled fields were actually beneficial plants for the farmers. They also realised that, up until a certain level, high planting density did not have significant impact on grain yield and could be seen as a risk-avoiding strategy against high seedling mortality due to pests, drought or flooding more seeds.

The MALMON project further conducted experiments to optimise the planting techniques by bringing Diola women farmers to work with Balanta women in Oio. The Diola, contrary to their Balanta counterparts, use low planting densities. In addition, the project also identified Balanta women who used low planting densities to join the Diola for the demonstrations. The Balanta women who came from different villages as observers laughed when they saw the low planting densities. They did not believe at first that planting at low densities could generate yields. One of the Balanta male young farmer-researchers, who conducted density trials, explained: *"When we looked at the furrows where we used two or even five seedlings, we thought that we were not going to have any production. Our wives and even other village farmers criticised us, but then after a month, we called them to look at the trial and tell us where we used very low densities, and they were unable to identify them."* Another farmer noted the stark difference in the amount of seeds: *"I more than halved the quantity of seeds that I used and now I have more rice to eat during the lean season, and the harvest is better too."*

During the collaborative dike building activity, the Balanta farmers also criticised other farming choices of the Diola farmers, including the small plots and lack of internal ditches, stressing that big plots and internal ditches are needed to effectively manage salinity. Gabriel, a Costa Rican PhD student and agronomic engineer, measured the concentration of salts and the water level in different Balanta and Diola plots. The results demonstrated that small plots and a lack of internal ditches help avoid heterogenous distribution of salinity and improve freshwater harvesting, given that Diola villages in Cacheu receive only a fraction of the annual rainfall of the country's south. Gabriel discussed his results with both Balanta and Diola farmers and then, later on, the Balanta farmers understood the rationale behind the Diola farmers' choices.

Matilda, an Albanian PhD student and environmental engineer, observed poor plant development in the nurseries due to high density and limited soil fertility. Together with Merlin, a Belgian PhD student experienced in composting, they engaged with three farmer-researchers in experimenting with different compost mixes, using locally available materials in each village, including neem leaves that have insecticidal and repellent properties. The PhD students and farmer-researchers designed their experiments in nurseries, where after transplanting, they acknowledged that seedlings developed better when using this compost. Additionally, using neem leaves prevents termite attacks. In the following years, these farmer-researchers continued composting and other villagers have started wanting to adopt the innovation. *"Applying compost has improved the soil in our nurseries, resulting in better seedlings growth"*, remarked Pedro na Onsa, as seedlings' development influences plant development and maturity in the fields.

Multiscale collaboration and learning

Collaboration and learning did not only happen in the agricultural fields but also in the digital world. MALMON leveraged information and communication technologies (ICTs) to further strengthen collaboration among farmers. Young farmer-researchers received training on ICTs alongside tablets and solar panels, and a grant for telecommunication expenses. They quickly became adept at taking photos and making videos to share with peers and researchers in a WhatsApp group, allowing them to communicate about their problems (e.g., difficulty in hiring labour groups, appearance of rice pests outbreaks, occurrence of high tides that created dike ruptures and harvests' loss, and so on), daily tasks and innovations they developed or tested (e.g., covering the nurseries with rice straw during dry spells, new ways of reinforcing the dike structure or repairing holes, or new rice varieties introduced by development projects). Sharing stories among peers offered comfort during challenging times and fostered a sense of community. During the 2024 rainy season, Mário Songó, a Diola farmer, shared that after more than a week of brackish water inundation and loss of crops, one of his African rice varieties survived and hopefully would provide a good harvest. His news inspired other farmers facing constant dike ruptures. The MALMON team aims to foster connections among them and scientists and among farmers, even after the project has ended, especially for those who are hundreds of kilometres from each other and highly unlikely to meet, if not for the project activities. As a Balanta farmer-specialist said about MALMON: *"You joined all ethnic groups like Cabral [the leader of the anti-colonial struggle] did."*

Transdisciplinary collaboration requires valuing the diverse and dynamic farmers' knowledge while empowering farmers as scientific contributors (see MALMON's videoclip at www.malmon-desira.com). For the project team, collaboration opened arenas of friction, tension and dialogue but, more importantly, it created spaces for mutual learning on different levels (farmer-farmer, research-farmer), forms (change in farming choices, mindset or attitudes), and platforms (in-situ, online) across space (villages, regions) and time. Our stories show the complexity of conducting transdisciplinary research with smallholder farmers. Though difficult and challenging, it can lead to meaningful and long-lasting impact for both farmers and researchers.

Mangrove swamp rice farming in Guinea-Bissau

Building a local One Health approach: **participatory evaluation** in a living lab

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The Santés & Territoires project implements six living labs across four countries to combine One Health and agroecological transition principles. In Cambodia's Battambang region, a living lab was established in an area with a unique community forest. Local actors, already motivated to protect their natural resources, were eager to collaborate around the One Health concept due to interconnected health challenges in their territory. The living lab engages farmers, researchers, non-governmental organisations and government representatives, and offers an open innovation space to co-create solutions. The project emphasises participatory evaluation, allowing local actors to take ownership of the process. Participants renamed and redefined their living lab in the local language, focusing on improving network communication, stakeholder involvement and experimental processes. This approach helps building sustainable solutions while creating a broader community of practice across countries, facilitating knowledge exchange and empowering local stakeholders.

The Santés & Territoires (S&T) project aims to combine the "One Health" framework with the principles of agroecological transition. Its goal is to improve the overall health of a territory, promoting the development of sustainable agroecosystems that support the wellbeing of people and improve the environment. To achieve its objective, the project is implementing a total of six living labs in Benin, Laos, Senegal, and in Cambodia, where this story is located.

The grounds for the living lab approach

The concept of living lab can be challenging to grasp for the uninitiated. A common definition states that living labs are "user-centred, open innovation ecosystems based on a systematic user co-creation approach integrating research and innovation processes in real life communities and settings"[1]. In other words, a living lab is a real-world space that brings together local communities, researchers and other groups to co-create and test innovations.

Each living lab will be different to suit its unique context and focus, leading to differences in participants, processes and outcomes. In the S&T project, living labs serve as open spaces for horizontal discussion and collaborative efforts among relevant stakeholders aiming at defining project interventions that give the best chance of reaching the project's overall objective. Such an approach aims to empower local stakeholders and enhance the efficiency of adopting co-created solutions.

What sets living labs aimed at promoting sustainable agroecosystems apart is their strong connection to a sense of place – be it a territory or a landscape – embodying a network of both human and non-human actors. This connection also involves specific sociocultural norms and their interplay with local, regional, national and international issues.

1] Ana García Robles, Tuija Hirvikoski, Dimitri Schuurman, Lorna Stokes. Editors, 2015. Introducing ENoLL and its Living Lab community. ©ENoLL

The living lab in Battambang, Cambodia

In Cambodia, the living lab was established through an initial workshop organised in May 2023 in the Romsay Sok community, close to the city of Battambang. It involved a dozen farmer households, researchers from CIRAD and the National University of Battambang, representatives from local non-governmental organisations, the local health centre, and representatives from both the Ministries of Agriculture and the Environment. This territory was selected to host the living lab because it is home to a community forest, an area where the natural resources are protected to benefit the community. The community forest has some unique features, such as the existence of a bat cave inhabited by thousands of individuals. Bats produce guano, a very strong and expensive fertiliser that can be sold to benefit the whole community.

The actors in this territory already had a strong motivation to protect their natural resources and were willing to work together around the One Health concept, not least because people in this area are already dealing with interconnected health problems. For example, farmers noticed the effects that the pesticides used in the rice fields have on their health, that of their families and of the consumers of their rice. They also observed that farm animals stopped drinking the water from the rice fields and noticed a decline in the biodiversity of the local agroecosystem due to the use of pesticides. That negatively affected not only the health of the environment but also the local economy: as the fish and crabs that used to live in the flooded rice fields are no longer present, farmers have lost a resource and source of income.

Motivating wide participation with a driving question

In this context, the actors in this living lab decided together what question to address to improve the management of their territory. Participatory workshops using the PARDI method ("problem, actors, resources, dynamics, interactions" (Etienne et al., 2016)) allowed them to co-construct a collective representation of a problem that needs to be addressed. During this participatory modelling process, participants agree on the actors, the resources, their interactions, as well as the dynamics that are decisive for the issue at stake. The living lab members chose to address the question: "How to improve soil and water quality to ensure good health of people, animals and the environment?". The first experiments and activities started: those who had access were making compost with resources from the farm and/or the bat guano, others were making and using bio-fertiliser, there was training on how to reduce pesticide use, and some were experimenting alternative pest-control techniques, such as for example traps for snails, who are one of the main pests affecting local crops.

Using the living lab approach – involving many different actors, including those with decision-making power, and initiating collective action in the community – could theoretically help build more durable solutions to local

A living lab workshop

problems, but the question remains how to assess the right functioning of such an entity?

Evaluating a living lab can be tricky if you don't consider the unexpected in the evaluation design. If living labs are constantly evolving over time, then maybe the best feedback on the living lab performance could come from the living lab actors themselves? With this idea in mind, it was thus decided to base the evaluation of the living lab on two principles: (1) that some actors of the living lab become users of the evaluation and make decisions to adjust it based on the results of its evaluation (a principle of utilisation-focused evaluation) and (2) that the evaluation design can be modified over time to better match the evolving objectives and principles of the living lab (coming from the developmental evaluation framework).

Evaluation as a learning and ownership building process

Five participatory workshops were organised to understand evaluation in the framework of living labs. The main objective of the first three workshops was to select the users of the living lab evaluation. Actors were gathered in clusters of similar profiles to decide the purpose of the work and who would be part of the evaluation group. They also discussed more broadly the purpose and functioning of the living lab in terms of membership, meeting purpose and frequency, and agreements to work together.

The expression "living lab" had never been translated in Khmer, the local language. Everyone was always referring to the living lab as "the project", even though the participants quickly understood that the way this project was working was different from any project they had previously known. During the fourth workshop, the actors agreed on the following definition of their living lab: "A discussion arena where we work together with all actors and share knowledge. The problems are co-identified, and experiments are co-developed. The aim is to improve the livelihood of farmers and the different healths". Users of the evaluation also came up with a name for the living lab in Khmer, which translates literally to "technical agriculture network for improving the One Health". Naming and defining their living lab allowed local actors to symbolically take ownership of the project approach, making it their own.

During the last two workshops, participants came up with four different uses for the evaluation: (1) improve the circulation of information and knowledge within the network; (2) encourage the involvement of every actor; (3) improve the experimental process; and (4) analyse the creation of local knowledge (to check how "local" it is and how it could be spread beyond the local network). They also chose their method of working. They refused to work on an evaluation table that was proposed by the project team, as they found it too abstract and not "straight to the point". Instead, they preferred to work around one big question: "How can we improve the network?", which also indicates they were taking ownership of the process. They decided that the term "network" had to be kept in mind for the evaluation, and the information and knowledge diffusion through this network required attention. Networking can be very important for farmers initiating an agroecological transition, as it supports change and offers a space dedicated to experimenting and getting approval from peers on new farming practices. Ultimately, the local actors ended up redefining the purpose of the evaluation of the living lab through the name they proposed and the way they wanted to work. Many actors outlined the fact that this collective process was important to them, as it made them feel included and gave them power. They appreciated the opportunity to speak with people so much different from themselves.

From local living lab experiences to broader implementation

Participatory evaluation provides a strong mechanism for all project stakeholders to jointly reflect and learn from their actions. The evaluation system requires adaptation to the needs of the project stakeholders, which is easier when those involved have direct control over this system. The utilisation-focused evaluation and developmental evaluation frameworks are two adaptive frameworks that leave enough margin for manoeuvre for this to be possible. In the S&T living lab in Cambodia, the actors started to take ownership over the process. This will hopefully continue to allow them to implement their own ideas as much as possible. Their strong desire to conduct participatory evaluation of the experiments as well as their ideas for on-farm visits and concerns about the scaling of the new practices are for now at the heart of the local living lab evaluation group. The involvement in the network has a secondary objective to federate actors and to root the new agroecological practices in the region. At the broader level, S&T implements six living labs across four countries with the overarching objective of improving the One Health framework, thus, it is crucial to harness key lessons from different contexts. Agroecosystem living labs act as "niches" that tackle global agricultural challenges, such as the agroecological transition, and demonstrate an opportunity to address significant issues through various innovative approaches (McPhee et al., 2021). A flexible albeit robust evaluation mechanism was therefore needed – such as the one chosen by the project team in this story, combining utilisation-focused evaluation and developmental evaluation. This combination would allow to harvest findings at the level

of the main objective of the project – improving the One Health framework through agroecology at the scale of the territory – while at the same time assessing the performance of the living lab as the main tool used in the project. The living labs become spaces where information and knowledge can be shared, experimental processes can get adapted to peoples' needs in local contexts, and where people who want to get involved in collective process of innovation development can act together.

With six living labs implemented across four countries, S&T is actively building a community of practice. This community, which includes various local stakeholders and scientists, is crucial in facilitating knowledge exchange and empowering local stakeholders on the design of agroecological interventions. Through comprehensive frameworks, tools and training within the living labs, the project encourages the co-design of these interventions in close collaboration with communities, fostering strong partnerships to tackle health-agriculture interactions effectively.

By building strong, engaged networks within living labs, these spaces can not only address local issues but also contribute valuable insights to global challenges. Moving forward, the integration of participatory evaluation in these labs will drive deeper collaboration, enabling communities to co-create solutions that are contextually relevant and scalable.

3 BUILDING A LOCAL ONE HEALTH APPROACH

Setting up snail traps

STORY OF CHANGE

Community leadership and agro-forestry systems in Colombia: **a commitment to forest conservation** from a social perspective

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4 A COMMITMENT TO FOREST CONSERVATION

Valentina Fonseca facilitating a workshop in Palo Blanco, Vigía del Fuerte.

In Colombia's richly biodiverse forests, where decades of conflict have left deep scars on both land and communities, an unexpected alliance process is taking shape. In Vigía del Fuerte and San José del Guaviare, local leaders, with support from the IDeas project promoting participatory governance, are proving that peace building and forest conservation can grow from the same roots: a process of co-construction, of collective intelligence. As these communities navigate the complex challenges of post-conflict recovery, they're developing innovative collective processes, to protect their forests while healing their social foundation. Their story shows how trust, once rebuilt within the community and with territorial organisations, is as valuable as the ecosystems they all strive to protect.

This story summarises the achievements of organised rural communities in Vigía del Fuerte and San José del Guaviare, two municipalities in Colombia that, despite numerous and constant challenges, strive to halt the advance of the agricultural frontier by implementing agroecological and organisational innovations. The changes reflect the resilience of rural inhabitants who have suffered more than six decades of armed conflict with devastating consequences for generations, and are currently affected by land insecurity, the proliferation of illicit crops such as coca, forest degradation and the expansion of extensive livestock farming.

Working to build trust in Colombia is an unparalleled challenge, as armed groups continue to affect the population, and it seems that there are few conditions for trusting one another. However, efforts to achieve sustainable peace must focus on trust as a way to rebuild the social fabric, the economic development of marginalised communities and ecosystems conservation. A key pillar in this process is the Comprehensive Rural Reform, included in the 2016 peace agreements with the Revolutionary Armed Forces of Colombia (FARC), which proposes the stabilisation of the agricultural frontier to balance environmental protection and social development of the communities that live in and protect the forests (Gobierno de Colombia, https://shorturl.at/cFKEN). In addition, there is the National Restoration Plan and the Comprehensive Strategy for Deforestation Control and Forest Management (https://shorturl.at/7xQ7s), which include restoration, reforestation, sustainable forest management and agroforestry.

Vigía del Fuerte, in the middle basin of the Atrato River, is one of the areas with the greatest natural wealth in the world: 75% of its territory is covered by forests and 12% by wetlands and bodies of water. Its inhabitants – indigenous and Afro-descendant communities – collectively own most of the land. The Senior Community Council of the Atrato Integrated Farmers Association is in charge of managing the communal lands and is advancing a long-term process to protect and sustainably manage their territory. San José del Guaviare, 650 kilometres away and located on the northwestern border of the Amazon, is facing illegal land grabbing by peasant communities that leads to land insecurity and high rates of deforestation due to extensive cattle ranching. That is why local organisation is key, and farmers in the municipality have organised themselves into cooperatives and community action committees to sustainably use and conserve the remaining forests. In this context, the IDeas project stands out, strengthening local capacities towards agroecological transition and promoting local governance. The project is coordinated by ONF Andina, in consortium with the Colombian Pontificia Universidad Javeriana, the French agricultural research and international cooperation organization working for the sustainable development of tropical and Mediterranean regions (CIRAD) and Wageningen University & Research.

Facilitating local governance and social participation

Strengthening community leadership, a task of facilitating collective construction processes by ONF Andina specialists, has been at the core of the efforts. Innovation facilitators have guided the actors in the territories to characterise governance arrangements and the needs for strengthening capacities. This participatory work is reducing the gaps between stakeholders and establishing a framework of agreements suitable for managing the territories.

In this process, community leadership capabilities have been strengthened based on assertive communication and listening, and other functional capacities (Toillier et al., 2020), to manage the complex reality of both territories. Sharing knowledge about the legal status of territories and how the regulations affect them has been a key activity valued by most people. The local actors are now learning to use cartographic tools to manage the territories, as Paola Martínez, President of the Caño Nilo Community Action Board in San José del Guaviare, mentioned: *"We learnt the importance of governance and of knowing and understanding our territory through cartography. We got to know the maps and we were able to see how deforestation has occurred over the last 20 years, and how much our territory has changed."* By using these tools, the community started appreciating issues of sustainability even more, as outlined by Héctor Ramírez, a farm owner: *"We have to make sure that our truth continues forward by preserving the forest reserves that still exist and the water sources for future generations, because we are leaving, but more generations are coming."* These capacity-building facilitation processes allow community members to guide decision making for territorial management and ecosystem restoration, giving them a leading role in the protection and sustainable use of their resources.

Valentina Fonseca and Carla Segard are two innovation facilitators from ONF Andina working to strengthen collaboration networks between local organisations and government actors. Valentina tells us: *"Leaders now have both technical tools and soft skills to manage their territory with greater capacity and establish dialogues with institutions and other actors in a more horizontal manner. This contributes to configuring more resilient and dynamic governance systems."* Carla reinforces the relevance of facilitation: *"Now, the leaders of the Community Action Boards efficiently communicate the information they receive to their entire community and are good advocates within the negotiation spaces."* Their work, and that of other facilitators, is resulting in greater capacities among the members of the communities to influence political decisions, as well as implementation of sustainable practices in the territories. These processes contribute to building legitimacy and also growing support and engagement over time for more ambitious actions.

Co-creating for landscape planning

The continued development of tools for landscape planning has provided plenty of opportunities for learning and sharing not only new knowledge, but also local knowledge kept by the communities. For example, with support from the Forland platform and the multistakeholder dialogues around it (https://www.onfinternational.org/en/forland/), the project has designed methods and tools to strengthen local stakeholder participation in decision-making processes related to land use. These methods have been instrumental in planning the stabilisation of the agricultural frontier in areas where deforestation

and expansion of livestock farming have threatened ecosystems and biodiversity. Through this process, land use scenarios have been created, which take into consideration the needs of local communities coupled with environmental objectives, fostering an integrated vision that promotes long-term sustainability. In participatory modelling exercises, the facilitators have guided local and national stakeholders to create scenarios and strategies for more inclusive governance in both territories. This has not only enabled them to make informed decisions about land management, but has also strengthened the capacity of local institutions to manage the territories sustainably.

This work in progress depends on the continuity of these processes based on local ownership and dialogue, but there are good indicators of potential success because the authorities are also keen to take part in the multistakeholder platforms to discuss the issues. Delegates from the Guaviare Governorate, the Ministry of Environment and municipal mayors are in dialogue with the communities organised in the Committee for Sustainable Development, Afro-descendant community councils and peasant communities. Openness to listen, understand the demands and collaborate to find solutions together are notable among public officials who have participated in the planning exercises. Juan Carlos Contreras, representative of the San José del Guaviare municipal mayor's office, states: *"It is important to coordinate so that the activities that are carried out are also known from the territory and cooperation with other institutions and organisations can be achieved."* This is reinforced by Kelly Castañeda, Director of the Administrative Planning Department of Guaviare, who says: *"These processes enrich us, we have very valid instruments to be able to broaden the vision of the department, where we should go, focus, also what problems we should address, and in a certain way it is a voice of the communities."* This participatory approach has been essential to generate a sense of belonging and shared responsibility, promoting cooperation between government institutions, non-governmental organisations and local communities.

"We start from the idea that for this to be a process of co-construction, that is, of collective intelligence, it is important that there is the same level of information among all the actors who participate in the discussion. The communities come with a process of capacity building. The idea is that little by little, they will be included in a discussion with the government and the Ministry of Environment and Sustainable Development to share visions in a balanced way where everyone has a voice and each opinion is valuable in the process. It is with all the ideas that we will find a solution to stabilise the agricultural frontier," indicates Marion Chesnes, CIRAD Coordinator.

Consensus building is becoming the glue that binds everyone together around common goals, facilitating collective decision making and ensuring the successful implementation of innovations. IDeas is not only fostering an environment conducive to innovation, but also strengthening group cohesion, promoting a culture of collaboration and continuous learning.

Technical models for forest restoration

With project support, the communities are testing practices for landscape restoration and reduction of greenhouse gas emissions, such as agroecology arrangements. With these practices, the communities now have options that not only restore ecosystems but also contribute to landscape connectivity in degraded and deforested areas, and contribute to family economies and food sovereignty.

Pilot projects have been implemented in the territories of El Capricho, which includes seven villages in San José del Guaviare, where the capacities of young people, men and women are reinforced. The pilots help build confidence and gain further support; those involved can take risks and experiment with innovative approaches. These pilot projects have been co-financed by the cooperatives. To date, 171 members of the COMGUAVIARE, COOMAGUA and El Capricho cooperatives are carrying out pilots that cover 102 hectares with agroforestry arrangements, and test bio-digesters to convert their crop residues into biogas and nutrient-rich fertiliser. Women are active participants, and their voices are heard and respected: *"This is very nice because it gives us the feeling that we have our income and we feel like we can do it, it gives us self-esteem because we can do it,"* says Jasmin Castro.

> ***"We are happy and grateful because this project is something that we women who are in the homes have been dreaming of. With the implementation of these gardens, we are going to help improve the household economy of all the women who are part of the project,"*** says Marly Valdez.

These two female leaders are making an impact by managing their own agroecological gardens in the COMGUAVIARE cooperative. The lessons from these pilots on how to integrate landscape restoration, agroecological intensification and sustainable management of natural resources have been shared at the national level to contribute to the development of public policy, and internationally, such as at the COP 16 on Biodiversity.

The road ahead

The local processes for territorial planning fostered by IDeas have promoted a comprehensive approach that combines governance, knowledge sharing, testing agroecological practices and territorial design. Based on facilitation of innovation processes, IDeas is cultivating an enabling environment for creativity, collaboration and effective resource management, resulting in innovative and sustainable local solutions. Given Colombia's recent history, conflict resolution and consensus building are critical to the success of collective innovation processes. In these environments where diverse perspectives converge to generate novel ideas and solutions, the ability to identify and resolve conflicts constructively, as fostered by IDeas, is essential.

In conclusion, stabilising the agroecological frontier in very complex territories, such as those of Colombia, requires multisectoral and multilevel efforts, and the commitment of local communities, combined with efforts of government institutions and research centres. The partners in this story are focusing on collaboration, building trust and potentiating their local innovation capacities. These efforts will contribute to transforming the governance and socio-ecological systems of San José del Guaviare and Vigía del Fuerte, through a constant exchange of ideas and knowledge. The hope is that these efforts are sustained to generate lasting solutions adapted to the local realities agreed upon by decision makers and the communities of both territories.

Women from Cooperative COMGUAVIARE training in agroecology

Further reading

Gobierno de Colombia,
Reforma Rural Integral PowerPoint
https://shorturl.at/cFKEN

Ministerio de Ambiente y Desarrollo Sostenible, Colombia,
Plan Nacional de Restauración Ecológica, Rehabilitación y Recuperación de Áreas Degradadas
https://shorturl.at/7xQ7s

ONF Andina, Forland
A collaborative digital platform for territorial management
https://www.onfinternational.org/en/forland/

What is behind the dynamism in the Central American Dry Corridor? **Multistrata agroforestry in action**

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The Dry Corridor in Central America extends from Guatemala to Panama, and faces severe drought, food insecurity and migration pressures. To address these challenges, the AGRO-INNOVA project fosters agroecological transformation in the region, enhancing climate resilience for smallholder farmers. With 21 partners, it engages farmers, researchers and institutions to test multistrata agroforestry system models (MASMs), improving productivity and sustainability of farming systems. Farmers, alongside researchers and innovation facilitators, co-develop solutions tested in the MASMs through field schools and informed by digital tools. Many of the project's organisations had already worked together on innovation projects; this story highlights the importance of building on existing collaborations among stakeholders to enhance the effectiveness, scalability and sustainability of innovation efforts.

There is much dynamism in the Dry Corridor of Central America where thousands of smallholder farmers, supported by researchers and facilitating organisations, are embarked on agroecological transformation to increase their resilience to climate change. This is a story of robust cooperation, testing technologies and practices, and learning together to transform a harsh reality into opportunities and better livelihoods, which comes together in the AGRO-INNOVA project.

More than 10 million people live in the Dry Corridor, a region that extends from the Pacific coast of Mexico to Panama. Thousands are dedicated to agriculture and the small-scale production of maize, beans and other basic foods. Around 80% of small-scale producers live below the poverty line and 30% live in extreme poverty (FAO, 2024). Historically, the Dry Corridor has been highly vulnerable to climatic events but currently, longer droughts and shorter periods of heavy rains are posing an even more severe risk to food production, which impact people's livelihoods, food security and nutrition. For many, the sole strategy has been to migrate out of the territories in pursuit of a better life. Those migrating are young: the average age of migrants from El Salvador, Guatemala and Honduras is 24 years old.

In this setting, AGRO-INNOVA aims to improve food security, productive development and climate resilience of highly vulnerable smallholder producers. The project is based on strong institutional commitment for innovation and brings together 21 strategic partners, working in 31 territories and 109 localities in six countries.[1] The main players are farmer organisations, supported by the Inter-American Institute for Cooperation on Agriculture (IICA), the Tropical Agricultural Research and Higher Education Center (CATIE) and national partners. These organisations have a long tradition of working together for more than fifty years. The strategy includes testing technologies and practices in field plots, strengthening capacities at local, national and regional levels, and sharing knowledge.

1] Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama

Getting all stakeholders together: embracing diversity to leverage joint action

In each country, IICA, as facilitating organisation, convened representatives of various groups, including farmer, research and non-governmental organisations, extension services, private actors, universities and others, to form a national technical committee (NTC). This space had three objectives: (1) generate consensus on research priorities, agendas and implementation of activities in each country; (2) help institutionalise AGRO-INNOVA processes, technologies and practices, especially in research and extension organisations; and (3) influence policies, especially for public research institutes and organisations promoting competitiveness. Each organisation funded the participation of its delegate. In each NTC, the stakeholders created a shared vision and made decisions through inclusive consultations, delimitation of benefits and responsibilities, and management of disagreements. They shared their values, concerns and interests, and the voices of traditionally marginalised groups such as women and indigenous peoples were heard as well. Facilitators made sure that communicating plans, strategies and outcomes was done regularly and with transparency.

Each NTC took a different form. For instance, in Honduras, seven farmer organisations from the department of El Paraíso were part of the NTC along with public organisations. In Panama, there was also private-sector participation from the Center for Competitiveness of Western Panama (CECOM-RO), the Chamber of Commerce, Industries, Agriculture and Tourism of Chiriquí (CAMCHI), and the Pro-Chiriquí Foundation. In Guatemala, besides the NTC, technical committees were created in two territories, Baja Verapaz and Chiquimula, with the participation of 13 farmer organisations, the Ministry of Agriculture and the National Coffee Association (Anacafé).

"It all starts by understanding the farmers' needs and aspirations", emphasises Lourdes Ortiz, a specialist in rural development from IICA Guatemala: *"We can improve our work in the territories by listening and recognising the capacities, resources and prerequisites of our producers, which can make the smallholder farmer processes much more successful. Also, by looking at the producers' life perspectives. It is very valuable to know their dreams and goals, to understand them, and this way build joint platforms that mutually enrich us".* Lourdes' work is based on mutual respect and continued commitment, values of good innovation facilitators (FAO and IICA, 2024). However, bringing together diverse actors was not without challenges, and often facilitators had to balance expectations and power dynamics.

At the regional level, the project strengthened structures that have been in place for years, albeit with some modification, joining forces in the regional technical committee (RTC), also facilitated by IICA. The RTC met regularly via Zoom and in participatory workshops to exchange experiences and capitalise on lessons learnt from the NTCs. Delegates from the six ministries of agriculture and other public agricultural policy makers participated to institutionalise these efforts.

Farmers discussing around a small water reservoir in a MASM plot.

A driver for success: multistrata agroforestry system models adapted to smallholder producers

Farmers know that planting fruit trees and timber species is not only a sound investment for the future but also improves the productivity of their land. Thus, in a consultation process, the project partners decided to use multistrata agroforestry system models (MASMs) which are agroforestry systems with layered trees and crops that mimic the structure of natural forests (De Clerck and Negreros-Castillo, 2000). Among their advantages, MASMs achieve high rates of food production and carbon sequestration (Nair, 2012) and help conserve biodiversity. *"At CATIE, we have worked for four decades with farmers developing agroforestry systems and we share our data with the national research institutes and other organisations,"* explains Guillermo Detlefsen, CATIE's representative in AGRO-INNOVA. Using MASMs, the goal was to put the farmers in the driving seat to guide participatory research.

Co-creation in MASM mode

Farmer leaders started by testing MASMs on their own plots, in coordination with researchers and the support of local facilitators. These experiments became open spaces to discuss agroforestry, its short- and long-term benefits, as well as other technologies and practices. Farmers experimented with technologies that were unfamiliar to them, and tested and adapted them to their needs and realities. For example, some farmers tried out native fruit trees instead of wooden trees, or built small infrastructures for water conservation, or implemented fodder banks, or tried composting with different local materials. Co-learning interactions between stakeholders in the MASM experiments was strengthened by farmer field schools, field visits and field days. For instance, in Panama, groups of 20 farmers from the Baitun Arriba Producers Association (APAU) met twice a month on a MASM plot. *"I shared my problems with cucumber, cabbage, tomato, passion fruit, lettuce and chili peppers, and I learnt a lot from my friends at APAU. With them, I have learnt to plant trees, prune and apply bio-inputs to grow my crops,"* says one of its members, Rene Ubaldino Rivera.

Altogether, these NTCs implemented 108 MASM plots (24 different MASM designs) and more than 1 200 producers participated in open dialogues during field days. The farmers modified the generic MASM to fit their conditions. *"Now our crops are better with the production of organic inputs that have contributed a lot to us and above all, to eat healthier,"* says Guadalupe Portillo, who, after seeing the benefits of a water reservoir on a MASM plot, built her own, ensuring year-round irrigation of her 1 500 m² intercropped plot.[2] In Costa Rica, the National Chamber of Milk Producers adapted MASM on its five farms, along with soil conservation practices, water harvesting, a seed forage bank and alley cropping.[3] Extension agents and researchers from the public systems provided technical backstopping to the farmers for at least one agronomic cycle in the process of adapting the technologies, along the way learning from the knowledge that the farmers brought.

Farmers working together in a MASM plot.

Overall, NTCs managed 77 hectares of MASM in the six countries, investing considerable funding, time and knowledge in the process. Scaling to other locations has also started. For instance, in Trifinio, a mountainous region shared between El Salvador, Guatemala and Honduras, MASMs have started to be implemented on 865 hectares in collaboration with another IICA project.[4]

Learning together: knowledge exchanges that yield results

Following the lifting of restrictions imposed by the Covid-19 pandemic, in-person events were key to fostering an environment of collaboration and trust. For example, during visits to CATIE, producers discussed with scientists about many topics of interest such as biodiversity conservation, sustainable livestock farming and added value in agroforestry. Some 120 researchers, extension providers and rural advisors participated in activities to co-create, learn and share knowledge with farmers via Zoom or in person.

The project launched six mobile applications, designed based on farmers' needs and incorporating their own knowledge, to help them make informed decisions about their crops and climate, for example in relation to emerging pests and diseases. These are facilitating the producers' access to automated tools, to insert them in the world of digital agriculture, as access to internet is improving in most rural areas in Central America.

Putting emphasis on the new generation of farmers, 1 603 agriculture students and young farmers participated in hands-on capacity-strengthening activities using information and communication technologies which are attractive to them. Robin Almendares, Executive Director Clubs 4S in Costa Rica, explains: *"We brought young farmers from the Caribbean and Guanacaste [Costa Rica] to share with their peers in other regions in the AGRO-INNOVA plots, and then we developed innovative technologies to work with these young people in our 250 clubs in the country in our Leadership Schools for Future Farmers programme".* He indicated that over 100 women from the Clubs 4S also shared their experiences. Simón Vasquez, from the National University in Panama, adds: *"We have incorporated our students into real scenarios, not theoretical, and they have been able to share experiences with producers. The idea is that students and farmers learn together from real life conditions and find solutions together".*

In August 2023, a unit dedicated entirely to demonstrating how satellite-based applications can benefit agriculture in the Americas, opened at IICA, a key legacy from AGRO-INNOVA. In these facilities, farmer leaders from the NTCs joined decision makers from public and private sectors to learn about digital solutions in agriculture, as well as specific case studies that utilise remote sensing and geo-referencing data from the Sentinel I and II satellites, generated via the Copernicus and Galileo Programmes5 with information collected on the ground.6 These tools will allow farmers to monitor the climate and adjust their crops based on real-time conditions, and can become one of the most effective technological and institutional innovations of the project.

Building conditions for scaling

This story has again reinforced the importance of collaboration because in one way or another, many of the organisations had already worked together on innovation projects; therefore, building on existent structures was more effective. Reinforcing collaboration among multiple stakeholders with active roles in designing innovations adapted to their needs provides a stronger basis for more scalable and less reversible outcomes.

Empowering all actors with up-to-date and accessible information on technologies and sustainable practices is essential to improve capacities and achieve effective scaling. Clearly, the solutions must be co-constructed and MASM experiments provided countless opportunities for discussion and learning. Now that farmers have learnt the technologies and practices, it is time for scaling. For this to happen, a favourable policy environment conducive to innovation is needed. As illustrated by the AGRO-INNOVA story, research can play a key role in the agricultural innovation system in each country. For this to happen systematically, it requires correcting the neglect suffered by public agriculture research across Central America (Nin-Pratt et al., 2023), which is a long-term endeavour. *"Public-funded research is a key element to help smallholder farmers innovate and so is attracting the private sector to invest accompanying these farmers",* says Lloyd Day, IICA's Deputy Director General, referring to institutional efforts to tackle key agricultural challenges with support from private companies. *"We share the learnings from AGRO-INNOVA with agricultural authorities in Central America to effect change. We need this good evidence to advocate for more investment in innovation processes",* he concludes.

In the end, when everyone collaborates, everyone wins. The partners in the AGRO-INNOVA project demonstrate that, with adequate tools and support, it is possible to improve the resilience of agricultural families in the Dry Corridor and ensure food security at large.

2] IICA. 2023. Hoja divulgativa. Sistema agroforestal de árboles frutales en asocio con granos básicos, producción de hortalizas y cosecha de agua. 3] Eric Montero, Executive Director National Chamber of Milk Producers in Costa Rica, AGROINNOVA closing event. https://www.youtube.com/watch?v=vhmgfaZvq-8. 4] Pedro Avendaño, PPT during DeSIRA Connect Colombia. https://www.desiraliftcommunity.org/wp-content/uploads/2024/07/Pedro-Avendano-AGRO-INNOVA.pdf

2 PART 2

Innovations in practices, technologies and supply chains

By Ricardo Ramírez, Bernard Triomphe and Renaud Guillonnet

How to ensure innovation benefits and returns at scale?

An analysis of DeSIRA projects – performed by DeSIRA-LIFT – has determined that about 56% of their innovation products relate to technology, markets and agrifood processing, with an additional 13% targeting agricultural services. Two thirds of DeSIRA projects expressed an aim of contributing to innovation of economic interest and potential market value.

A main objective of the DeSIRA initiative, and that of DeSIRA projects, has been to contribute to innovations of environmental value at large, with a particular focus on climate change mitigation, soil preservation or restoration and the protection of biodiversity. Several of them apply the One Health framework (Sinclair, 2019).

Half of the projects referred to at least two of the 13 agroecological principles as objectives of their innovation approaches. Applying agroecological principles underlies the notion of technology in most DeSIRA projects (Lof et al., 2025). Such technologies propose to substitute input-based and resource-intensive agricultural practices by new climate-smart and nature-based solutions contributing to more sustainable agriculture, based on management of resources that preserve or restore degraded ecosystems. In addition, such innovations propose to ensure comparable or increased agricultural output while improving the nutritive value of food, thus contributing to balanced diets along the broader food system.

As such, DeSIRA innovations are opening potential disruptive approaches in terms of agricultural practices, inasmuch as they managed to implement agroecological alternatives – such as composting and applying different types of bio inputs.

With regards to building conditions for economic viability that would ensure uptake and dissemination of innovations beyond their time span, projects have facilitated the inclusion of non-farming actors or the emergence of more formal structures at the level of farming communities. In doing so, they built avenues to ensure the economic benefits of technical innovations through market access, the development of new supply chains or the insertion into existing ones.

These, however, are more incremental in terms of patterns that would ensure economic returns, without which their adoption would be compromised. They therefore seek to balance potentially contrasting interests of sustainable management, and possibly more frugal use, of resources and economic stability or growth for the targeted farming communities.

In the face of these trade-off challenges, DeSIRA projects moved away from the traditional research-to farmer transfer of technology model and embraced participatory processes and multistakeholder platforms with a view to favour co-design and eventual adoption of technological innovations by farming communities. While they allowed for the necessary corollary changes in mindsets and values of individuals and communities (see Part 1), participatory multistakeholder mechanisms also sought to provide avenues for policy changes (Part 3), as well as to meet the promise of economic return of innovations with market stakeholders. This was done through the inclusion of economic considerations into innovation strategies thanks to the participation of private-sector players such as cooperatives, input suppliers or chambers of commerce, funding and certification mechanisms that would demonstrate compliance and build trust with consumers.

The stories in this chapter illustrate various forms that such innovations have taken. They raise the question of what factors would be efficient to scale these innovations towards systemic impact since *"the profitability ranking of [climate-smart agricultural] practices at small scale might be different at large scale"* (Lan et al., 2018). Among these factors is the nature of funding required and how to attract and access it.

What we have learnt

Innovations described in this chapter stem from consultations, compromises, negotiations and agreements among stakeholders achieved from multistakeholder mechanisms widely used in these projects (Toillier et al., 2024). They constitute locally-designed combinations of elements agreed among the relevant stakeholders that have been proven at small (experimental) stages and have the potential to take root and scale. They are frequently knowledge-intensive, some based on improved management practices, some on improved or alternative inputs, and result from co-designed processes focusing on plot- and farm-level experiments or supply chain agreements (Busse et al., 2023). Most rely on increased knowledge at the level of producers, generated from training, sharing among peers and other stakeholders, co-designed and tested technological solutions, strengthened functional capacities and soft skills.

Altogether, these innovations have helped farmers and farming communities improve their outputs thanks to new or improved agronomic management practices at farm level (e.g. an organic input substituting a chemical one) and resulting produce (e.g. a healthy agroecological vegetable), a new or reinforced organisation among producers (see also Part 1), coupled with partnerships with a broad range of stakeholders and partners, including policy makers (see also Chapter 3) and private-sector actors.

Some innovations have explicitly targeted the creation of supply chains (as illustrated by the MARIGO and Artemia4Bangladesh stories), while incipient local supply chains in fodder and dairy can be observed in the ICSIAPL project in Kenya. Likewise, technologies are reinforcing the sustainability of the cocoa and rice value chains in Guinee Bissau and Peru, and that of meat in Mongolia. Other DeSIRA projects, not figuring in this book, have succeeded in contributing to similar effects.

The ICSIAPL and ProSilience projects show how communities of smallholder farmers and pastoralists can be empowered to better manage funds for investments and make financial decisions that serve their best interests. In both cases, such funds allowed deeper adoption and dissemination of technological innovations.

The work on certification – for example in the MARIGO project, or through broader regional guidelines in the ASSET project – indicates the ability of projects to have an influence on market factors, often coupled with new or improved produce (e.g. an agroecological vegetable, an improved breed) and good agronomic practice.

Improved or new supply chains, market potential

In Côte d'Ivoire, the MARIGO project is contributing to an agroecological transition of peri-urban market vegetable production through a combination of approaches, including production practices, organisation and marketing. *"The MARIGO project focuses on harnessing natural processes and using locally available resources to manage pests and enhance soil fertility. It encourages the use of naturally-derived pesticides, such as neem extracts, which effectively control pests while minimising harm to beneficial insects and the wider ecosystem. In parallel, MARIGO promotes the application of microbial inoculants to enhance soil fertility, improving nutrient availability and overall soil health"* (Lof et al., 2025) MARIGO recognises the interconnections between people, animals, plants and soils under the One Health approach. It also engages in educating consumers on the pricing and quality of agroecologically produced vegetables. Moreover, MARIGO accompanies farmers, non-governmental organisations and others in reflecting and developing quality labels and certification schemes, including via the participatory guarantee system for organic and agroecological vegetables, which is a needed development for those consumers, still not a majority, who can afford to pay more for quality products, provided they can trust, via a credible label, that this is indeed the case.

In Bangladesh, the ARTEMIA4Bangladesh project used a comprehensive approach to introduce a new culture – *Artemia* – into the farming systems in Cox's Bazar. The innovation consisted of integrating the production of *Artemia* with salt farming and aquaculture. *Artemia nauplii* or brine shrimp is one of the most widely used crustaceans to feed farmed fish and shrimp. Engaging in *Artemia* production allows salt producers to diversify their income stream during the rainy season, when they cannot produce salt. The project provided training and technical support in *Artemia* production to salt farmers, while training fish farmers how to use *Artemia* to increase their production. At the same time, the connection with the market for *Artemia* cyst was made, by linking *Artemia* producers with shrimp hatcheries and involving marketing agents. Training in the use of Artemia as a human food was also provided, to make the best out of the new technology. Significant gains in production of both *Artemia* and of fish and shrimp were achieved, leading to significant increases in income.

Improved production and livelihoods from climate-smart solutions in feed, soil and animal health

This part contains two Stories of Change in the livestock sector. The story of STREAM highlights the combined challenges livestock production has faced in Mongolia with regard to a changing climate, overgrazing, soil erosion and loss of grazing lands. STREAM has introduced a combination of practices and innovations that include breed improvement through artificial insemination, reduced grazing combined with supplementation and management of grasslands, introduction of crop rotations in pastures, and opening new markets for meat and steers, including trade talks with the European Union. Herders in two areas have formed two new cooperatives to fatten livestock and streamline sales of steers through linkages with private-sector actors. In addition, linkages with producers of animal mineral blocks have led to improvements in livestock health, growth, fertility and immunity: *"by combining these ecological approaches with efforts to strengthen herder cooperatives and improve market linkages for livestock products, STREAM aims to create more sustainable and resilient pastoral systems that can adapt to changing climatic and economic conditions while preserving Mongolia's unique cultural heritage"* (Lof et al., 2025).

The story of ICSIAPL in Kenya, which initially focussed on contributing to climate resilience for agro-pastoral communities, has gradually evolved into the development of potentially sustainable local supply chains thanks to the provision of technologies and integrated community-driven solutions. In the arid and semi-arid regions, pastoralists face the challenge of drought, degraded land and scarcity of feed, resulting in poor animal health and declining production of foods they would rely on. The project has promoted the production of fodder with certified seeds of drought-tolerant species. Farmers were at first doubtful, but through training and joint experimentation they got enthusiastic after witnessing the benefits in animal health and the increased milk and forage production that opened avenues for commercialisation. The project has provided financial incentives through an innovation fund that co-finances investments on a 50%-50% basis by organised groups and associations, to help producers shift from subsistence farming to more commercial livestock production. The multistakeholder platform, consisting of research organisations, the private sector and local governments, has allowed connecting the grassroots farmer organisations with a broader range of partners that can help sustain the results already achieved.

Agroecological practices as private-sector incentives

The TRANSITIONS PSii project aimed to scale agroecological approaches to cocoa in Peru and wheat in Ethiopia. Farmers in both settings are facing parallel problems of deforestation, limited access to synthetic inputs and subsequent soil degradation. The approach taken by PSii centres on identifying the different incentives can bring together the private sector, farmers and other service providers into agroecological transitions. Four types of incentives are considered: market incentives (prices, premiums, subsidies), non-market incentives (organisational membership, extension advice), regulatory incentives (certification, standards, labelling) and cross-compliance incentives (payments for ecosystem services).

Sustaining and scaling

Moving beyond proof of concepts that innovations are possible and viable, to actually scale these innovations at the level of countries or regions requires implementing adequate strategies and funding mechanisms.

Financing strategies

The next step for these projects is to consolidate progress achieved and scale the successes obtained, which among other things (see Chapters 1 and 3) requires developing adequate funding strategies. As mentioned in the DeSIRA-LIFT Learning Review on innovation funding mechanisms (Juguet and Defebvre, 2025), there are four types of funding strategies to support scaling:

1. create a public or private economically sustainable structure to scale up the innovation;
2. transfer the innovation to existing private-sector players;
3. set up a commercial distribution network relying on existing private-sector players; and
4. support end beneficiaries in accessing the innovation.

According to Juguet and Defebvre (2025), these four strategies rely on the setting up or reinforcement of permanent structures and business models and the continued coordination of various types of players, chiefly among them private-sector actors, including farmers or farmer-based organisations. Sustaining these processes however calls for two main different types of funding: public funding for non-economic activities, such as capacity building of players, typically business and managerial training, the facilitation of networks, and additional research and development; and private funding (equity, debt, venture capital and philanthropy investments) for working capital of production, processing and distribution, and for the acquisition of the final product by end beneficiaries (income and private revenues).

Key to equity and debt financing is the ability of farmers to access this type of funding. This raises the question of which types of farmers are able to take advantage of the research and innovations and the demonstration of net economic returns associated with adaptation and adoption of new practices and technologies (Lan et al. 2018).

In other words, how many of those who started using innovations are commercial farmers, how many are so-called small investor farmers with an existing connection to market and inputs, how many are asset-limited small farmers, and how many are subsistence farmers (Woodhill et al., 2012) may provide guidance on how much additional effort would need to be put into building capacities and networks and into developing perennial structures that would offer sufficient scale for financers and market agents.

Reinforcing non-economic activities, building on structures, linkages and capacities

There are tangible signs that "sustainable structures" are being developed to facilitate scaling in the form of farmer associations with enhanced governance and good leadership. Bringing private-sector players on board as did STREAM and ICSIAPL in the livestock/fodder examples, is another key strategy[1] that needs further implication of these players into providing equity for viable productions. Indeed, a second phase of the STREAM project is expanding to other areas and consolidating some of the linkages and market opportunities, which can contribute to sustainability of the actions. Artemia4Bangladesh could probably benefit from following a similar path, but helping to structure Artemia farming into proper commercial ventures could also provide stability to producers.

The efforts by MARIGO to connect producers with urban markets aligns with the fourth strategy, in this case supporting clients of the innovation. However, connecting with a wide enough consumer demand remains a challenge for scaling, as remarked in Lof et al. (2025). Agroecological products demand a premium price and require proper labelling to gain trust of consumers, which makes them accessible to few consumers for the time being. Going beyond early adopters would require increasing output – to lower prices – and structuring markets based on consumer information and awareness.

1] There are funders that emphasise public-private partnerships, such as the United States-based Foundation for Food & Agriculture Research: https://foundationfar.org/what-we-do/.

Further capacity development, network facilitation, continued and reinforced policy dialogue and advocacy, may call for additional funding to ensure continuity of the enabling environment. Kirina et al. (2022) documented how scaling was more likely to take place when projects secured a second phase, which speaks to the key importance of the time frame necessary for innovation-oriented projects and interventions to achieve desired outcomes at scale. They also noted how post-intervention sustainability requires local delivery mechanisms to include self-generating financing. They further suggested that scaling requires farmer-to-farmer sharing of results and experience, capacity building to strengthen institutions, new partnerships, supply chains that the market can sustain, curriculum development and policy support.

Additional dimensions to consider

Other relevant dimensions to consider in scaling approaches may include gender. Existing studies demonstrate how often women lead the way in testing innovations, bringing men into the fold once they have proof of concept (Ramírez et al., 2022). The "model couples" in the FO-RI Story of Change in Chapter 1 underscore that the adoption by women farmers of new farming techniques, including agroecological approaches, favour their scaling into the community, and, in addition, the ripple effect improves family relations and livelihoods.

Further dimensions to consider include issues of land tenure, employment, labour and age. Considering that several stories mention that an implicit goal is to make agriculture attractive for the next generation of farmers, then ensuring who has access to land, how much labour innovations require, or whether they contribute to job creation will require to take a more central place in future innovation strategies.

In their endeavour to ensure uptake of technological innovations and their dissemination towards systemic change, DeSIRA projects have sought to build conditions for these innovations to ensure benefits and economic return at scale. Stemming from the same multistakeholder and participatory mechanisms organised to co-design the innovations, projects have contributed to opening new supply chains or reinforcing existing ones. The actual expansion or full activation of these supply chains with further inclusion of additional partners in their downstream marketing or processing components will require continuation and articulation of non-economic activities – such as capacity building, networking and policy advocacy – with viable economic ones. This aggregation, together with a proper valuation of tangible (production facilities and output, land, etc.) and intangible (human capital, intellectual property, organisation and governance) assets should provide incentives for adequate funding. The realisation of economic potential of supply chains will however require that rural enterprise and agribusiness development is accompanied by appropriate conducive policies (Devaux et al., 2018).

STORY 1:
Hitting a sweet spot in salty water: introducing *Artemia* culture in the salt ponds of Cox's Bazar in Bangladesh

STORY 2:
Cultivating fields of possibility – enabling the agroecological transition of market vegetables production in Côte d'Ivoire

STORY 3:
Sustaining Mongolia's traditional herding practices through innovation and collaboration

STORY 4:
Unlocking sustainable farming: a blended approach to agroecology in Peru and Ethiopia

STORY 5:
Transforming agropastoral livelihoods in Kenya: a community-driven story of resilience and change

Hitting a sweet spot in salty water: introducing Artemia culture in the salt ponds of Cox's Bazar in Bangladesh

Author: Muhammad Meezanur Rahman, project leader, World Fish

Salt farmers in Bangladesh's Cox's Bazar district struggle with minimal income and seasonal unemployment. The Artemia4Bangladesh project transformed this challenge by introducing brine shrimp cultivation in their salt ponds, creating an innovative integrated farming system. *Artemia*, a nutrient-rich crustacean that thrives in saline water, serves as valuable feed for aquaculture and has potential for human consumption. The project's success was built on collective action, connecting farmers, government agencies, universities and private-sector actors. By organising farmers into clusters, the project facilitated peer learning, collective bargaining and market access. The established networks and clusters continue to function post-project, demonstrating the sustainability of this innovative integrated farming system.

Bangladesh is among the most vulnerable countries in the world with respect to climate change. Cyclones, floods and saltwater intrusion affect the livelihoods of the millions of households in the coastal areas. In one such area, the Cox Bazar district, 50 000 artisanal salt farmers produce 95% of the country's crude salt. However, the income from salt production is minimal. As salt farms are productive only in the dry season, salt farmers are left without their main source of income for the rest of the year. To support their families, they are forced to look for temporary non-farming jobs – for example delivery or small commerce. Some salt farmers also grow fish, but fish farming in the region struggles with poor productivity. The Artemia4Bangladesh project came up with an idea on how to use the saline environment of salt farms to create a more integrated production system that would make small farms in Cox's Bazar productive for longer periods, offering more economic opportunities to farmers: the introduction of *Artemia*.

The brine shrimp *Artemia* is one of the most widely used crustaceans in the world. It is often used as live feed for farmed fish and for the larviculture of other crustaceans, such as shrimp and crab. Importantly, it can thrive

***Artemia* Meeting**

in highly saline water. It also has potential for human consumption, as it provides protein, essential amino acids and fatty acids needed for child development. Introducing *Artemia* would thus contribute to diversifying the source of income of salt producers, increasing marine aquaculture productivity in salt farms, and enhancing food and nutrition security in the area.

WorldFish, the implementer of the Artemia4Bangladesh project, started working with salt farmers in the Cox's Bazar region in 2021. The first activities involved training in innovative practices such as *Artemia* pond culture, use of *Artemia* biomass, tilapia culture in *Artemia* ponds, nutrition sensitive carp-mola-tilapia polyculture and improving traditional aquaculture in the salt fields. Women were specifically trained in homestead aquaculture and vegetable gardening, but also in *Artemia* biomass cooking as human food.

On the first sight, there is nothing spectacular about *Artemia*, which is only about 1 cm long. As its potential was completely unknown to the farmers in Cox's Bazar, it was crucial to demonstrate how introducing *Artemia* could lead to improved production systems – without the proof of concept there was no chance for the new technology to be adopted on a larger scale. To get farmers on board to test the potential of *Artemia*, the project offered a subsidy (that would decrease over time) and provided all the necessary inputs for free. Project staff regularly monitored daily operations to assure quality. As farmers were becoming more autonomous, the intensity of support was decreasing.

The project worked with 57 *Artemia* demonstration farmers, who volunteered to take part after they participated in consultation meetings organised by the project in Cox's Bazar. Together, the demonstration farmers produced 120 kg of *Artemia* cyst (brine shrimp eggs with an excellent hatching rate) and 11.4 metric tons of *Artemia* biomass. Locally produced *Artemia* cysts were of excellent quality in terms of cyst size and hatching percentage (86%). *Artemia* biomass – free from major shrimp pathogens such as white spot syndrome virus, acute hepatopancreatic necrosis disease, *Enterocytozoon hepatopenaei* and *Vibrio harveyi* – was used in shrimp hatcheries and nurseries, and shrimp/fish grow-out ponds. Given its high nutritional value (51% crude protein, highly unsaturated fatty acids and essential amino acids), it was also used for food, for both crab nursing and human consumption.

Abul Hossain, a 40-year-old farmer from Uttar Notun Ghona in Badarkhali, Chakaria, Cox's Bazar, was one of the demonstration farmers. Abul Hossain, who lives with his wife and two children, was a salt and fish farmer who struggled with earning enough income from these activities to meet the needs of his family. In 2022, Abul Hossain attended an Artemia4Bangladesh meeting. The project provided him with training on the cultivation and management of *Artemia* biomass and cysts. The training covered essential aspects such as pond preparation, maintaining appropriate salinity levels, water level management, fertilisation and the use of organic fertilisers. Equipped with this new knowledge, Abul Hossain began his journey into *Artemia* culture on a 436 m^2 plot. The results were remarkable. By the end of the year, Abul Hossain had produced 90.5 kg of *Artemia* biomass and 100 grams of cysts, which led to a significant increase in his annual income. It not only brought in more money but also improved the nutrition of his shrimp and fish farm. Using *Artemia* as feed for shrimp post-larvae, he saw a big increase in their survival rates, making his farm more sustainable and profitable. *"Artemia culture in the salt farms provides an opportunity for salt farmers to diversify their income. It is also an excellent nourishment for shrimp post-larvae to improve survival in traditional shrimp and fish farms,"* said Abul Hossain. He was not the only one to gain the necessary knowledge and skills to implement advanced farming techniques effectively – 65% of participants applied the training outcomes directly.

The income of all farmers trained by the project in at least one technology increased on average by 21%, while the annual income of demonstration farmers increased even more considerably – between 45% and 83% depending on the type of intervention. This provided an incentive for other farmers to try *Artemia*.

An integrated approach to make the most out of the new technology

Producing *Artemia* was not enough – it was vital for the project that the farmers would find the use for produced biomass, such as feed for fish, shrimp or crab (for their own aquaculture activities or for other fish farmers), with the eventual surplus used for household consumption – both for humans and for animals, whereas *Artemia* cyst could be sold to shrimp hatcheries. The project shared an innovative integrated salt-*Artemia*-aquaculture production system. Among the salt farmers who implemented it was Belal Uddin, a salt producer from Teknaf, who has long grappled with the challenges of sustaining his family of four amidst the unpredictable rhythms of coastal life. Managing a two-hectare plot dedicated to salt farming, Belal found himself idle during the rainy season, with no viable options for productive engagement. In 2022, Belal participated in a consultation meeting organised by Artemia4Bangladesh. As a result, Belal allocated a portion of his land to *Artemia* cultivation during the dry season and tilapia farming during the rainy season. One year later, his integrated approach yielded 70 kg of *Artemia* biomass and an impressive 723 kg of tilapia, providing a much-needed boost to his family's income. Building on this success, Belal continued to refine his techniques. His efforts led to an even bigger production of *Artemia* biomass in just three months, further solidifying his position as a catalyst in integrated *Artemia*-aquaculture farming. His tilapia finds its way not only to his dinner table, but also to the Rohingya refugee camp (the world's largest refugee camp, located near Cox's Bazar) and local markets. He sold his *Artemia* to shrimp hatcheries and local shrimp nurseries/grow-out farms, while also using it on his farm and for his family's nutritional needs.

" Artemia culture in the salt farms provides an opportunity for salt farmers to diversify their income. It is also an excellent nourishment for shrimp post-larvae to improve survival in traditional shrimp and fish farms."

Abul Hossain

Bringing farmers together in clusters for better outcomes

As the project targeted the poor small-scale farmers, there was no possibility to work with farmer groups or associations – in Cox's Bazar, small-scale farmers are not organised and they have no habit of collective action. To avoid creating inequality and conflicts in neighbourhoods between beneficiaries and non-beneficiaries of the project, and to facilitate training delivery and peer-to-peer learning, the project team decided to work with clusters of 20-25 neighbouring farmers rather than with individual farmers dispersed around the zone. This approach paid off also when the project started working on marketing strategies. The project team realised that without links to markets *Artemia* production could not be sustained, as farmers were producing more *Artemia* than they could use.

Salt farmers had no links with shrimp hatcheries and no experience in marketing the new product. A member of the project's steering committee, representing the association of shrimp hatcheries, suggested that the project connects farmers with the marketing agents working for the association. This suggestion was welcomed by the project team and the connection made. As the farmers were organised in clusters, it allowed them to negotiate a better price together instead of lowering their prices to compete against other individual farmers.

Local hatcheries became successful users of live *Artemia* biomass as a result of the link with local *Artemia* producers facilitated by the project. *"Despite the huge demand for Artemia in the country, it had to be imported from abroad as it was not produced. Artemia biomass as live feed for domesticated shrimp broodstock increases its fecundity rate,"* said Mainuddin Ahmed, owner of the MKA specific pathogen free shrimp hatchery in the Sonarpara hatchery zone. Also, the shrimp farmers were convinced of the interest of using *Artemia* biomass to grow their shrimps by observing the results obtained by the project participants. *"I was astonished by the impressive growth and survival rates of shrimp achieved through the use of Artemia biomass. Many neighbouring shrimp farmers visited my farms when I harvested juveniles,"* said Norul Kabir, a seasoned shrimp farmer from Teknaf who participated in the project.

Farmers taking initiative to sustain *Artemia* production Aquaculture in Cox Bazar now contributes to 30-50% of the annual income of the participating salt farmers, whereas this contribution was marginal before the project. Success stories from many farmers help to sustain interest in *Artemia* production in Cox Bazar, even despite some bumps on the road. During project implementation, there was a significant increase in fuel prices, increasing the cost of pumping water, which is necessary for growing *Artemia*. But farmers wanted to continue the production and found a way to overcome this inconvenience by introducing solar energy to operate their pumps. Another farmers' initiative was to ask the project to make frozen storage available to preserve some biomass to ensure its availability during the rainy season. Deep freezers were provided to clusters. After the project ended in 2024, several farmers who were brought into clusters by the project continued to work together.

Creating conditions for *Artemia* to grow

The project partnered with governmental and non-governmental organisations, national and foreign universities, private companies, shrimp/fish hatcheries, salt/shrimp/fish/crab farmers, marketing agents and clusters of farmers, and facilitated knowledge sharing between these actors and beyond. Workshops were organised at national and international level, and participants could interact during exchange visits and consultation meetings. Besides handbooks, training manuals and other extension support materials, the project also published a cookbook with *Artemia* biomass as human food recipes.

The Department of Fisheries of the government of Bangladesh played a central role in exploring the potential, and in planning and coordinating the scaling of these innovative technologies. Participation of the Department of Fisheries and the Bangladesh Small and Cottage Industries Corporation (BSCIC) added reliability to the project and contributed to increasing its acceptance by a wide range of stakeholders, which played a role in facilitating the continuation beyond the project period. Private-sector engagement and networking among value chain actors remain crucial for driving the growth of *Artemia* culture in salt farms. These collaborations help strengthen the industry by facilitating knowledge exchange, technology adoption and market access, all of which are essential for the sustainable expansion of *Artemia* production. And the potential for expansion is big: there are 50 000 salt farmers, 300 000 shrimp and prawn farmers, and 35 million people living in the coastal areas of Bangladesh.

Cultivating fields of possibility
enabling the agroecological transition of market vegetables production in Côte d'Ivoire

Authors: Thibaud Martin, project leader, CIRAD; Euphrasie Angbo, WP 1 coordinator, ESA-INPHB; Angel Angbo, WP 2 coordinator, CIRAD

The vegetable value chain in Côte d'Ivoire is undergoing transformation. Through the MARIGO project, traditional farming practices burdened by heavy pesticide use and marketing struggles are giving way to a more harmonious approach. The project supports the agroecological transition by intervening at both the production and marketing levels. Vegetable producers experiment with or observe sustainable practices and then they expand their perspective as part of a broader agrifood system. A new participatory certification system is the culmination of the process which strives to bridge the gap between conscious producers and cautious consumers, weaving a future where sustainable farming can truly flourish. By engaging farmers and other value chain actors in this process, exposing them to new possibilities and encouraging exploration, MARIGO helps participants take ownership of the transition, ensuring long-term change beyond the project's direct influence.

Vegetables constitute the main source of vitamins and nutrients for populations in Côte d'Ivoire, while growing and selling them secures livelihoods of many, especially in urban and suburban areas, where they are grown in community gardens. However, to provide access to healthy food for consumers and sufficient income for producers, both the production and marketing of vegetables in the country need to be improved.

Most Ivorian vegetable producers apply unsustainable farming practices, especially for soil fertilisation, plant protection and post-harvest, leading to both environmental issues and suboptimal economic benefits. Producers often opt for monocropping and use large amounts of synthetic pesticides as their main form of pest control at every production stage, and still their yields are generally low. These conventional practices have a negative effect on the sanitary quality of vegetables, limiting access of consumers to healthy products. In addition, vegetable production is not very diversified in the country, overlooking the potential of indigenous leafy vegetables which are rich in vitamins and minerals and thus highly interesting from a nutritional point of view.

On the marketing side, without the support of an organised supply chain or a cooperative system aimed at providing access to the local market, vegetable producers are generally left to their own devices to market their crops.

Igniting innovation processes

This was the prevalent situation until the start of the 2019 project Agroecological Transition of Market Gardeners in Ivory Coast (TAMCI) that aimed at developing improved crop-management techniques. During its implementation, a group of 25 producers from Yamoussoukro were trained to diversify their production and to adopt agroecological practices such as the use of organic fertilisers, crops association and rotations,

local micro-organisms as means to improve soil health and help fight plant pathogen such as bacterial wilt, biopesticides and others. Following this training, they formed the Yamoussoukro Association of Agroecological Market Gardeners (AMAYA) to further develop their agroecological farming practice. This pioneer association is now involved alongside other groups of producers in the DeSIRA project "Development of an agroecological peri-urban market gardening – MARIGO", launched in 2021. MARIGO builds on the foundation laid by TAMCI to advance the agroecological transition in market vegetable production. It also incorporates key elements of the One Health framework which emphasises the interconnectedness of human, animal, plant and soil health, along with components of value chain strategies.

As part of MARIGO, the French agricultural research and international cooperation organization working for the sustainable development of tropical and Mediterranean regions (CIRAD) trained the producers of AMAYA and other farmer organisations on sustainable farming practices, such as crop diversification (i.e. including onion in the rotations), intercropping and efficient crop rotations, the use of readily available non-industrial organic fertilisers (which involved mapping of locally available organic matter) and the preparation of their own organic pesticides (i.e. plant-based pesticides), among others. After completing their training, the gardeners have adopted a set of practices that promote healthy living. *"Today, I have a diversity of crops in my field and I use organic inputs. This has improved my general health and wellbeing, as well as increased my income",* shared Sylvie Zounon, one of the participants. *"Women's groups have received training from MARIGO and are fully committed. They produce bio-inputs and fight insects with biopesticides made from plants. They also raise snails for food and calcium production. Oddly enough, there are fewer insects now in the potato, eggplant and okra fields. We use snails, they are not pests, they eat other plants in the potato field. As we need calcium for biopesticides, we use snail shells as a source,"* told Sédric Konan from San Pedro during a workshop on pesticide reduction, another activity co-organised by MARIGO and the Pretag[1] initiative.

The project established demonstration sites at the farms of early adopters of agroecological strategies to showcase the benefits of agroecological techniques and to enable discussion of the merits of the technologies among neighbours and within the surrounding communities. "The main problems that we had were soil depletion due to the excessive use of synthetic fertilisers and pesticides, coupled with a dependence on increasingly expensive mineral fertilisers," recalls Auguste Kouamé, a member of AMAYA. "Through projects like TAMCI and MARIGO, producers have been able to experiment with different practices and talk about them to their neighbours. Some of them are surprised when they see that we can produce without pesticides. In our association, there were eight of us at the beginning, we are now 40. We share knowledge on our practices and our socio-economic results among peers," he adds.

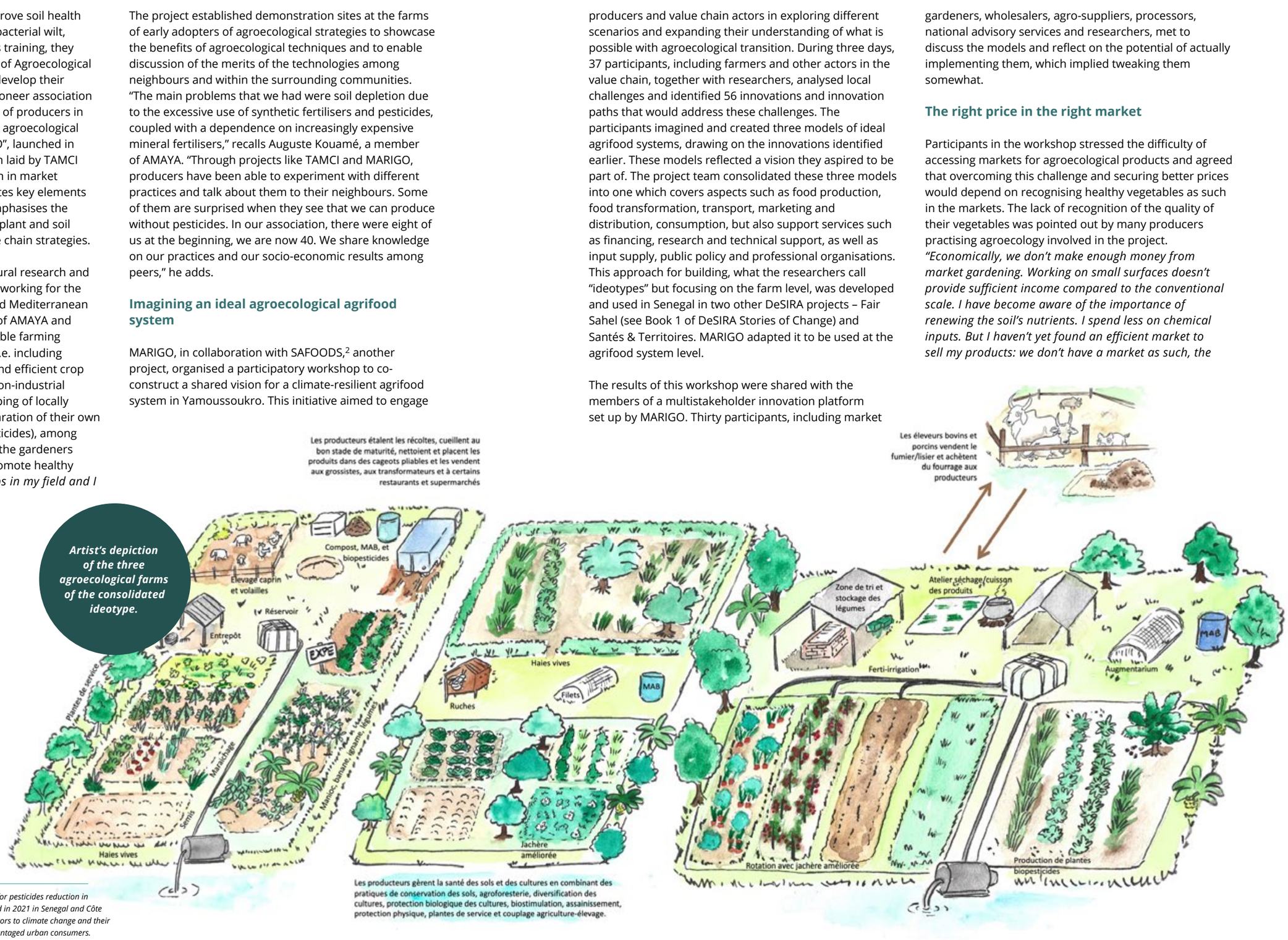
Imagining an ideal agroecological agrifood system

MARIGO, in collaboration with SAFOODS,[2] another project, organised a participatory workshop to co-construct a shared vision for a climate-resilient agrifood system in Yamoussoukro. This initiative aimed to engage producers and value chain actors in exploring different scenarios and expanding their understanding of what is possible with agroecological transition. During three days, 37 participants, including farmers and other actors in the value chain, together with researchers, analysed local challenges and identified 56 innovations and innovation paths that would address these challenges. The participants imagined and created three models of ideal agrifood systems, drawing on the innovations identified earlier. These models reflected a vision they aspired to be part of. The project team consolidated these three models into one which covers aspects such as food production, food transformation, transport, marketing and distribution, consumption, but also support services such as financing, research and technical support, as well as input supply, public policy and professional organisations. This approach for building, what the researchers call "ideotypes" but focusing on the farm level, was developed and used in Senegal in two other DeSIRA projects – Fair Sahel (see Book 1 of DeSIRA Stories of Change) and Santés & Territoires. MARIGO adapted it to be used at the agrifood system level.

The results of this workshop were shared with the members of a multistakeholder innovation platform set up by MARIGO. Thirty participants, including market gardeners, wholesalers, agro-suppliers, processors, national advisory services and researchers, met to discuss the models and reflect on the potential of actually implementing them, which implied tweaking them somewhat.

The right price in the right market

Participants in the workshop stressed the difficulty of accessing markets for agroecological products and agreed that overcoming this challenge and securing better prices would depend on recognising healthy vegetables as such in the markets. The lack of recognition of the quality of their vegetables was pointed out by many producers practising agroecology involved in the project. *"Economically, we don't make enough money from market gardening. Working on small surfaces doesn't provide sufficient income compared to the conventional scale. I have become aware of the importance of renewing the soil's nutrients. I spend less on chemical inputs. But I haven't yet found an efficient market to sell my products: we don't have a market as such, the*



Artist's depiction of the three agroecological farms of the consolidated ideotype.

1] Pretag initiative: Scientific and partnership approaches for pesticides reduction in tropical agricultures. 2] The SAFOODS project was launched in 2021 in Senegal and Côte d'Ivoire to improve the resilience of fruit and vegetable sectors to climate change and their contribution to the food and nutritional security of disadvantaged urban consumers.

market price is practically the same for agroecology as for conventional agriculture," shared Raimond Koffi during a workshop on pesticide reduction. With respect to recognition of the quality of the agroecological vegetables, Sylvie Zounon from Yamoussoukro expressed the following: *"Since I have been in agroecology, I have noticed that (agroecological) products spoil less quickly, they last longer without wilting. Wholesalers say the opposite, some of them see the traces of chemical products on the skin of vegetables as a sign of quality, they think the consumers will say to themselves that the product is treated and will resist longer, keep better".* Sylvie is among those producers who do not only sell to wholesalers. She has her close network of urban consumers, who are willing to pay a little more to get better quality vegetables. So does Jean-Paul Ago from AMAYA, who says: *"My vegetables are the preferred choice on the Yamoussoukro market because they taste better and last longer".* But these examples are exceptions rather than the rule. In a study about the willingness to pay for organic vegetables, focusing on 2 189 urban and peri-urban heads of households in Côte d'Ivoire, MARIGO researchers found that 58% of consumers were prepared to pay more for organic vegetables, but most of them only 10% more, even if they knew it was better for their health. The willingness to pay was further reduced in Abidjan by the lack of certification.

The opportunity to stand out: the participatory guarantee system

This led MARIGO to address the issue of how to facilitate the sale of such vegetables at a better price. Certification and labels are common answers to remedy the lack of recognition. However, labels for organic or agroecological vegetables do not currently exist in Côte d'Ivoire. MARIGO thus supported the Labelivoire[3] initiative, aiming at developing the first national label for organic agriculture in the country. The activities were carried out by Nitidæ, a partner of the MARIGO project, and AIER, an association of farmer groups interested in promoting agroecology or organic farming in Côte d'Ivoire. Among all interested stakeholders, including 40 farmers, they co-constructed a charter defining technical specifications to be met to obtain the label during a series of workshops held in Abidjan, Yamoussoukro and Bouaké. They also analysed and compared five existing African labels and their control systems to identify what could fit better the context of Ivorian agriculture, and the actual diversity of agroecological farms. The label they eventually came up with was called Organic Ivoire PGS. The labelling procedure is guaranteed by the Association for Organic Agriculture in Côte d'Ivoire 2AB-CI. A multistakeholder participatory guarantee system (PGS) committee is established within the association, composed in majority of certified organic farmers who are meant to assure the control by peers. The label is presented as PGS, as the technical specifications have been developed in a participatory manner, however, the labelling procedure still involves a third party (the association), which does not exploit the full potential of the participatory guarantee system. PGS can be more locally focused, adapted to local markets and short supply chains, involving the producers with their direct consumers, without the involvement of a third party (which reduces the cost of labelling).

To further explore the potential and challenges of PGS and share knowledge among stakeholders, MARIGO organised the first regional meeting of PGSs of West and Central Africa. It brought together 37 participants from 13 existing or emerging PGSs from Benin, Burkina Faso, Cameroon, France, Ghana, Guinea-Bissau, Mali, Nigeria, Senegal and Togo. Key issues addressed included how to ensure horizontal organisation and involvement of all peers, and how the PGS can be financed, among others. The participants agreed on several propositions on how to improve the marketing of their products: strengthen and encourage interaction between different countries, expand sales options (shops, organic markets and baskets, etc.); better diversify to satisfy producers' needs and improve product presentation. The 13 PGSs signed a joint declaration, in which they committed to several actions, such as, among others, capacity building and information sharing through WhatsApp groups; harmonisation of databases to allow capitalisation and joint dissemination of data, and finally institutionalisation of regional PGS meetings.

Some conditions for further advancement

In sum, MARIGO intervenes at both the production and the marketing side to enable first steps in the agroecological transition of market vegetable production in Côte d'Ivoire. Starting at the farm level, where vegetable producers can experiment or see the results of the experiments of others, then inviting these farmers to imagine their farms as part of a larger agrifood system, and finally providing a space to learn from a larger network about the concrete ways in which their new value chain can be developed, provides a base to advance innovation processes. The transition pathway to continue and deepen agroecological transition in the future remains largely to be imagined. Involving the producers and other actors of vegetable value chains in this process, opening them to new possibilities and encouraging them to explore different options, creates conditions for them to take ownership of the process and drive the change in the future, beyond what MARIGO can accomplish.

3] The Labelivoire project (funded by the PAFAO program) aims to create an Ivorian organic label to promote local products; it is based on the SPG (Participatory Guarantee System) model.

7 CULTIVATING FIELDS OF POSSIBILITY

Watering tomatoes in Yamoussoukro.

Sustaining Mongolia's traditional **herding practices through innovation** and collaboration

Authors: Amgalan Aruinbold, project manager, FAO; Enkhbaatar Ganbaatar, national livestock specialist, FAO

In Mongolia, where herding is central to the nomadic way of life, a sharp increase in livestock numbers has led to severe overgrazing. The STREAM project addressed this challenge through an integrated strategy demonstrating the value of public-private collaboration. Strategic partnerships with private-sector actors set the enabling conditions for Mongolian herders to transition to more productive herds while reducing grazing pressure and maintaining income. Through an integrated value chain approach – combining improved herd productivity, sustainable fodder practices and enhanced market access – the project created conditions for lasting change.

The practice of herding remains a cornerstone of Mongolia's nomadic and semi-nomadic way of life. For generations, herders have grazed their livestock across vast, seemingly endless pastures. However, in recent decades, livestock numbers (cows, sheep and goats) have risen sharply, from 25 million heads in 1989 to 71.9 million heads in 2022, which provides sustenance to herders but has also resulted in significant overgrazing. This has placed immense pressure on fragile ecosystems, threatening their long-term sustainability.

Herders' preference for a male-dominated herd structure contributes to the problem of overgrazing. Oxen are often favoured due to their ability to survive harsh winters with minimal resources. Also, male goats are retained by herders to boost overall cashmere yield, even though it results in the decline in the quality of cashmere as evidenced by an increase in the micron size of the fibres. The problem is that male animals grow slower, which increases grazing pressure on pastures, and in addition, male-dominated herds are less productive.

To address these challenges, the Sustainable Resilient Ecosystem and Agriculture Management in Mongolia (STREAM) project proposed an integrated strategy to assist Mongolian herders in decreasing the numbers of grazing livestock without affecting their livelihoods.

Improving the beef value chain through artificial insemination and training

One of the entry points of the strategy was to improve the quality of beef breeds. This initiative involved over 70 herder households and aimed to enhance herd productivity through strategic crossbreeding. The project facilitated the artificial insemination of 1 120 Mongolian cows with the fast-growing Red Angus breed across three soums (administrative divisions of Mongolia) in the Khentii province. Red Angus cattle are known for their efficient grazing habits and rapid growth rates, with crossbreeding resulting in a 25-30% increase in live

weight. Their adaptation to harsh climatic conditions and their size make them suitable for being crossbred with Mongolian breeds.

Calves who grow more quickly are ready for market earlier. A key benefit of this approach has been the sale of 18-month-old steers, reducing the number of males in herds and shifting the focus toward female productivity. This transformation prioritises quality over quantity, enhancing overall herd efficiency while alleviating pressure on pastures.

To support the artificial insemination initiative and make it last beyond the project's duration, three local veterinarians and four herders from the Binder, Bayan-Adarga and Umnudelger soums completed training to become certified artificial insemination technicians, which equipped them with professional skills to sustain and scale the programme. They will be moving around with mobile insemination equipment that the project provided to facilitate access to artificial insemination for more herders.

To broaden awareness of artificial insemination, the project developed an animated guide showcasing best livestock breeding practices, which introduced livestock crossbreeding techniques that combine local Mongolian cattle with fast-growing beef breeds. With clear and practical direction, the content reached nearly 100 000 viewers.

Partnership to open markets for quality meat

As artificial insemination comes at a cost of 80300 (approximately 23 USD) per service, for this breeding practice to be scaled, herders need consistent market opportunities to sell their steers at a price that would secure sufficient profit. To make this possible, the project forged a partnership with a private-sector actor, Metagro, located in Ulziit village, where it runs a feedlot farm. Supplying animals to feedlot farms is a viable option in a context where feed supply is inconsistent and pastures are being overgrazed. It allows herders to secure a profit while removing animals from pastures at an earlier stage.

Metagro cultivates fodder plots across 10 000 hectares and has the capacity to fatten 20 000 cattle annually. By increasing local fodder production and providing consistent fattening services, Metagro contributes to creating conditions for reducing pressure on pastures and improving cattle productivity, which is in line with the project's objectives. This strategic partnership has strengthened connections between herders and buyers. Through organised meetings and events, herders from the Umnudelger and Bayan-Adarga soums supplied 48 oxen and 368 steers to Metagro's feedlot farm, showcasing the success of this collaboration in expanding market access.

To strengthen the position of herders in the value chain, the project facilitated the creation of cooperatives. Mongolian herders move their herds at least four times a year. Being on the constant move does not favour collective action. Only recently, suffering from the effects of climate change is pushing them to collaborate. Entering a new value chain provided an incentive to undertake collective action – to allow herders to market their livestock and meat at premium prices through organised, single-channel sales. With the support from the projects' facilitators who brought them together and helped them with the formalities, 17 herders in the Binder and Umnudelger soums formed two cooperatives to fatten livestock and streamline sales. Training and consultancy services were provided by the project to operationalise these cooperatives, which are now actively engaged in beef production and the supply, preparation and processing of by-products. To secure these activities, nine members are temporarily employed by the cooperatives, providing an additional employment opportunity for herders.

Partnership to support feed supplementation and local production

While herders benefit economically from the emerging sale of steers and oxen, challenges remain, including shortages in feed supply, inconsistent feeding practices and financial constraints. Animals sold to feedlot farms need to be properly fed until then to reach a satisfactory weight, which takes at least 18 months.

Despite some improvements in regional fodder supply, significant gaps persist. Waste grain and bran obtained after grain processing is used to feed livestock. This food is abundant in fall, however, during winter and spring herders remain reliant on fodder imports from Ulaanbaatar due to insufficient local production of grains, poor infrastructure and limited access to high-quality fodder crops. Harsh winters exacerbate this issue, as livestock requires more energy-dense feed to survive the extreme conditions, often dropping below -30°C. This reliance on external feed with low nutritional value slows the growth rates of young animals, leading to prolonged pasture grazing and further land degradation.

To improve local access to high-quality livestock feed, the project partnered with another private actor, Khangai in the Umnudelger soum. On the company's 54 hectares field, and in collaboration with the School of Agroecology of the Mongolian University of Life Sciences, a training programme was introduced to promote pea cultivation for both human and animal consumption.

8 HERDING PRACTICES THROUGH INNOVATION

The project facilitated the artificial insemination of 1,120 Mongolian cows with the fast-growing Red Angus breed across three soums (administrative divisions of Mongolia) in the Khentii province.

The programme emphasised agroecological practices such as crop rotation and intercropping with fodder crops. By incorporating an 85:15 ratio of green fodder to other crops, both protein quality and soil nitrogen levels improved, enhancing soil fertility and crop yields for the future. Implementing these practices addressed both decreasing crop biodiversity and pasture degradation.

Additionally, high-quality grains, bran and forage have become essential components of concentrate feed for lambs and steers. In collaboration with Khangai's experts, the project developed feed formulations using internationally recognised programmes, such as the dairy cow ration balance programme (FAO-RBP), WinFeed 2.8 and Rumen8. These efforts resulted in the production of an initial 50 tons of concentrate feed with 12-14% protein content, crucial for animal growth, fertility and immunity during winter and spring.

In partnership with Khangai, the project established a small factory capable of producing 900-1 000 kg of animal mineral blocks per hour, which are used to provide supplementary nutrition to animals. The factory produces two mineral block formulations: red blocks for all grazing animals and white blocks for dairy cattle. These mineral blocks are essential for improving livestock health by providing vital nutrients that enhance growth, fertility and immunity. For dairy cattle, the white blocks specifically support milk production and overall vitality, ensuring animals remain productive throughout the challenging seasons. To date, 80 tons (16 000 pieces) of these mineral blocks have been sold, creating three temporary jobs and addressing the mineral supplementation needs of herders in the Khentii province. The factory's capacity positions it to serve the entire eastern region of Mongolia, demonstrating the value of public-private collaboration.

Part of a larger picture

Strategic partnerships with private-sector actors have created conditions for herders to shift to more productive, better structured herds, making it possible to decrease the number of grazing animals without losing income and thus manage pastures in a more sustainable way. Intervening in an integrated manner along the value chain, the project provides a solid ground to make these new practices sustainable. By improving herd productivity, promoting sustainable fodder practices and enhancing market access, the project actors have addressed key challenges faced by herders. Collaboration between herders, cooperatives and private-sector actors such as Metagro and Khangai demonstrates the transformative power of partnerships in achieving resilient and sustainable agricultural development in Mongolia.

These efforts are supported by actions targeting the policy level – making policy recommendations to increase quota for meat export to expand the capacity of the market even further. Advocacy from herders themselves and the facilitating organisations that have accompanied them during the project is going to make this change possible. Sustainable management of pastures contributes to the larger objective of the project to implement innovative and sustainable long-term landscape management to address food system challenges and climate stresses in Mongolia. These project steps are going in the right direction.

Young calf

STORY OF CHANGE

Unlocking sustainable farming: **a blended approach to agroecology** in Peru and Ethiopia

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Scaling adoption of agroecology remains a challenge even if its benefits are increasingly recognised across countries and regions. This story drives conclusions from the use of incentives in two different countries – Ethiopia and Peru – in which the TRANSITIONS PSii project leverages collaboration with the private sector to scale agroecology innovations. In Ethiopia, the project promotes agroecology in wheat production through crop diversification, organic amendments and soil conservation. In Peru, PSii enhances cacao production by training farmers in bokashi fertiliser use and implementing a digital traceability system, improving market access and compliance with European Union regulations. These inclusive multistakeholder efforts focusing on engaging the private sector are laying the groundwork for sustainable market linkages, structured business models and increased investment in the agroecological transition.

Despite the proven benefits of agroecological practices, their widespread scaling is a significant challenge. The Agroecological Transition – Private-Sector Incentives and Investments (PSii) project tackles this challenge by focusing on co-designed, context-specific solutions within agroecology-smart landscapes (ASL).[1]

Building on agroecology's principles of transdisciplinary knowledge co-creation, PSii co-develops climate-resilient, resource-efficient and socially acceptable agroecology farming practices, and leverages multistakeholder partnerships, business models, incentives and investments to effectively scale agroecology innovations. Blending business models and leveraging investments, the PSii project explores a diverse range of incentives, including market-based mechanisms (e.g., premium pricing), non-market incentives (e.g., training and knowledge sharing), regulatory incentives (e.g., policy

1] Xxxxxxxxxx xxxx.

TRANSITION PSii, Ethiopia

1] Xxxxxx.

changes) and cross-compliance. These incentives, investments and business models are tailored to specific contexts to accelerate the adoption of agroecology practices in Ethiopia and Peru.

Peru: transforming cacao production through bokashi and traceability

In Peru, cacao farmers often receive low prices from intermediaries operating within informal market structures, perpetuating widespread poverty. Cacao cultivation, however, offers opportunities for agroecology practices. As a tree crop, cacao can be intercropped with diverse species, improving soil health, boosting productivity, controlling weeds naturally, and supporting forest conservation and biodiversity (Estrada-Carmona et al., 2024).

The PSii project facilitated a public-private partnership centred on transdisciplinary collaboration. This partnership includes: (1) the producer organisations Colpa de Loros, COCEPASA and Banaqui Curimana; (2) research institutions – Alliance Bioversity International-CIAT and the National Institute of Agricultural Innovation (INIA); (3) the Peruvian Chamber of Commerce; and (4) the French organic and fair-trade chocolate company KAOKA.2 This collaborative effort focused on co-designing solutions, which involved identifying, testing and adapting agroecological practices alongside the development of a cacao value chain traceability system, inclusive business models and creating opportunities for attracting investments.

In partnership with the collaborating stakeholders, the TRANSITIONS PSii project facilitated an inclusive and iterative co-design cycle, which included (1) a baseline survey with the aim of identifying gaps, opportunities for improvement, and the most suitable incentives and investments for the local context; (2) technical training with the support from INIA experts in context-specific agroecology farming practices; (3) a business model and incentives workshop with smallholder cacao farmers; and (4) an agroecology performance survey.

The survey revealed significant underutilisation of fertilisers and a scarcity of soil conservation practices among farmers, largely due to widespread use of traditional practices and financial constraints. In response, the project implemented a two-phased strategy: training farmers in the production and use of bokashi, a low-cost organic fertiliser as a non-market incentive; and the development of a traceability system to increase cacao prices and establish fairer value chains as a market incentive as part of the private-sector business model.

A digital traceability system is being co-developed with the Colpa de Loros cooperative, TRUSTY – an IT service provider, and KAOKA, that will encourage consumers and private-sector firms to pay premium prices for organic cacao linked to the system (Mockshell et al., 2024). The traceability system will also provide a low-cost monitoring, reporting and verification tool for more than 500 smallholder cocoa farmers to meet the European Union Regulation on Deforestation-free Products (EUDR).3 PSii is working closely with the cooperative's main buyer, KAOKA, to define the next steps for the system's implementation and is also integrating support for the traceability system with Altromercato, buyers of cacao produced from the Banaqui cooperative. In addition, PSii has established partnerships with local cooperatives and organisations to provide continuous support and monitoring of organic practices (Steinke et al., 2024). As part of this effort, PSii will conduct a monitoring and endline survey to assess the challenges, motivations and limitations producers face in adopting technologies.

"[The partnership] has allowed us to work with Colpa de Loros on very important aspects, such as soil restoration, implementing a traceability system and planning for carbon sequestration. Additionally, we are focusing on quality aspects of the cocoa we are producing. In this strategic partnership we are working to meet the social, environmental and economic standards required by the certifications", says Miriam Guerrero, KAOKA consultant in Peru. Miguel Vasquez, director of INIA in Pucallpa, added: *"We are committed to agroecological practices, we are transferring knowledge in partnership with the Alliance Bioversity and CIAT, working with Colpa de Loros and collaborating with organic producers. Also, through the Ministry of Agrarian Development and Irrigation, we are promoting agroecology because it is the foundation for ensuring food security and restoring the ecosystem".*

PSii is also collaborating with the CGIAR Agroecology Initiative Multifunctional Landscapes programme to invest in community-based fermentation and drying facilities to enhance the post-harvest quality of cacao produced by Banaqui producers. The work will begin in 2025 with investments in the central supply centre of Banaqui in Arenalillo, Curimana-Ucayali.

In line with the resource efficiency agroecology principle, the materials used for making bokashi are typically readily available to cocoa producers, making it low-cost and easy to prepare. The bokashi training engaged 69 producers directly and 207 indirectly. Using co-learning and trainer of trainers approach, the PSii partners will scale out bokashi in the farming communities and beyond with a selected number of the ASLs.

Meeting the standards has improved the business model of the producer organisations and created opportunities to attract higher prices and investments. Nancy García, president of the Chamber of Commerce in Ucayali, emphasised:

" Now the benefit for our members is also significant as we have seen the inclusion of entrepreneurs who are being taken to another level, implementing practices that care for the environment, the concept of circularity and especially this idea that it allows us to make the most of the resources we have in our Amazon region".

Scaling bokashi in Peru: a three-step strategy

To ensure scalability and sustainability, the project implemented a three-phase strategy:

1. Knowledge dissemination: detailed, context-specific manuals on bokashi production were created and distributed, both in print to reach farmers with limited internet access and as an online video to engage younger farmers (Mosquera et al., 2024).
2. Resource provision and investment: direct incentives were provided in the form of key local inputs such as Guano de Isla and essential tools such as shovels and trench forks, addressing resource gaps and demonstrating the effectiveness of input provision as a strategy.
3. Demonstration farms: three demonstration farms were established, providing hands-on learning opportunities and allowing for pre- and post-bokashi application soil testing to quantify the benefits.

The training programme enabled producers to implement the learnt practices to meet the rigorous quality, quantity and chemical-free standards of the organic cocoa market. As Heiner Sánchez of the Banaqui cooperative shared: *"Before becoming organic, we produced 600–700 kg/ha. Now, with organic fertilisation, we are producing between 1 000 and 1 200 kg/ha." Alex Correa, an extension agent of the Banaqui cooperative, told us during a workshop: "Bokashi could work very well in the bio-gardens. We are encouraging producers to also grow their own vegetables, helping with food sustainability".* Martín Reyes, a cacao producer from the Colpa de Loros cooperative, highlighted: *"Very nice experience we are having, where we have worked together as colleagues. As farmers, we hope these field workshops will continue. I will prepare bokashi to improve the production of my plot".*

Training in bokashi preparation, TRANSITION PSii

Ethiopia: enhancing wheat production through crop diversification and soil health

In Ethiopia, wheat is a crucial crop for food security, second only to maize in caloric contribution. However, wheat production faces significant hurdles: limited access to affordable fertiliser and quality seeds, widespread soil degradation and a scarcity of haricot bean seeds hindering crop rotation. Furthermore, limited market integration for smallholder farmers restricts access to fair prices and impedes the development of a sustainable wheat industry. The PSii project addressed these challenges through co-creation, incentives, business models and leveraging investments. This involved (1) carrying out business model workshops; (2) a private-sector mapping exercise; and (3) individual interviews with large farm owners, warehouse operators, millers, bakers and flour/biscuit processors, to identify appropriate incentives and investments for promoting an agroecology transition in selected ASLs.

Capacity building sessions serve as platforms for partnership building, connecting producer organisations, district agricultural offices and seed providers. The partners included: (1) government agencies, chiefly the Ethiopian Ministry of Agriculture and extension services; (2) universities and research institutions such as Haramaya University, Wuchamo University, Ethiopia Agricultural Research; (3) international research projects including the CG-initiatives: Agroecology/EIA/MFS/AICCRA; (4) farmer associations and unions; private-sector processors; and (5) non-governmental organisations like MELCA-Ethiopia,4 Inter Aide,5 RCBDIA6 and ELaRP.7 Based on collaborative needs assessments, the project is implementing a bundled approach focusing on five key agroecological practices: (1) site-specific fertiliser application and organic amendments; (2) fava bean-wheat crop rotation; (3) desho grass planting for improving soil fertility and providing livestock fodder; (4) soil bund construction for enhancing water infiltration and moisture retention; and (5) home garden establishment for improving household nutrition and income. Training on a 32-hectare demonstration field, showcasing fava bean and wheat rotation, provided a valuable platform for 127 producers to share experiences and learn from one another. The positive results are evident in the words of Degefe Dalelo, a farmer from Doyogena district: *"I appreciate the work done so far on the field. From this single plot of land, I can raise three different types of crops and utilise them, and my neighbours can benefit from this valuable practice as well. I want to acknowledge the expertise of the trainers who have provided excellent training. The agroecology of our area is conducive to good work, and I am very happy with the progress we've made and with the trainers' support."*

Farmers implementing the bundled agroecology practices have already reported improved soil quality and more stable crop yields. This is likely due to the nitrogen-fixing properties of fava beans, contributing to enhanced soil health and sustainability. According to Erun Armias, agriculture head of the Doyogena district:

> *" Our farmers ingeniously cultivate three different crops on the same plot of land. This not only maximises yield but also enhances soil fertility. The canopy of potato plants aids in nitrogen fixation, while haricot beans also contribute to this process. The leaves of these crops further enrich the soil, ensuring fertility for the upcoming wheat season".*

The inclusion of local politicians in the training has significantly expanded its reach because they now promote the training as a model for other districts, with agricultural officials from neighbouring areas expressing strong interest in adopting these agroecology practices.

Building on positive results to encourage private participation

The PSii project has focused on identifying and establishing connections with private-sector actors to ensure the long-term sustainability of implemented agroecology actions. In both Ethiopia and Peru, there has been significant private-sector participation facilitated by agreements, partnerships and collaborative events in the project. The aggregation of cocoa in Peru, and wheat and fava beans in Ethiopia through cooperatives is reducing transaction cost for private-sector off-takers. This capacity strengthening and training activities also provide a collective action capital for improving smallholder bargaining power for fairer prices.

With a long-term action plan, these activities are on track to strengthen market linkages in the coming years. The ongoing efforts in these inclusive multistakeholder partnerships and their initial success in the ASLs demonstrate the critical role of implementing structured business models, creating standards for agroecology products, and leveraging public and private investments for the agroecology transition.

Transforming agropastoral livelihoods in Kenya: a community - driven story of resilience and change

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In Kenya, agropastoralists are facing increasing challenges due to climate change such as erratic weather, overgrazing, land degradation and poor livestock health. These communities are increasingly vulnerable to food insecurity, economic instability and recurring poverty. But despite this challenging context, the ICSIAPL project is showing positive results in building resilience among agropastoralists. Together with SNV, KALRO, private-sector partners and involving local communities, the project is implementing climate-smart agricultural practices and community-driven solutions to overcome adversity and build more sustainable livelihoods. Its success highlights the power of partnerships, combining research with local knowledge, inclusivity and facilitation by committed organisations.

In Kenya, nearly 80% of land is classified as arid and semi-arid, where conditions for farming are challenging. Despite the harsh environment, these regions are home to over half of the country's livestock, which plays a vital role in the economy and food security (Nabinejad and Schüttrumpf, 2023). Nevertheless, for many years, agropastoralists in these areas have been grappling with the effects of erratic weather patterns, overgrazing, land degradation and poor livestock health. Pastoralists normally practise extensive grazing systems and have their own structures for managing grazing, relying on the natural grass for their livestock production. As climate change affects these lands, these issues have left many agropastoralists vulnerable to food insecurity, economic instability and cyclical poverty.

Saoyo standing in his field of grass

However, change is possible. Pastoralists, organised communities, SNV Netherlands Development Organisation, the Kenya Agricultural and Livestock Research Organisation (KALRO) and private-sector organisations are working together under the umbrella of the Integrated & Climate Smart Innovation for Agropastoralist Economies and Landscapes (ICSIAPL) project to find solutions. Targeting over 7 000 pastoralists, their initiative seeks to address the complex issues facing Kenya's arid and semi-arid land communities (ICSIAPL, 2023) by combining innovative climate-smart agricultural practices with community-driven solutions. This story demonstrates how practical solutions driven by partnerships, multistakeholder engagements and community-lived experiences and ownership, are contributing to lasting impact. Over time, the project is achieving inspiring results and its success can serve as a model for other vulnerable regions that face similar challenges.

A new beginning for farmers: introducing climate-smart forages

Many agropastoralists in Kenya's arid and semi-arid lands, like Jane Mwangi from Taita Taveta County, have lost many heads of cattle during the dry seasons due to a lack of forages and poor land management. *"I have watched my cattle weaken during the dry seasons,"* says Jane. The first steps of KALRO and SNV were to understand the needs of the pastoralists' communities by hearing about their challenges and then searching and proposing potential solutions, such as technologies and practices that had worked in similar conditions. Together, they decided to introduce drought-tolerant forage varieties, such as Brachiaria, Nutrifeed and Sugar Graze, in test plots. These forages were paired with holistic grazing practices, which involved rotating grazing areas and allowing pastures time to regenerate. Jane was one of the earlier convinced of the benefits. *"Now, with Brachiaria grass, I've not only kept my livestock healthy but also sold fodder to my neighbours,"* she says.

By 2023, 67% of agropastoralists in the project area had started growing fodder, an encouraging increase from 40% at the project's inception. Like Jane, many agropastoralists benefitted from trainings through demonstration plots they established in partnership with KALRO and SNV. The communities contributed significantly in-kind through labour and their own productive assets to these demonstration plots. These plots served as real-life examples of how the high-protein, drought-tolerant forages could thrive even in harsh conditions. Farmers who attended the first-hand training sessions gained practical knowledge about cultivating these forages.

> *"Since setting up the demo plots with different forage varieties, this has become a training hub for farmers in Taita. I have held four field days in my farm to demonstrate production and conservation of different forage varieties, after I upscaled to 10 acres,"* says Gerrishon Mngerezah, a young farmer from Taita.

Many farmers were initially sceptical about the benefits. Change, especially when it comes to farming practices that have been passed down over generations, can be daunting. However, many began seeing tangible results with time. For Peter Kamau, a farmer from Narok County, it was not until he saw the success of his neighbour's herd that he decided to try the new technologies. *"I was hesitant at first, but now my milk yields have doubled,"* Peter shares, as he reflects on the usefulness of the changes he is implementing. His story is not unique. As more farmers saw the tangible benefits of these new practices – improved livestock health, increased milk yields and more productive land – there were many more interested in trying these technologies, new for them. The high-protein forages were not just a solution to the immediate challenges of drought; they are becoming a long-term strategy for improving livestock health and land productivity.

Overcoming resistance: the role of training and peer learning

While the benefits of the new forages became apparent over time, the road to change was not without challenges. Many farmers were resistant to the idea of using new forage varieties or shifting from traditional grazing methods; many saw this as a risky change. Overcoming this resistance required a concerted effort to build trust and offer practical, hands-on experience.

Many agropastoralists lacked the technical knowledge needed to manage the improved forages and implement sustainable grazing techniques. Using a "Training of Trainers" approach, the project partners focused on capacity building, training local farmers as "champions" who could spread their knowledge to others. In Taita Taveta County, Jane Mwangi became one of those champions. *"I've held training sessions on my farm to show others how to grow Brachiaria grass and manage fodder. I want them to see that it's possible to succeed here,"* she says proudly.

Peer-to-peer learning and field days, which allowed pastoralists and farmers to observe real-life successes, have been instrumental in addressing the initial resistance and fostering trust in the technologies that are being tested at a wider scale in these communities.

The role of the private sector and an innovation fund However, despite the early positive outcomes, the initial barriers such as access to certified seeds, which coupled with limited forage management skills among agropastoralists, hindered larger acceptance of the technologies, despite their benefits. The farmers in the project counties did not produce sufficient forages in 2022 owing to recurrent drought. This saw a hike in demand both for planting materials and forage for animal feed.

To tackle these problems, another approach was undertaken by the project: the establishment of an innovation fund, designed to encourage private-sector investment and foster market-driven solutions (ICSIAPL, 2023). The fund operates on a co-financing model, where individuals, organised groups and associations contribute 50% of the funding for a specific endeavour. This approach has catalysed significant investment in mechanised tools for fodder planting, harvesting and storage, making the entire process more efficient and potentially scalable. The success of these investments is evident: the small and medium-sized enterprises (SMEs) that have access to the funds in the region are now commercialising fodder, selling certified seeds and offering mechanised solutions that help farmers boost productivity. The fund has already disbursed €236 717, and with an additional €500 000 co-financed by the applicants, the project is helping pastoralists and farmers transition from subsistence farming to more commercialised livestock production.

With funding from the innovation fund, the SMEs have been sufficiently prepared to produce at scale through mechanisation of operations, from land preparation to harvesting and storage, providing an opportunity to efficiently produce at scale for their own use and for the market.

David Omondi, a local entrepreneur from Taita Taveta, is one of the many users of the innovation fund. *"Through the innovation fund, I was able to purchase mechanised tools to harvest and store fodder more efficiently. This has allowed me to produce more and now I'm able to sell surplus fodder to other farmers,"* David explains. Access to certified seeds and modern tools also remains a significant challenge for many farmers in remote areas. To address this, the project worked with private-sector partners like Advanta Seed to establish local distribution networks and ensure timely delivery of high-quality inputs. *"I'm now able to access quality seeds and mechanised tools, which has made my farming more efficient and productive,"* shares David. His business has not only benefitted from increased efficiency but also from the new market opportunities that the project has created.

Building resilience: women, youth and community ownership

The successful partnerships forged by the ICSIAPL project are not just about better livestock; they are also about empowering marginalised groups, especially women and youth. These groups often face significant barriers to participation in agricultural decision-making processes everywhere, and that is not different in the arid and semi-arid lands. By prioritising their involvement, the project is creating opportunities for women and youth to take leadership roles and drive change in their communities.

For example, in Kajiado County, women-led cooperatives have emerged as leaders in fodder production and preservation. The Maasai Kajiado Women Dairy Cooperative Society (MKWDCS) collects milk from farmers and sells it to processors. Jane Saruni, MKWDCS Board Member, explains: *"The three-year drought affected us where we moved from producing 65 000 litres a day to shutting down milk production since our livestock migrated and others died. Through capacity building from SNV on forage production and integrated landscape management, we have selected 50 champion farmers who have put at least five acres of land in forage production and practise a good range of management practices. The champions have also simple hay barns as a guide to the members from their respective areas. This is to ensure that in case of any drought, the lactating cows do not migrate"*. About the benefits from training, she explains:

> *"I have managed to store 50 tons of silage for my livestock. I will continue storing more because during training I learnt that it can be kept for many years".*

Similarly, Amina Hassan, a cooperative member, has seen the positive impact of her involvement. *"I now contribute to my family's income and have gained respect in my community,"* Amina says. For her, the project has opened doors to new opportunities.

Farmers attending a field day at Gerishon's farm

"We did not migrate our 50 cows during the drought and none of them died," says Rosemary Mwatuni, a farmer who benefitted from the project's holistic grazing management and forage conservation training. *"We divided our farm into 40 paddocks using local materials and from some paddocks we harvested around 700 bales of natural grass that we used to feed our cows during the drought."* Through capacity-building workshops and training, these women have not only gained new skills but also strengthened their positions within their communities.

Youth engagement has also been a cornerstone of the project. Many young people, like Gerrishon, have found new pathways to success.

> *"Before the project, many of my friends were leaving the area in search of work elsewhere. But now, with the knowledge I've gained, I see a future for myself in farming,"* he shares.

Restoration of degraded ecosystems

Restoring the region's degraded landscapes is another pivotal aim of the project. Holistic grazing management and land restoration practices have already resulted in the rehabilitation of over 20 000 hectares of land in Narok County. *"Lands are considered rehabilitated when interventions of land restoration have been applied to degraded lands, for example preventing invasive species encroachment, or avoiding bare land without vegetative cover to prevent soil erosion or applying practices to increase soil moisture and soil fertility. We witness changes in terms of regeneration of vegetation and improvement in soil moisture retention"* says Julius Rono, ICSIAPL Project Manager. *"These practices not only benefit livestock but also improve soil health and increase the availability of pasture for wildlife,"* he continues.

"We have restored over 1 000 acres in Maili Tisa, Ngatataek and Kalelo that did not have pasture at all," says Ndula Leperes, Chairman of the Oililai Disaster Risk Reduction Group in Kajiado County. *"We're using manure when reseeding our land after removing invasive species like Ipomea. This has been a game changer for our community,"* he concludes.

Looking ahead: scaling success and sustaining progress

As the ICSIAPL project moves towards its conclusion, the challenge lies in scaling its successes and ensuring that the gains made are sustained. The project's focus on community ownership, private-sector engagement and policy influence has created a solid foundation for future growth. *"We've seen how these innovations have transformed our lives,"* says Jane Mwangi. *"Now, we need to ensure that these practices continue, even after the project ends."* This sentiment is echoed across the communities involved in the project, as agropastoralists, farmers, entrepreneurs and local leaders work together to sustain the momentum and continue improving their livelihoods.

The partnerships created by the ICSIAPL project are powerful examples of how community-driven solutions can create lasting change. Elements for success include innovation that brings together research and local knowledge, collaboration between all stakeholders in the territories led by local actors, a focus on inclusivity and the facilitator role of organisations with the right expertise and commitment.

Further reading

Integrated & Climate Smart Innovation for Agropastoralist Economies and Landscapes (ICSIAPL) (2023), Annual Narrative Report.

3 PART 3

Innovations at policy level
and policy innovations

By Ricardo Ramírez, Bernard Triomphe and Renaud Guillonnet

How can policy makers support innovation scaling?

For any intervention aiming to generate a lasting impact, a key way to ensure this is achieved by improving the enabling environment for innovation and change, with policy formulation being a major component. DeSIRA-LIFT performed a Learning Review of whether and how DeSIRA projects had policy outcomes as a means to influence the agricultural innovation systems (AIS) where they operated (Douthwaite et al., 2025). This review showed that more than a third of DeSIRA projects seem to have contributed to a significant policy change, ranging from informed decision-making processes to actual legislative texts or strategies. It also highlighted the extent to which projects had succeeded in doing so and how they had managed to meet this objective.

Generating policy outcomes was a core objective of some projects, such as TAP-AIS (implemented by the Food and Agriculture Organization of the United Nations (FAO) in nine countries) or AcceSS in Burkina Faso. The very strategies of these projects were designed for that purpose and hence policy outcomes were the ultimate outcome that would mark the success of such projects in having a transformative effect on the national AIS. For other DeSIRA projects, policy influence was an additional, though not always explicitly stated, element of the strategy to achieve their main innovation objective. Policy outcomes emerged indirectly as a result of other activities.

Douthwaite et al. (2025) further identified that projects achieved or contributed to policy outcomes from a combination of activities – or policy outcome trajectory –, among them: capacity building of various players, dialogue, evidence-based knowledge production. For projects with an explicit policy objective, the sequence and combination of activities was planned and adjusted based on a theory of change and monitoring, evaluation and learning (MEL) frameworks. For other projects, it resulted from the necessity for stakeholders and communities to gain policy influence to unlock progress, or to ensure sustainability and uptake of outcomes at technological or value chain levels. In both cases, they were able to make opportunistic use of “policy windows”; those unique moments where researchers have the opportunity to feed information into the complex cycle of policy making.

Furthermore, during the DeSIRA Connect Days (events organised in all regions where the DeSIRA initiative was deployed), most project partners expressed that it would be the role of the governments, and therefore that of policy makers, to take ownership of project results. For them, this would ensure that results be carried forward, thus transforming the short-term project dynamics into a continuous change process over longer timeframes. Influencing policy makers, preferably with structured data and arguments, was therefore considered as a way of ensuring sustainability of DeSIRA project outcomes.

Several Stories of Change in this book, and particularly those in this part, illustrate how DeSIRA projects created the enabling conditions to influence policy. A common thread was the engagement of policy actors through multistakeholder platforms that provided a forum where different actors collaborated in research, and in doing so took ownership over scientific evidence and innovations that were deserving of scaling (Toillier et al., 2024). This widespread approach also favoured the emergence of innovative ways of informing and making policies.

At the global level, the DeSIRA initiative aimed to contribute to the Sustainable Development Goals and to address grand challenges such as biodiversity loss, climate change, nutrition and economic development. This was tackled through research leading to agricultural innovations covering a broad range of themes and issues, in particular those valorising agroecological principles. This collective effort has been a contributor to placing the agroecological transitions at the core of local and regional policy agendas.

What have we learnt

According to Douthwaite et al. (2025a), four pathways encapsulate the research-to-policy strategies developed by DeSIRA projects:

1. carrying out research to demonstrate both the policy need and policy solution;
2. building capacity both to implement the policy solution and advocate for it;
3. building an enabling environment for policy adoption and implementation; and
4. taking advantage of [intermittent] windows of opportunity[1] when large policy shifts can happen.

The review also outlines seven strategy components and practical actions that projects did and can take to achieve policy outcomes:

1. building on previous initiatives, relationships and evidence (i.e. contributing to “a policy outcome trajectory”, see quote below);
2. aligning with and being responsive to government priorities and policy windows;
3. facilitating multistakeholder platforms and other coalitions;
4. generating and communicating policy-relevant evidence;
5. developing local capacity and ownership for policy implementation;
6. providing technical assistance and piloting solutions; and
7. adapting to changing contexts and learning iteratively.

“A core assumption underlying our approach is that significant policy-related outcomes always emerge from a patterned, evolving and ongoing system of interactions over time between actors, knowledge, technology and institutions. Projects contribute to policy outcomes through playing a part in the policy outcome trajectory. An outcome trajectory is a complex adaptive system, as defined by Axelrod and Cohen (1999)” (Douthwaite et al., 2025b).

1] https://academic.oup.com/rev/article/32/2/200/6770062?login=false

Furthermore, bridging from research to policy requires three elements to come together, namely that: (1) evidence becomes confirmed and packaged to be meaningful to decision makers; (2) relationships and networks-of-trust be in place; and (3) windows of policy opportunity open up and are taken advantage of in a timely manner (ODI, n.d.). When this is the case, policy outcomes are possible. However, arranging this confluence is difficult to operationalise; the process is complex and highly unpredictable.

Building from the bottom up, reinforcing the capacity of multiple stakeholders sets up an enabling environment

As illustrated in Part One of this book, action research in DeSIRA projects often began at the grassroots level. By fostering new values, mindsets and attitudes based on co-constructed and locally-owned knowledge, agency among individuals and communities was strengthened. This was often made possible through multistakeholder mechanisms that created space for dialogue and capacity building, ultimately enhancing their ability to advocate for change. Clearer messages, well-documented needs supported by scientific evidence, and stronger governance mechanisms increased these communities' visibility and relevance, giving them greater influence in the eyes of decision makers.

Similarly, their enhanced capacity to engage with policy makers and gain attention motivated these communities to continue, consolidate and share their innovations, thereby contributing to the scaling process.

The PRISMA Story of Change demonstrates how representatives from umbrella farmer organisations formed a task force across three countries (Burkina Faso, Mali and Niger) to collectively advocate for policy change in the livestock sector. The task force members are building their capacity in policy advocacy while deepening their understanding of both national and regional issues governing livestock. They have developed a joint policy advocacy strategy. This multicountry task force is an effort to build an enabling environment that can accommodate the various policy opportunities in each country, as well as across different ministries and levels of government.

Putting innovation on the roadmaps for dialogue and policy decision

The Clima-LoCa project has been operating in Colombia, Ecuador and Peru, focussing on addressing cadmium contamination in cacao production. Its goal was to influence government policies and national planning documents related to climate change mitigation and food safety regulations in the sector. A key part of achieving policy influence has been mapping cadmium levels in cocoa-producing regions, which helps producers meet stringent European Union standards. To this end, the project supported multistakeholder platforms that engaged supply chain actors, including producer cooperatives and export companies. It also worked with representatives from key cacao value chain stakeholders in each country through its Steering Committee, which advises governments on cacao-related policies. Policy influence is supported by several innovative science-based tools developed by Clima-LoCa researchers in collaboration with national and regional partners: maps to identify cadmium hotspots, a validated cacao soil sampling technology, a portable cadmium testing machine for local cocoa testing, and blending practices that help cooperatives meet clients' cadmium level requirements.

Some of these tools and innovations target cocoa growers through agroforestry practices and regenerative agriculture, while others focus on creating a favourable environment for these innovations, aiming to sustain, combine and replicate their outcomes.

The combination of evidence, objective data and spatial visualisation of problem areas enabled multiple actors to engage in the process and jointly design solutions. With researchers acting as facilitators, the project worked with major cooperatives and private supply chain actors to develop and promote practical solutions on the ground. These solutions were then communicated to government ministries and agencies using structured, evidence-based and verifiable data.

Additionally, the ProSilience project provided technologies such as improved seed varieties and integrated soil fertility management techniques to manage soil nutrients and organic matter loss. Ownership and management of these technologies was fostered through training involving extension agents and model farmers, who championed them within their communities using peer-to-peer learning, on-farm demonstrations and local input production to build trust and confidence.

Scaling to entire watersheds was achieved through the Community Managed Agricultural Development Initiative (CoMADI), which organised and legalised watershed user associations and local governments. CoMADI operates with participatory decision making controlled by farming communities, includes financial management, and partners with private companies to foster long-term resilience and self-sufficiency.

National expansion was ensured through two pathways. First, structured data from the Ethiopian Soil Health decision support tool contributed to a policy brief advocating for changes to fertiliser imports, which led the Ethiopian government to adjust its fertiliser import strategy. Second, strengthened collaboration with civil society organisations and non-governmental organisations led to the creation of the Ethiopian Sustainable Food Systems and Agroecology Consortium, which was officially registered in 2024. The consortium works on policy dialogue and drafting a national agroecology strategy, informed by the Agroecology Leadership Academy created under the project and the evaluation of agroecological principles in Ethiopian regional policies using the World Agroforestry Centre (ICRAF)'s Tool for Agroecology Performance Evaluation (TAPE).

These two projects demonstrate how combining evidence, objective data and spatial visualisation of problem areas ensures broad adherence to the process and the joint design of solutions. Researchers, acting as facilitators, helped multiple stakeholders organise formally, collaborate and promote practical, ground-level solutions, which were shared with government ministries and agencies as structured, evidence-based and verifiable data to support policy decisions.

Innovation trajectories and policy windows

Seizing a policy window is only possible when relevant and sufficient evidence and arguments have been amassed to be pushed through this window and become a (more) perennial and systemic change (Douthwaite, 2025a).

The story from the AcceSS project describes how successive projects (CDAIS, TAP-AIS and AcceSS) in Burkina Faso, operating over a decade and orchestrated by the same consortia of partner organisations, formed an innovation trajectory that purposefully contributed to the establishment of an interministerial coordination unit: *the Cellule de Coordination du Système National d'Innovation Agricole* (CC-SNIA).

Regular dialogue events among multiple actors reinforced with capacity building – mostly targeting functional capacities (Tropical Agriculture Platform, n.d.) – and a MEL framework allowed to not only put in evidence the need for an institutional coordination mechanism between several ministries and other key players to govern innovation for the structural transformation of agriculture in the country, but also to co-define how this mechanism should be operationalised.

The CC-SNIA was established by joint ministerial order and is chaired by the Permanent Secretariat for the Coordination of Agricultural Sectoral Policies (SP-CPSA). As expressed by Dr Segda Zacharie, Institutional Facilitator: *"This mechanism for foresight, reflection, consultation and strategic proposals will certainly provide an answer to the lack of synergy of action between the stakeholders in the national agricultural innovation system."* Among these stakeholders, farming communities, public research, education and extension services, and the private sector, who have been part of the journey, are expected to continue to design and implement agricultural innovations. The CC-SNIA and those stakeholders should be equipped with assessment mechanisms and tools to support policy makers in monitoring, evaluating and designing policy instruments and investments to support agricultural innovation in Burkina Faso.

In Southeast Asia, the ASSET project has also been building upon a decades-long trajectory formed by multiple and successive projects and initiatives borne by an array of partners. Deep roots in the targeted communities, broad networks of committed stakeholders consolidated by long practices of joint research, knowledge and capacity building have provided a solid basis for the development of the policy guidelines on agroecology transitions in the Association of Southeast Asian Nations (ASEAN) that were adopted in 2024.

Developed through an inclusive human-centred design thinking process involving consultations with partners such as the Agro-ecology Learning alliance in South East Asia (ALiSEA), the Conservation Agriculture and Sustainable Intensification Consortium (CASIC) and regional research platforms (e.g. MALICA),[2] the guidelines will support key policy actors in advancing the agroecology transition in the region. The project has taken advantage of a policy window by leveraging Laos' ASEAN Chairmanship in 2024 to accelerate the guidelines development process.

The project has followed a multipronged approach that combined developing regional guidelines, strengthening national platforms in participating countries, aligning with existing food system policies, and leveraging regional and global networks.

ProSilience has built on the Global Programme ProSoil that has been implemented by GIZ since 2024 in Benin, Burkina Faso, Ethiopia, India, Kenya, Madagascar and Tunisia. This decade-long work on agroecological and climate-smart agricultural practices and transformation processes focusing on sustainable land management also illustrates how policy outcomes stem from long-term innovation trajectories.

2] www.malica.org/

Sustaining and scaling policy innovations

Innovations at policy level entail various aspects. They range from the ability of grassroot communities to organise, often based on those changes in mindsets, social norms and values among individual stakeholders described in Chapter 1, to equipping policy makers with guidelines. They often result from combined innovations in niches and communities, and multistakeholder dialogues, implemented over a substantial period of time that allow multiple actors to come to joint understanding of challenges, agree on co-designed solutions supported by concrete tools and methodologies provided by research.

The role of research along these policy outcome trajectories (Douthwaite et al., 2025) not only consists in providing such methodologies but also in compiling evidence into structured formats that feed iterative awareness raising and decision processes. It also consists in playing a facilitation role, thus establishing missing links across levels in the AIS, from grassroots to policy makers, thus unlocking the potential of all actors to be innovative in the policy-making processes. More generally, all actors involved in DeSIRA projects call for an environment that is more conducive for innovation. They consider it a condition for scaling their outcomes and they place their trust in institutional and state actors to nurture and guarantee it, thus enticing them to favourably influence policy makers, something fairly coherent with findings by Cosoveanu et al. (2024), who showed that most policy experiments contributed to social learning, rather than direct policy changes. In other words, they established a foundation for policy advocacy, as part of an enabling environment. An enabling environment should also address two preconditions for scaling (Steve Wiggins of ODI, quoted in Woodhill et al., 2012: 39): *"…a good investment environment for agriculture, and; two, there must be adequate investment in the core public goods of infrastructure, education and research."*

The stories in this chapter show how they built outcome trajectories through strategies adapted to their contexts. As emphasised by Douthwaite (2025a), policy change is highly unpredictable and exhibits features of complex adaptive systems – hence the importance of adaptability to changing circumstances and taking advantage of the emergence of auspicious windows of policy opportunity.

Strategies of DeSIRA projects entailed building on large networks of interconnected stakeholders, capacity building and sharing verifiable evidence to reduce asymmetries, constant dialogue with strong bottom-up features and constant monitoring and accountability. Such foundations allowed to seize opportunities – policy windows – for breakthroughs. These often-innovative ways of making policies contributed to reinforce the enabling environment for agricultural innovation, or, in other words to help the AIS progress. Stories from DeSIRA projects highlight how significant changes are achieved from long-term trajectories of collective action and the ability of actors to identify decisive moments that can result from their action or simply happen from evolutions outside their own work.

Going forward, it would be desirable to formulate follow-up initiatives that pay attention, from the start, to the various strategic components for policy outcome generation and to the complex and unpredictable nature of the research-to-policy bridge.

STORY 1:
Pastoral organisations taskforce: a political advocacy tool for livestock farming in the Sahel

STORY 2:
Cadmium-free cacao: co-developing maps for decision making in the Andean region

STORY 3:
ASSET: building momentum together – the road towards ASEAN policy guidelines on agroecology transitions

STORY 4:
Toward governance of the national agricultural innovation system in Burkina Faso: an interministerial coordination cell to shape the directions and outcomes of innovation

STORY 5:
Roots of resilience: empowering farmers through agroecology to heal Ethiopia's soils

Pastoral organisations taskforce: a political advocacy tool for livestock farming in the Sahel

Authors: Maïmouna Ousmane, project coordinator, Enabel; Kader Issoufou, MEL expert, Enabel

In the heart of the Sahel, where three nations converge, a quiet revolution is transforming how livestock farmers defend their interests. For generations, pastoralists in Burkina Faso, Mali and Niger have moved their herds across vast landscapes in search of grazing lands. But as climate change intensifies and borders tighten, these communities face unprecedented challenges. Now, with the support of the PRISMA project strengthening multistakeholder collaboration, a remarkable coalition of pastoral organisations is emerging, turning adversity into opportunity and reshaping how farmers can influence the policies that affect their lives.

In Burkina Faso, Mali and Niger, the three countries where the Research and Innovation for Productive, Resilient and Healthy Agro-Pastoral Systems in West Africa Project (PRISMA) is working, livestock farming is practised by nearly 80% of rural families. Livestock production represents the main economic activity for at least 50 million people out of a total Sahelian population of 137 million (PRAPS, 2016). It contributes 40% to the agricultural gross domestic product (GDP) and accounts for 15% of the total GDP in Niger (Hiernaux et al., 2018), 10 to 20% in Burkina Faso (FAO, 2019) and 19% in Mali. Livestock products are either the second- or the third-largest export item in each of these three countries (Hiernaux et al., 2018).

In the local geographical and climatic conditions, the success of livestock farming relies heavily on the seasonal mobility of the herds in search of available fodder. Herd mobility is increasingly limited by multiple constraints: the shrinking of pastoral areas linked to the expansion of cultivated land; the closure of access (total or partial) for herds to certain coastal countries, such as Benin, Côte d'Ivoire, Ghana and Togo, which used to provide a place of retreat for livestock during dry periods in the Sahel; the increasingly irregular availability of pastoral resources due to recurrent droughts and floods; the degradation of soil and plant cover (both woody and herbaceous); the loss of biodiversity affecting pastoral areas; and the weak land governance that leads to conflicts among pastoralists and sedentary farmers over the use of natural resources. Furthermore, the growing sense of insecurity pushes people to steal livestock or enter areas where grazing is prohibited. The difficulty of getting supplementary feed of sufficient quantity and quality does not help to curb the fodder deficit and the reduced pastoral mobility. On top of that, zoonotic diseases (which are transmitted from animals to humans) are detected in the Economic Community of West African States (ECOWAS) region, where the immunisation rate of cattle herd has been at less than 5% in recent years, which poses a real risk to public

Taskforce workshop Prisma

health. In the absence of any traceability system, the provenance of products of animal origin is, for the most part, unknown. To contribute to solving these problems, civil society and private-sector actors in the livestock sector have come together to form a taskforce.

Research providing grounds for actors to come together

The idea of forming a taskforce emerged from a series of workshops organised by PRISMA to define a policy advocacy plan related to the two components of the project's intervention: improving access to and availability of pastoral resources and livestock feed, and limiting health risks associated with the consumption of raw milk. The project has carried out several studies to provide evidence for policy makers on innovative initiatives related to pastoral resource management, carbon credit, carbon sequestration, the status of livestock feed banks and drought-related risks. Other studies focused on aflatoxin contaminants to ensure the quality of livestock feed and on zoonoses to limit the risks associated with milk consumption. These studies suggest solutions to the problems of the livestock sector and, if taken into account by policy makers, can become part of future sectoral strategies.

Since political dialogue can influence political decision making, PRISMA opted to support political advocacy by local actors by aiming at developing sustainable multistakeholder structures that can continue the advocacy work beyond the life of the project.

The project's strategy included mobilising several umbrella pastoral organisations (three or four per country) as allies to carry out the advocacy activities. A joint workshop was organised to share the team's thoughts and gain their support. The workshop succeeded: not only did the pastoral organisations give their support to the initiative, but they also decided to create a supranational working group – a taskforce – with the main objective to advocate for policy change to solve problems of Sahelian livestock farming at the country and sub-regional levels.

The workshop brought together actors who, despite operating in the same countries, communicated very little, due to perceived differences of opinion, conflicts of interest and positions. PRISMA initiated subgroup discussions to make participants analyse the context (including power relations) and the problems, jointly define advocacy objectives, identify targets and allies, propose an agenda, tactics and modes of action. During

Prisma Enabel Niger

the restitution of this work, participants discussed the weakness of pastoral organisations in defending the interests of their members and their limited ability to work together for the development of livestock farming within the same country. The same problem was observed across several countries, despite the existence of sub-regional structures bringing together pastoral organisations, who seemed disconnected from their members on the ground.

The actors unanimously recognised that this lack of understanding between pastoral organisations, preventing them from working together, made them weaker, even though they represent a significant economic sector. When participants agreed to continue collaborating in a spirit of solidarity, understanding and cohesion, one of the participants proposed, to general applause, to set up a taskforce right away.

The composition of the taskforce:

- The Billital Maroobé network (RBM, by its French acronym): a West African regional reference framework for herders and pastoralists that works to defend the interests of its members at the economic, political, social and cultural levels
- The collective of pastoral associations of Niger (CAPAN, by its French acronym)
- Association for the revitalisation of livestock farming in Niger (AREN)
- Tassaght, Mali: an organisation that promotes conflict prevention and management, and sustainable development in Mali
- Andal & Pinal association of livestock breeders, Burkina Faso
- Federation of livestock breeders of Burkina Faso (FEB)
- Federation of cattle, meat and milk value chains of Mali (FEBEVIM)
- Milk inter-branch organisation of Niger (ANFILAIT)
- Cattle, meat, leather inter-branch organisation of Niger (IP/BVCP)
- Milk inter-branch organisation of Burkina (IPROLAIT-BF)
- Milk inter-branch organisation of Mali (AMAFILAIT)

Aboubacar BA of FEBEVIM, a member of the taskforce, said: " *The taskforce is a real response to the realities of three countries", and Moussa Boubacar from CAPAN added: "It is a tool for analysis and advocacy on issues of adaptation and development of pastoralism in the central Sahel in the context of climate change, a galloping demography of geostrategic importance. The taskforce allows organisations from the livestock sector (both non-profit and commercial) to discuss their concerns and to propose solutions together". According to Modibo Dicko from AMFILAIT: "If the taskforce did not exist, we would have to create it eventually. It is a platform that gives a means of expression to all its members".*

Building knowledge and joint solutions

Since their first meeting, the taskforce members have been identifying issues to focus on for policy advocacy. The chosen themes correspond to those already targeted by the PRISMA project: conservation and restoration of pastoral areas; the need for an effective mechanism for preventing and controlling zoonoses and aflatoxin in West Africa; availability and accessibility of quality livestock feed; and the development of an indexed insurance scheme that would help recover the losses incurred by breeders in the event of droughts in the Sahel regions.

To strengthen their commitment to work together, the taskforce members made recommendations on how to assure the sustainability of their initiative. They agreed to seize any opportunity to finance actions that could contribute to the development of the livestock sector in West Africa, such as developing a pastoral infrastructure, restoring degraded pastoral areas, securing pastoral resources, or revising legislative frameworks on livestock activities. They also recommended to focus on the financial autonomy of the taskforce.

After their first meeting, the taskforce members immediately undertook some actions – from identifying other allies to enlarging the circle to have more weight to influence decision makers, to developing an advocacy strategy. The strategy was developed with the support of a consultant hired by PRISMA during a five-day workshop. Through exchanges between farmer organisations and inter-branch organisations from different countries, the participants strengthened their knowledge of the context of West African livestock farming and deepened their understanding of the issues related to different national and regional policy texts that govern the livestock profession. As one of the taskforce members, Hammadou Abdou of AREN, said: *"The taskforce has allowed us, civil society organisations,*

to fundamentally improve our knowledge and to well research the information and understand its logic, to understand the issues, the reality of the difficulties and how the policies are organised". The members pointed out the top-down nature of policy making and their lack of anchoring in the realities of the countries and decided to include this issue in their advocacy efforts.

Advocacy will also focus on degradation and occupation of the pastoral routes, a problem common to the three countries, in search of a solution of securing, restoring and conserving pastoral areas. Another focus of advocacy is the growing social insecurity resulting in the migration of livestock to more stable countries, without any prospect of return. On this subject, Aboubacar Ba, FEBEVIM, said:

> *" The taskforce can be a tool to approach the authorities regarding livestock problems in Burkina Faso, Mali and Niger. The livestock is migrating due to security problems (…). Mali has more than three thousand billion CFA potential in livestock: how to bring back the livestock that has left? How to secure this livestock, how to find pasture? How to get the authorities to really look into livestock? I think that our group can initiate finding solutions to problems related to the movement and distribution of livestock in space. I believe in it a lot."*

With the support of PRISMA, the members of the taskforce have also benefitted from training on advocacy skills. They have learnt what political advocacy must focus on, and what the factors for successful advocacy are, such as having a common vision, good knowledge of the context, being able to provide alternatives to propose as desired changes in place of the current solutions.

Structuring sustainability beyond PRISMA

The taskforce is currently operating with the support of PRISMA in organising meetings. A WhatsApp group is already operational and helps to streamline communication. The group is led by an external expert from the Regional Agency for Agriculture and Food (ARAA), a partner of PRISMA, who will gradually give way to a member of the taskforce. The material and financial resources for the taskforce operation are, for now, the responsibility of the project. Subsequently, the taskforce will have to find other means – either from the members' own funds or by seeking funding from development partners. Discussions are underway to make the taskforce sustainable. Boubacar BA, speaking of the taskforce, said: *"It is an essential tool that must be preserved and strengthened. (We need to) see what contributions the actors of the different countries can make so that this structure does not need to be necessarily backed by the project to last. I see young people joining the profession. This means that succession is assured. They need to get more invested. Let us get out of the current system and think about what future we can design for livestock farming in our area. The taskforce is really an answer, and if it is well structured and well strengthened, it can become the beginning of really securing areas reserved for livestock farming".* Regarding the success of the taskforce, Moussa Boubacar of CAPAN said: *"The main factors of success are the determination of the actors and their availability",* while Modibo of the inter-branch organisation pointed out: *"We must not go bluntly, we must diagnose real problems. The more solutions to the problems we have, the more the taskforce becomes a success".*

The sub-regional political advocacy taskforce is in its early stages of operation; it will need significant support to become autonomous. The foundations for the sustainability of the taskforce exist and include its composition (existing livestock structures that operate beyond the time frame of the project), the identification of common concerns to be addressed by the three countries and the Sahel in general, and the willingness and clear commitment of its members to work together to solve livestock farming problems. However, it needs technical and financial support to establish its position and start its actual advocacy actions. In perspective, the members plan to collect evidence as part of the production of advocacy content and to conduct advocacy in each country and in the Alliance of Sahel States area on themes that go beyond the borders of a country. The recent political crisis, with the withdrawal of the three countries from ECOWAS, can slow down the actions of the taskforce to address certain problems such as cross-border transhumance necessary for pastoralism in the Sahel, or livestock migration to coastal countries. However, the taskforce is an opportunity to improve integration between the three countries. In the immediate future, the taskforce needs to define operating rules and a mechanism to ensure the continuity of actions beyond the project.

Cadmium-free cacao: **co-developing maps for decision making** in the Andean region

Authors: Mayesse da Silva[1], Maria Camila Giraldo[2] Diego Zavaleta[3], Roberto Cosme[4] and Wilmer Jimenez[5]

In the Andean region, renowned for its high-quality cacao, an international collaboration is transforming the cacao value chain. Led by the Clima-LoCa project and coordinated by the Alliance Bioversity & CIAT, this initiative strengthens national capacities in Colombia, Ecuador, and Peru through digital soil mapping to tackle cadmium contamination, an issue threatening market access for small-scale farmers due to new European regulation. This collaborative effort strengthens national capacities while building a unique regional database containing information from over 4 000 cacao farms. But the project's impact extends well beyond mapping; it informs land-use planning, mitigation strategies and policy decisions, while ensuring that small-scale farmers can maintain their livelihoods.

The Andean region is globally recognised for producing some of the finest flavoured cacao, known as "origin cacao". This region is undergoing an important transformation to improve the crop's value chain led by an international platform that unites researchers, agronomists and decision makers from international and national government organisations, under the Clima-LoCa project. This initiative, coordinated by the Alliance of Bioversity International and the International Center for Tropical Agriculture (Alliance Bioversity & CIAT) is strengthening the national capacities in digital soil mapping (DSM) in Colombia, Ecuador and Peru, while addressing the critical issue of cadmium (Cd) presence in cacao-growing soils. DSM is only a component of the broader objective of promoting low-carbon and climate-related innovations to cacao production to improve the resilience and inclusiveness of the cacao value chain (Vanderschueren and Pulleman, 2021). These efforts exemplify how collaborative research and science-based approaches, coupled with policy dialogue and capacity strengthening,[1] can drive meaningful change.[2]

Cadmium in cacao: understanding the challenge

Cadmium (Cd), a naturally occurring heavy metal in soil, poses significant health risks when consumed over time through food, water or other sources. In recent years, its presence in cacao has led the European Union[6] and other countries and international bodies to establish new regulations and permissible limits. It aims at ensuring food safety and protecting public health.

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For cacao-producing regions in Colombia, Ecuador and Peru, meeting these standards is critical for the economic survival of smallholder producers, who produce approximately 90% of cacao in the region. Non-compliance could threaten market access and severely impact their livelihoods.

Knowing Cd levels precisely in cacao-growing areas is crucial for decision making in this regard. But currently, only Ecuador and Peru have maps with this information, which proves that only specific locations in both countries have high levels of Cd. Colombia does not have any map, which led to the misconception that the entire country has high Cd levels in its cacao. Developing standardised Cd information across countries facing the same issue is an opportunity to strengthen collaboration and essential to finding regional solutions. DSM has emerged as a powerful tool to tackle the Cd challenge. By generating high-resolution and continuous maps of Cd and related soil properties, public researchers of the three countries are providing science-based and site-specific information that is critical in identifying areas at higher risk of Cd accumulation in cacao beans, enabling targeted interventions and informed land-use planning.

A collaborative effort: co-constructing soil maps

Applying a collaborative approach is the basis for success, as it brings together researchers from the Alliance Bioversity & CIAT and from the national government institutions across the three countries to develop soil maps using artificial intelligence (AI) and sampled soil data. The objective is to strengthen the capacity of participating organisations in DSM, while generating maps to inform producers about the levels of Cd in the soils. National researchers have already studied Cd contamination in their countries and are working on local solutions, thus bringing a wealth of knowledge to the effort. The involvement of local and government organisations in developing the Cd maps is crucial, as their mandates enable them to influence policy makers and promote the use of the information generated.

This approach builds on previous experience in Ecuador in developing the country's first soil fertility map, which has been widely used. As Wilmer Jiménez from the Climate Change Unit of MAG stated: *"The soil fertility map of Ecuador has been important to generate public policy and supporting data-driven decision making. Likewise, we are confident that the cadmium map, with its high level of detail, will be a key tool to strengthen actions in the country, enhance producers' resilience and improve livelihoods".*

The collaboration began with an in-person meeting at the Alliance Bioversity & CIAT campus in Colombia in May 2024, where participants learnt about the general aspects of DSM, including field data collection. Afterwards, virtual sessions of approximately four hours each, held every 15 days over six months, were organised with those in charge of developing the maps in the three countries. These sessions were designed to guide participants through each step of DSM. They included theory (at times through invited lectures by experts), hands-on exercises and discussions about the results obtained between sessions. Activities between sessions reinforced learning and allowed step-by-step map development.

In Colombia, two government organisations have been participating in this process: the Geographic Institute Agustín Codazzi (IGAC), which is the national entity responsible for producing Colombia's official cartography, including soil maps; and the Colombian Geological Service (SGC). In Ecuador, the participants come from the Ministry of Agriculture and Livestock (MAG) and the Polytechnic School of the Coast (ESPOL). In Peru, the partner institution is the National Institute of Agricultural Innovation (INIA). All these organisations have responsibilities, either for research or providing extension services, advice and information to farmers.

Besides improving their capacity on DSM, all participating organisations are contributing to elaborate a regional map of Cd in soils and related physicochemical soil properties. The cross-country team combines diverse expertise allowing it to deepen the understanding of Cd variability and occurrence in cacao landscapes, and to ensure that proposed solutions are both scientifically robust and locally relevant. *"One of the great advantages of this development has been the participation of experts from different countries and organisations, who, based on their experience and professional diversity, have contributed significantly to the discussions and to a deeper understanding of the behaviour of cadmium in cacao landscapes,"* indicates Javier Martin from Alliance Bioversity & CIAT.

The collaboration is already scaling because IGAC is implementing another project to map Cd in all Colombian soils, thus the approaches and tools learnt during this co-development in Clima-LoCa are being used for the mapping activities in that project. This is a work in progress. The next phase of this collaboration will focus on a country-specific approach, where it is expected that these organisations will lead the development of national maps of Cd in soils with support from Clima-LoCa researchers. The final maps of each country will be published on their official online platforms as national data and will be further shared and made available to the public.

> *"One of the great advantages of this development has been the participation of experts from different countries and organisations, who, based on their experience and professional diversity, have contributed significantly to the discussions and to a deeper understanding of the behaviour of cadmium in cacao landscapes."*
>
> Javier Martin

Digital soil mapping: a scientific approach that yields actionable results

DSM started in the 1990s, but it is a fairly new approach in the Andean region to generate high-resolution and continuous soil maps, and it is gradually replacing traditional soil mapping. It relies on models, with increasing use of AI models, that combine field and laboratory soil data, both new and legacy data, with geographic information system (GIS) data and satellite imagery representing the soil-forming factors. These models predict the spatial variability of soil properties across landscapes. The soil-forming factors are incorporated as covariates in the models and are typically represented by digital elevation models and their derivatives (e.g., slope, topographic wetness index), vegetation indices from satellite images, climate and traditional soil maps, and so on. The delegates from each country, working together with scientists, tested over 50 different models and maps before selecting the one used to produce the final maps.

As a result of this collaboration, Clima-LoCa has built a unique database for the region, containing laboratory

6] https://eur-lex.europa.eu/eli/reg/2021/1323/oj/eng

soil data not only for Cd, but also for relevant soil properties, with information from more than 4 000 cacao farms, along with approximately 90 covariates across three countries. While this dataset is valuable for modelling, it also presents challenges. Given the region's large size and the immense volume of data, standard computers of participants don't have enough processing power to run the models and generate maps. Additionally, not all participating organisations could sign data sharing agreements due to the sensitivity of the information and data rights.

To tackle these challenges, researchers from the Alliance Bioversity & CIAT and their national collaborators opted to run all models and generate maps across multiple servers within the Alliance's infrastructure. Still, processing these models takes several days or even weeks to generate a single map. This mapping process is ongoing and is expected to be completed by March 2025.

A process to inform change and influence policy

Working together, the Clima-LoCa platform has achieved important milestones, showcasing the power of science and collaboration. It is a process that contributes at different levels.

Enhanced national capacities: by providing training in DSM approaches, the project has empowered national institutions and professionals to generate and interpret digital soil maps, fostering long-term sustainability. Andrés Felipe Rodriguez from IGAC said: *"I found these learning spaces to be very relevant and appropriate because, in my case, the knowledge contributes to my organisation, especially the topic of modelling, which was very well explained and useful, considering that we are working on the national mapping of Cd in soils using DSM, and later we will work on others. Previously, we were working in a very general way, but now with the training, I believe it can be more specific."*

Land-use planning and mitigation strategies: with the development of detailed maps, a clearer picture of Cd spatial distribution in the region is emerging. This is quite important for land use planning, especially for informing expansion of cacao to new areas and prioritisation of mitigation strategies. For instance, producers could mix low and high Cd cacao beans for keeping the Cd levels below the safety limits or using soil amendments that reduce the uptake of Cd from soils by the cacao plants. These strategies have been validated with producers and cacao companies within the Clima-LoCa cooperation framework.

> *" Thanks to the training in DSM with a focus on Cd, I had access to cutting-edge tools globally, enabling the development of predictive models and a DSM emphasising Cd for Peru,"*

said Roberto Carlos Cosme de la Cruz from INIA. *"With over 89 000 cacao farmers as direct beneficiaries, this training marked a significant milestone for INIA and Peruvian agriculture. Additionally, it is worth highlighting that INIA is currently carrying out the 2M Campaign, which involves soil sampling and the analysis of 2 million soil samples to develop predictive soil fertility maps at the national level,"* he added.

Risk identification: the maps are an important tool that allows producers' associations and cooperatives, cocoa buyers and exporters, and decision makers to identify areas most at risk of being affected by food safety regulations. This information enables policies, territorial planning and mitigation strategies to safeguard market access. Farmers can also benefit from this information through technical assistance offered by farmers' associations or cooperatives, and exporting companies, among others, that can use the maps for improving their recommendations for Cd mitigation and crop management. In Ecuador, MAG and its partners developed the National Strategic Agenda, which includes measures to prevent and mitigate high levels of Cd in the cocoa supply chain (MAG, 2019). The Cd map will be an important tool for supporting MAG's agenda implementation.

Disseminating information for all decision makers: Clima-Loca is entering its final year of implementation with a strong focus on sharing project results. A document written in non-scientific language for all interested parties, especially the producers who contributed their knowledge and allowed the project to collect samples from their plantations, has been developed and will be distributed through local workshops. It explains the sampling method and presents the results of the analyses conducted on their farms.

A public-private collaboration that leads to positive outcomes

At the heart of the Clima-LoCa project's success is trust. The active involvement of national institutions and other stakeholders in its implementation has fostered a sense of ownership and credibility, recognising the importance of collective action to address the Cd challenge.
A successful case of public-private collaboration occurred in Peru with Cooperativa Agraria Norandino, the largest cooperative in a region with the highest Cd levels in cacao. This cooperative specialises in fine-flavour native cacao varieties for the European market. After the implementation of European Union regulations, it was forced to reduce cacao exports by 50%, restrict purchases from many areas and sell locally at lower prices leading to a 60% reduction in farmers' profits. Clima-LoCa researchers partnered with the cooperative to validate new, low-cost equipment capable of real-time, high-quality Cd analysis. This technology enabled the cooperative to sell 100% of its fine-flavour cacao stock in full compliance with European Union regulations, allowing it to pay better prices to farmers. As a result, 800 associated farmers in northern Peru and 3 600 others across the country have directly benefitted (Atkinson and Pulleman, 2024).

Outputs that contribute to planning

The importance of the DSM process is not only to strengthen local capabilities to produce high-resolution soil maps that are continuous and variable in space-time. The DSM is an essential tool to know the spatial variability of the different soil properties, thus allowing diagnosis and optimisation of the use of fertilisers. It also supports the prioritisation of mitigation strategies, not only for Cd but also for other heavy metals, and monitor soil organic carbon stocks, among others.

> *" We are disseminating this information in briefs that inform the public and particularly policy makers and looking for integrated solutions to the cacao value chain,"*

said Mirjam Pulleman,[7] leader of Clima LoCa.

The European Union regulations on Cd limits in cacao function as a policy window to inform policy through the project findings, using the maps and results from field trials on soil amendments and genetics aimed at mitigating Cd in cacao and improve productivity (Douthwaithe et al. 2025.). To that effect, engagement events with policy makers and other stakeholders in the cacao value chain will be organised throughout the project's final year to disseminate the results. In the end, it is all about using evidence-based knowledge to inform decision making and policy.

7] Jornadas DeSIRA Connect in Latin America and the Caribbean. https://www.youtube.com/watch?v=q0-yF4Xn828

ASSET: building momentum together the road towards ASEAN policy guidelines on agroecology transitions

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Advancing agroecological transitions is a shared objective driving collective institutional regional action in Southeast Asia. The ASSET project has built on existing networks and initiatives to strengthen regional cooperation in this line. It plays a key role in policy development through multistakeholder processes, facilitating consultations and policy dialogues that led to the drafting of ASEAN guidelines on agroecology transitions. Key strategies that allow to reach further along innovation trajectories and increase chances for bringing solutions at scale do not remain there; it is necessary to put efforts in creating conditions for continuation beyond a project cycle, tapping into already existing regional dynamics, helping build the capacity of partners, keeping eyes open for a policy window and responding to it.

Agricultural systems in Southeast Asia are at a crossroad between conventional intensive models and emerging agroecological approaches. The continuous intensification of conventional models which rely heavily on chemical inputs is leading to a simplification of agricultural landscapes, land degradation and biodiversity depletion. Contamination of soils and aquifers and the presence of pesticide residues pose health risks to both farmers and consumers, raising concerns in relation to food safety and food security. Agroecological approaches, on the other hand, generate an increasing range of agricultural and market innovations that make it possible to shift towards healthier, more environmentally friendly and more socially sustainable practices.

The objective of the Agroecology and Safe Food System Transitions (ASSET) project, implemented by GRET, together with CIRAD and a consortium of partners, including the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), is to support the transitions necessary to foster sustainable, safer and inclusive food systems in Southeast Asia, through harnessing the potential of agroecology practices and principles. This scope of ambition requires a shared vision of agroecology and agroecological transitions developed through a comprehensive set of interventions: from raising awareness among citizens and fostering demand for agroecological and safe food via strengthening multistakeholder networks, through designing and promoting efficient agroecological practices and innovative market and quality management mechanisms, up to integrating agroecology into policies from local to regional (Association of Southeast Asian Nations – ASEAN) levels, opening a dialogue on linking agricultural, market and food system transformations in policy frameworks.

Following up on previously formed alliances ASSET, which works in Cambodia, Laos and Vietnam, has strong roots in the region through its implementing partners. It builds on an earlier programme, Towards a regional agroecology transition in Great Mekong sub-region countries (ACTAE), as well as on long-term research platforms in partnerships, Agroecology in Southeast Asia (ASEA) and Markets and Agriculture Linkages for Sustainable Food Systems in Asia (MALICA), which bring together research and educational institutions from Southeast Asia to work on agroecology and sustainable food systems in Southeast Asia. It further strengthens these networks and partnerships, and broadens the coalitions developed during the implementation of ACTAE.

One of the networks created under ACTAE and further developed by ASSET is the Agroecology Learning alliance in South East Asia (ALiSEA), coordinated by GRET. ALiSEA gathers over 200 members (civil society, non-governmental and farmer organisations, research and academia, private sector, government), from Cambodia, China, Laos, Myanmar, Thailand and Vietnam. Its goals are to enable local and regional agroecology stakeholders to leverage their expertise to produce evidence-based studies and share them broadly, increase visibility and credibility of agroecological movement towards policy makers and consumers, and scale up the development and adoption of agroecological practices among farmers. ALiSEA helps to create a safe space for stakeholders to engage and learn from each other about agroecological transitions. It plays a role in this story.

However, the main role is played by another partnership created under ACTEA, which gained a new life under ASSET: the Lao-facilitated Initiative on Agroecology for ASEAN (LICA). LICA was the result of the cooperation between CIRAD and the Department of Agricultural Land Management (DALAM), under the Ministry of Agriculture and Forestry. Initially called the Lao Initiative on Conservation Agriculture (LICA) when it was endorsed by the Special Senior Officials Meeting of the ASEAN Ministers on Agriculture and Forestry (SOM-AMAF) and the 34th AMAF meeting in Vientiane, Laos, on 27 September 2012, the initiative was devoted to promoting conservation agriculture as an eco-friendly and climate-resilient agriculture intensification in the ASEAN region, but later in 2017, it was driven to advocate more broadly for agroecology with the objective of developing a common position of ASEAN. In July 2019, during the 26th ASEAN Sectoral Working Group on Crops (ASWGC) in Singapore, Laos officially presented and succeeded in integrating its proposition to work on an ASEAN common position on agroecology in the work programme of the ASWGC. It also called for member countries to nominate LICA focal points who then agreed on the objectives of LICA: sharing successful experiences and learnings of ASEAN countries on policies and institutional mechanisms that efficiently support agroecological transition, facilitating their analysis through partnership with ASWGC.

Imagining and putting in place a new kind of policy process

Hence it was LICA, which, during the 29th meeting of ASWGC in July 2022, was mandated to draft ASEAN guidelines to support agroecology transitions. This led to the process of formalising the reflections on how to support agroecology transitions in the region through policy mechanisms. Guidelines were developed under the direction of LICA and the ASEAN Secretariat, through an inclusive, multistakeholder process led by CIRAD, ESCAP and FAO under ASSET.

ASSET organised a series of consultations around the scope and orientation of the guidelines. High-level special events played an important role in this process. One was a 1.5-day virtual multistakeholder regional workshop on agroecology and safe food system transitions: for green, resilient and inclusive recovery in the ASEAN region, organised in November 2021. It included a high-level segment on visions and strategies for sustainable agriculture transformation. This segment included statements from the Under-Secretary General of the

United Nations and Executive Secretary of ESCAP, the FAO Assistant Director General and Regional Representative for Asia and the Pacific, the Minister of Agriculture, Forestry and Fisheries from Cambodia, the Head of the Food, Agriculture and Forestry Division of the ASEAN Economic Community Department, the Director General of the International Cooperation Department of the Ministry of Agriculture and Rural Development in Vietnam, the Chair of the Executive Board of the Conservation Agriculture and Sustainable Intensification Consortium (CASIC) in Cambodia and the Regional Coordinator of LICA. The discussions around the requirements for a transition to agroecology and safe food systems fed the initiative to produce ASEAN guidelines on sustainable agriculture, and LICA processes and milestones, including ASEAN guidelines on agroecology transitions.

Another consultation, organised with the support of ESCAP and the ASSET policy dialogue team, was held in March 2023 as a side event to the 2023 Asian-Pacific Forum on Sustainable Development (APFSD) in Bangkok, Thailand. APFSD, an annual, inclusive intergovernmental forum to support follow-up and review of progress on the 2030 Agenda for Sustainable Development and the Sustainable Development Goals at the regional level, brings together governments, civil society, the private sector and other stakeholders to prepare for the High-Level Political Forum on Sustainable Development (HLPF). The 1.5-day ASSET side event gathered, among others, LICA focal points, representatives of civil society and farmers, including ALiSEA, the Asian Farmers Association (AFA) and the Asian Partnership for the Development of Human Resources in Rural Areas (AsiaDHRRA), comprising 11 social development networks and organisations in 11 countries. AsiaDHRRA is well established in the region and has strong links with the ASEAN Secretariat in connection with its work on the development of the ASEAN master plan on rural development and poverty alleviation. An objective of the Bangkok meeting was to discuss the strategy for the multistakeholder process and associated concrete development of the guidelines. The participants identified key actions for the way forward, which included planning for upcoming regional, but also national consultations.

During the months leading to the next important collective event, a human-centred design thinking process was facilitated by ESCAP, to use the daily challenges of target users to frame the structure and content of the guidelines. The consultative process involved, among other stakeholders, the ASSET policy dialogue team, ALiSEA and the regional research platforms MALICA and ASEA. Rather than remaining at the high policy level, the idea was to have an inclusive policy process that would respond to the needs of different stakeholders allowing to produce guidelines relevant for different countries in the region and for different types of decision makers. The types of target users have been described as “champions”, who advocate from within, leading the advancement of agroecology from within the government, “coordinators”, who work with others to bring different stakeholders and processes together, “technical experts”, who work with “champions” and “coordinators”, either within the government, or through development partners’ interventions, and “advocates”, who are on the outside of government advocating for change. The guidelines were developed to meet the practical needs of these users, supporting their role in advancing agroecological transitions, rather than providing guidance on the “how to” of agroecology practices.

Imagining the policy guidelines together

The template developed through the consultative process was further improved and given more substance during a policy dialogue organised as a preliminary event to the international conference “Transitioning towards agroecology and regenerative agriculture: a contribution to food systems transformation (TARASA23)” in October 2023 in Siem Reap in Cambodia. TARASA is an international workshop organised by CASIC, an intersectoral platform driven by the Cambodian government gathering a vast network of organisations that are working on conservation agriculture and sustainable intensification in Cambodia. The establishment of CASIC followed a long collaboration between the Cambodian Department of Agricultural Land Resources Management (DALRM) and CIRAD on innovative cropping systems and practices based on the principles of conservation agriculture. The policy dialogue was hosted by the government of Cambodia through CASIC and co-organised by FAO, ESCAP and CIRAD under ASSET. Thanks to complementary financial support from FAO, it involved over 70 participants from agriculture and food system communities in Southeast Asia and Europe, in particular representatives from the ASEAN Secretariat, and representatives from governments and farmer organisations from several ASEAN countries (Indonesia, Laos, Malaysia, the Philippines, Thailand and Vietnam). The full-day workshop aimed at generating recommendations for policy support for agroecology transitions, contributing to inform ASEAN policy guidelines’ framing and content. It was the first big collective discussion on what the guidelines could look like. Organising the workshop together with TARASA was a way of facilitating the mobilisation of various stakeholders, thereby strengthening the underlying broad-based multistakeholder policy processes and connecting to more encompassing Asian and global dynamics.

13 ASSET: BUILDING MOMENTUM TOGETHER

Looking far through a policy window

In 2024, Laos assumed the ASEAN chairmanship under the theme ASEAN: enhancing connectivity and resilience. One of the objectives of the chairmanship was to adopt the ASEAN action plan on sustainable agriculture, following the ASEAN guidelines on sustainable agriculture adopted in 2022. With the interest of the Lao partners for agroecology, the chances of endorsing the guidelines under the Lao chairmanship were better than they would be in other circumstances. This meant that the document had to be finalised and validated before the end of the chairmanship year. As this was not the initial plan, accomplishing this required adaptation to a new schedule, redesigning the process, assigning more resources into this component of ASSET and putting more effort from the small CIRAD, ESCAP and FAO team guiding the process, together with DALAM and LICA. This chance to use a policy window could not be overlooked and the project team decided to take up the challenge of speeding up the process to try to leverage the Lao chairmanship to achieve a policy outcome that would exceed initial expectations. The effort, supported by all the partners, resulted in submitting the final document to the ASEAN Secretariat at the end of May 2024.

Throughout the process, the guidelines have been presented in national level consultations in Cambodia, Indonesia, Laos, the Philippines, Thailand and Vietnam. These national consultations, co-organised by AsiaDHRRA, the Senior Officials Meeting on Rural Development and Poverty Eradication (SOMRDPE), SOM-AMAF, ASWGC and LICA with support from FAO, the Agroecology Coalition and ASSET, had as objectives to socialise key ASEAN instruments – the master plan on rural development and the guidelines on sustainable agriculture – as starting points for building strategies and actions in support of food systems transformation; generate inputs from national stakeholders; provide an inclusive space for family farming organisations and civil society to participate in shaping the policy agenda; and catalyse potential multistakeholder partnerships and mechanisms needed to sustain the process of developing impactful action plans for agroecology and food systems transformation.

The guidelines were adopted at the 45th SOM-AMAF held in Johor Bahru, Malaysia from 6 to 8 August 2024; and during the 46th meeting of the ASEAN AMAF held virtually on 24 October 2024.

The guidelines are organised under seven transition leverage points which address transitions from different but complementary perspectives: (1) planning; (2) working with farmers; (3) intervening along the agrifood value chains; (4) multistakeholder engagement; (5) capacity building and knowledge sharing; (6) developing a research agenda; and (7) financing. These points outline voluntary interventions that countries can adapt based on national contexts and priorities.

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The next step for member states is to build national action plans to integrate agroecology transition targets and policy support into national development strategies, including for food systems, with the wide engagement of relevant actors, within and outside of government.

To keep the wheels turning

Even though the ASSET project ends in 2025, conditions are created to sustain the necessary dynamics. The idea is that LICA, recognised at ASEAN level as the reference group on agroecology, follows up the process of the guidelines' implementation with the ASEAN Secretariat and ASEAN sector working groups, holding stakeholders accountable for the implementation. Strengthening ALiSEA and involving it in the national consultations together with AsiaDHRRA helped to integrate it in the ASEAN guidelines process. The link with ALiSEA is to be further strengthened by making knowledge resources referenced in the guidelines available through the ALiSEA knowledge hub, whose development is currently supported by ASSET and to be continued, with funding already secured through the commitment of the Swiss Development Cooperation (SDC).

Supporting and strengthening networks and platforms like ALiSEA, LICA, CASIC, ASEA and MALICA creates an environment for the work to continue after the project ends. Identifying and working with champions, individuals committed to the same goal and driven by a shared vision of agroecology – in CASIC, LICA and other participating organisations and institutions – increases chances for continuous commitment of these organisations, beyond project duration, in a similar manner as nurturing partnerships and broadening alliances makes them last. Building on previous work and creating conditions for continuation beyond a project cycle, tapping into already existing regional dynamics, helping build the capacity of partners, keeping eyes open for a policy window and responding to it, are the strategies that allow to reach further along innovation trajectories and increase chances for bringing solutions at scale.

At the centre of the ASEAN policy guidelines on the agroecology transition process was an exceptionally close relationship between the ASSET partners involved in this project component. Each of the institutions brought to the table their respective networks, perspectives on development and their mandates to work at different levels: CIRAD its strong research-based network globally and locally, science policy expertise and good working relationship with national partners developed through its long-term presence in the region; FAO its convening power, mandate on agroecology and access to other multistakeholder regional and global networks, which resulted for example in the important connection with AsiaDHRRA; ESCAP its strong orientation to "greening" development strategies and engagement with government officials in policy innovation. A shared vision, excellent teamwork and commitment of champions within these institutions played a critical role in driving the process forward.

Agroecological farming in Vietnam

STORY OF CHANGE

Toward governance of the national agricultural innovation system in Burkina Faso: an interministerial coordination cell to **shape the directions & outcomes of innovation**

Authors: A. Sempore, A. Toillier, M. Gnoumou, Z. Segda, L. Nikiema, R. Kiogo

In Burkina Faso, a well-orchestrated series of European Union-funded projects have strengthened the capacities of the national innovation system over a 10-year period without discontinuities, between 2015 and 2025. These efforts culminated in the creation of the national agricultural innovation system coordination cell (CC-SNIA) in 2023, established by an interministerial decree. Participatory assessments led to define its governance and institutional anchoring. Ensuring synergies and alignment of multistakeholder consultations, capacity building and advocacy, played key roles in its creation, marking a significant step toward a sustainable and inclusive agricultural innovation system. Led by the Permanent Secretariat for the Coordination of Agricultural Sectoral Policies, the CC-SNIA ensures long-term coordination of innovation efforts. This story illustrates how public action contributed to bridge the functional gaps of the national agricultural innovation system.

What was the state of the national agricultural innovation system?

In Burkina Faso, the structural transformation of agriculture is a top political priority. Despite the progress made in recent years, Burkina Faso's agricultural sector suffers from low productivity, low intensification of production systems, poor access to markets, severe degradation of natural resources and poor access to credit, financial services, inputs and equipment.

To meet the food needs of its population and increase its wellbeing through improved agricultural productivity, the country needs to adapt, modify or even change the way it does its scientific and technological research, and integrate it into a socio-economic system conducive to innovation and impacts. In 2011, a ministry in charge of scientific research and innovation was created to design, implement and monitor government policy on scientific research and innovation for Burkina Faso's economic and social development. This was followed by the adoption of several strategic policy documents on scientific research and innovation, including the Law on the Orientation of Scientific Research and Innovation and the National Innovation Strategy 2016-2025.

Policy workshop Burkina Faso

Despite the existence of an enabling political and institutional environment, at the level of the state structures responsible for coordinating policy implementation, the operational distinction between the concept of innovation and scientific research remains in an embryonic state. Very little is being done to strengthen the culture of innovation among the players in agricultural development.

"This is partly due to the fact that many large-scale interventions are still largely externally driven, preventing the launch of autonomous, long-term transformation dynamics that simultaneously involve all the players concerned," said Dr François Lompo, former Burkina Faso Minister of Agriculture, in 2019.

The obstacles to the good functioning of the national agricultural innovation system in Burkina Faso are linked to (i) the lack of innovation support services adapted to the needs of innovative project leaders; (ii) the weakness of coordination between actors and activities of the innovation system around common objectives (vision, strategy, means); and (iii) the disparity of data on indicators of agricultural innovation performance functions.

" Providing Burkina Faso's national agricultural innovation system with a high-level coordinating instance is crucial to strengthening it," said Alain Sawadogo, Technical Advisor to the Ministry of Agriculture, Animal Resources and Fisheries, in his opening speech at the technical workshop to identify new mechanisms with potential impact on the performance of Burkina Faso's agricultural innovation system in 2021. In addition, he noted that *"Burkina Faso needs to stimulate innovation, make stakeholder networks more effective and dynamic, and so on. This will only be possible if our country profoundly and sustainably modifies the institutional and political environment in support of agricultural innovation, in order to set in motion autonomous dynamics of sustainable transformation that will simultaneously involve all the actors in the system".*

This started to pave the way towards a durable coordination mechanism of key actors in the national agricultural innovation system.

How have a series of agricultural innovation capacity-building projects contributed to the establishment of the CC-SNIA over the long term?

"The creation of the CC-SNIA is a necessity for sustainable agricultural development. It is a much-awaited instance," said Dr Halidou Compaoré, Researcher at the National Centre for Scientific and Technological Research (CNRST).

In Burkina Faso, a well-orchestrated series of European Union-funded projects have strengthened the capacities of the national innovation system over a 10-year period without discontinuities, between 2015 and 2025. The CDAIS project (2015-2019) started with the strengthening of the capacity to innovate at policy level and at the level of innovative project leaders. To address the institutional and political constraints related to agricultural innovation after the CDAIS project, a policy dialogue roundtable was organised in 2019 for greater political support for agricultural innovation. One of the main recommendations coming out of this policy dialogue roundtable was the creation of a coordination cell for the national agricultural innovation system to continue the dialogue mechanism around the issue of supporting agricultural innovation, not only through the national research system but also through other actors and mechanisms, such as entrepreneurial ecosystems or community-led innovation ecosystems. This recommendation has been taken on board by the TAP-AIS project (2019- 2024), which has helped to further strengthen the institutional and policy environment for agricultural innovation in Burkina Faso.

In addition, the participatory action-orientated assessment of the performance of the national agricultural innovation system carried out as part of the TAP-AIS project highlighted functional gaps that need to be bridged by public action and not by private investments or project-based approaches (FAO, 2021). The strategy proposed to fill these gaps is based on systemic innovation capacity development, with a particular focus on reorienting the mandate and actions of certain actors in the national agricultural innovation system, and on the implementation of a monitoring-evaluation system to help adjust the policy instruments to be deployed or strengthened along the way.

In order to assess the feasibility of setting up a coordination cell for the national agricultural innovation system, a consultation of key stakeholders was carried out in 2022. The specific aim of this process was to define a sustainable operating mechanism for the unit to be created, specify its institutional anchoring and identify a structure capable of operationalising the monitoring-evaluation and action capitalisation system. The consulted stakeholders unanimously stressed the need and relevance of setting up a body for political dialogue on the national agricultural innovation system. Such a mechanism would provide a broader framework for concerted action, helping to focus political action on strengthening the system's dynamics and effectiveness. Drawing on the results of these political consultations, the TAP-AIS and AcceSS projects (2021-2025) organised several workshops with each of the key organisations to deepen reflection and co-construct the conditions

necessary for the establishment and efficient, sustainable operation of this mechanism. The reflections were informed by continuous practical experience and learning from those innovative mechanisms in support of innovations arising from multi-actor innovation partnerships ongoing in the country. Providing concrete examples and challenges of the different ways to efficiently mobilise research, farmer organisations, civil society, private firms, public agencies towards successful agricultural innovations was key to incentivise, motivate and support this policy innovation: the CC-SNIA.

" The creation of this cell is eagerly awaited, as it will help to ensure that innovation systems are taken into account in agricultural policies. The cell's attachment to the Permanent Secretariat for the Coordination of Agricultural Sectoral Policies (SP-CPSA) will speed up the process,"

said Dr Michel P. Sedogo, (retired) Researcher, SNIA resource person. Thus, the CC-SNIA was created in June 2023 by joint interministerial order of the Ministry of Agriculture, Animal Resources and Fisheries (MARAH), the Ministry of the Environment, Water and Sanitation (MEEA), and the Ministry of Higher Education, Research and Innovation (MESRI) to improve governance and coordination of the national agricultural innovation system beyond short-term projects. The cell is chaired by the SP-CPSA, an interministerial structure which is one of the institutional mechanisms for coordinating agricultural sector policies created by the Burkina Faso government in 2001. The main mission of SP-CPSA is to help steer and support the implementation of rural sector policies.

Key mechanisms leading to the creation of the CC-SNIA

"I am particularly satisfied with the actions undertaken by the projects (CDAIS, TAP-AIS and AcceSS) to build the capacities of institutional and political stakeholders, on the one hand, and to set up the CC-SNIA, on the other. This mechanism for foresight, reflection, consultation and strategic proposals will certainly provide an answer to the lack of synergy of action between the stakeholders in the national agricultural innovation system," said Dr Zacharie Segda, Institutional Facilitator who led the political consultation process between 2017 and 2023.

Along the pathway of the three successive innovation capacity-building projects, the creation of the CC-SNIA is the result of several key mechanisms put in place along a triple pathway of change with interventions at three levels: policies, innovation support services and innovation niche partnerships. Among these mechanisms, multistakeholder consultations and participatory workshops helped to co-construct a common vision and identify the conditions required for effective coordination of agricultural innovation. At the same time, capacity building, experimentation with governance models and capitalisation of best practices helped figuring out the institutional anchoring for the unit. Finally, active advocacy and the mobilisation of resources led to the adoption of an interministerial decree guaranteeing the unit's existence and long-term operation.

"The creation of the CC-SNIA is the fruit of a long process, which began with the CDAIS project, continued with TAP-AIS and culminated with AcceSS, in collaboration with key national organisations, CIRAD and FAO. Its creation represents a major step forward, fulfilling one of the key recommendations of the policy dialogue roundtable. This journey has been marked by numerous initiatives aimed at strengthening the institutional and political environment in favour of agricultural innovation in Burkina Faso," said Moussa Maiga, FAO Burkina Faso Programme Assistant.

Roots of resilience: **empowering farmers through agroecology** to heal Ethiopia's soils

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In Ethiopia, agrifood systems face sustainability challenges such as climate change and soil degradation. Agroecology offers a transformative solution by integrating ecological, social, economic and political dimensions. ProSilience builds on previous initiatives to implement agroecological practices, improve policies and share knowledge. A critical factor for successful adoption is the ability to "witness success". Farmers are more inclined to adopt new practices when they observe tangible benefits firsthand. Model farmers demonstrate innovations like vermicomposting and biofertilisers, fostering peer-to-peer learning. ProSilience accelerates agroecological transitions, strengthening local ownership of sustainable practices. Back-to-back with this is the role of available data in influencing policy; data-driven decision making is key to inducing change. Tools like the Ethiopian Soil Health decision support tool provide precise fertiliser recommendations, leading to policy shifts.

The Ethiopian agrifood system is grappling with significant sustainability challenges, including climate change, soil degradation and a rapidly growing population. These factors have led to the expansion of agricultural land, which in turn exacerbates social and ecological issues, creating a detrimental cycle. This is where agroecology comes into play. By weaving together ecological, sociocultural, technological, economic and political factors from production to consumption, agroecology offers a roadmap for the sustainable transformation of agrifood systems in the country.

Since 2015, farmers have worked with professionals from GIZ and other organisations in the global programme "Soil protection and rehabilitation for food security" (ProSoil). ProSilience, a component of ProSoil, provides further momentum to this collaboration by focusing on three main outputs: (1) implementing innovative technical and socio-economic agroecological measures on the ground; (2) improving the respective political and research framework conditions; and (3) using effective knowledge management to exchange lessons learnt, experiences and innovations with various stakeholders from national to international levels.

ProSilience operates across multiple levels, spinning a web between policy, research and on-the-ground implementation, whereby concrete results and learning experiences from the field are used directly to convince decision makers and other relevant stakeholders of the agroecological approach. In Ethiopia, the project implements the fourth and final phase of a structured approach to agroecological transition in areas where ProSoil has previously established groundwork.

"Quick win" strategy for promising results

At farm level, farmers test the so-called "quick wins" – practices such as improved seed varieties, combining organic and inorganic fertilisers, and applying lime to address soil acidity. By using these technologies, farmers can yield significant results within a single growing season, encouraging them to embrace new methods while fostering the trust necessary for more extensive changes.

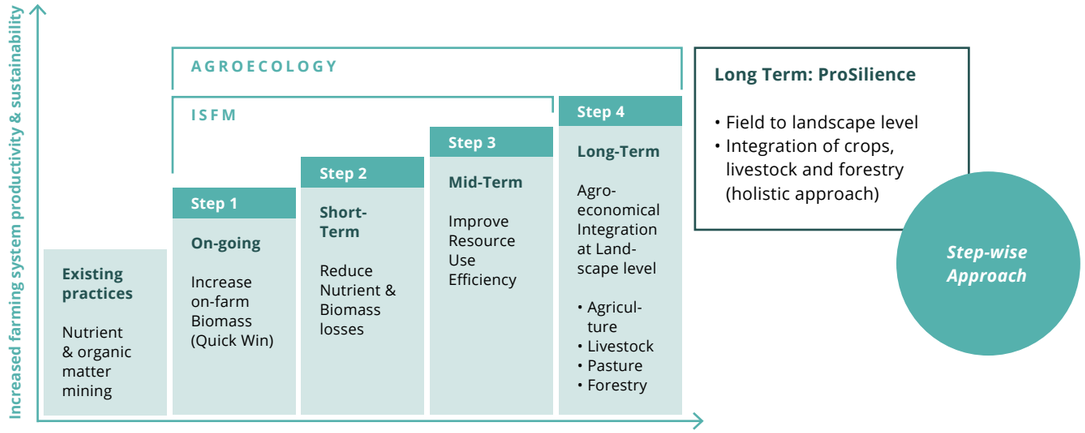
Subsequent steps focus on minimising nutrient and organic matter loss and improving nutrient use efficiency, gradually broadening the scope to include the entire watershed, by working with relevant associations on the ground. The final phase aims for the long-term integration of the crop, livestock and forestry nexus at the landscape level. Farmers work together supported by researchers, to take action from farm to watershed level and to apply agroecological methods that enhance biodiversity, optimise resource flows and ultimately create resilient food systems.

Model farmers: hands-on experimentation to improve soil health

Hand in hand with researchers, farmers are driving change. Model farmers, also called ambassador farmers, are role models who help smallholder farmers adopt farming practices to increase yields and income. These motivated individuals are empowered to showcase innovative practices on their farms, including the installation of biodigesters for cooking and fertiliser production, the use of worms for composting, and green manuring to enrich soil nitrogen and organic matter (Roobroeck and Vanlauwe, 2024). By demonstrating tangible benefits, such as improved soil health and increased yields, these farmers promote wider adoption of the practices, cultivating a self-sustaining network of knowledge transfer and agricultural transformation within their communities, thereby creating a ripple effect of change.

Model farmers are selected for their openness to innovations and their commitment to sharing knowledge with fellow farmers. They position themselves as change agents within their communities. They receive comprehensive training, initial input support and guidance from extension workers that enable them to effectively implement integrated soil fertility management (ISFM) techniques (Nekesa et al., 2024).

Innovation platform farmers visioning exercise



Enare Beste, a female farmer from Bursa district in the Sidama region of Ethiopia's Highlands, has gained valuable insights in ISFM through a model farmer in her village. Reflecting on her experience, she shares: *"Thanks to the ambassador in my village, I've acquired many useful skills that enhance my farming activities. It was important for me to see the technologies on his farm before investing in my own, because it's a lot of money for me. I now collect cattle urine and manage vermicomposting on my farm. Using the cattle urine as spray on my vegetables has significantly reduced insect infestations and improved my yields".*

Birke Torba's journey as a model farmer began amid significant challenges. In a community where local beliefs regarded worms as symbols of impurity, she encountered rejection from her family and neighbours when she introduced vermicomposting, a highly effective method of producing organic fertiliser using worms. Despite the stigma surrounding her innovative approach, Birke remained steadfast in her conviction that vermicomposting could enhance soil fertility and increase crop yields. As her crops thrived, so too did the acceptance of her methods. *"Initially, my family thought I was crazy for working with worms,"* Birke recalled. *"But when they saw the results, larger, healthier crops, they began to understand. Vermicomposting has not only transformed my farm but has also empowered me to challenge longstanding beliefs. Today, I take pride in being a role model for others in my community."* Data collected by ProSilience on IFSM demonstration plots between 2016 and 2022 revealed average yield increases of up to 83% for maize in the first year of using ISFM, highlighting the significant impact of the practices.

Despite the potential of these practices, financial constraints, labour intensity and scepticism prevent many farmers from adopting them. Adoption is uniformly associated with higher crop incomes and labour demand (Hörner and Wollni, 2021). To overcome these challenges, peer-to-peer learning, on-farm demonstrations and the local production of inputs are employed to foster trust and confidence among farmers.

In the highlands, farmers compete for access to biomass. This biomass is not only a critical resource for fertiliser production, but is also used for livestock feeding, fuel for cooking and erosion control. In response to this pressing issue, farmers learnt about ways to optimise biomass utilisation. A key initiative has been the promotion of locally produced micro-gasifier stoves, which burn cleanly, consume less fuel and offer an efficient energy solution, thereby alleviating pressure on biomass resources.

Assuming full responsibility for change: the CoMADI initiative

As the focus broadens from individual farms to entire watersheds, collaboration and community engagement become increasingly vital. ProSilience has collaborated with local governments to foster community involvement through the Community Managed Agricultural Development Initiative (CoMADI), aiming at getting local farmers and stakeholders actively involved in planning, implementing and monitoring agricultural projects. This initiative was developed in response to challenges posed by traditional top-down implementation approaches, where high staff turnover, understaffing and the limited functionality of some committees hindered progress and reduced community participation. By transferring control to organised and legalised watershed user associations, CoMADI ensures that communities assume full responsibility for managing agricultural development resources, including financial transactions, with support from existing government structures. This innovative framework empowers communities to oversee agricultural development resources via organised watershed user associations. Under CoMADI, communities manage a project fund for agricultural development within their watershed, implementing initiatives such as by-law development for soil rehabilitation, construction and maintenance of erosion control structures, grazing management and agroforestry.

By taking ownership over the collective management of their watershed's development, communities not only enhance agricultural productivity but also sustainably strengthen their social and physical capital. This model has proven effective in increasing transparency and accountability, reducing administrative costs and accelerating project implementation. By integrating participatory decision making and sustainable financing mechanisms – such as payment for ecosystem services and partnerships with private companies – CoMADI is fostering long-term resilience and self-sufficiency among farming communities.

1] https://communities.agroecologytpp.org/topics/21467/page/agroecology-leadership-academy

Convincing evidence to influence policy decisions
Effective soil management also requires tools to enhance nutrient use. To address this need, project partners have supported the establishment of the Ethiopian Soil Health decision support tool (DST), a pioneering resource on the African continent aimed at improving nutrient use efficiency. This innovative tool provides tailored location-specific fertiliser recommendations and yield forecasts, drawing on 50 years of crop response data consolidated through collaboration with farmers, government and research stakeholders. Developed using advanced machine learning, the DST delivers context-specific advisories, resulting in remarkable outcomes: farmers who employed the DST in the piloting phase experienced an average wheat yield increase of 38% compared to traditional blanket recommendations.

The data used to develop the tool were also used to create a policy brief advocating for a change in imported fertilisers. In response to this recommendation, the Ethiopian government decided to focus solely on importing nitrogen and phosphorous fertilisers, eliminating other nutrients that are not primarily yield-limiting. This strategic shift has the potential to save the country millions in imports. ProSilience aided in disseminating these findings with all the data generated by a diverse range of stakeholders. In addition, ProSoil/ ProSilience has established an MSc programme in agroecology at Haramaya University and incorporated ISFM and agroecology concepts into MSc and PhD curricula at Hawassa University.

Strengthening local ownership: the Agroecology Leadership Academy

Creative approaches to sharing experiences and co-creative, mutual learning have also proved successful in ProSilience, for example in the form of an Agroecology Leadership Academy. The Academy, which brings together 38 participants from various sectors in Ethiopia and six other countries, integrates three key objectives – learning, acting and networking – with methodological principles such as linking agroecology with leadership, transformation initiatives and strong communication.

The Academy was organised in sowing, growing, harvesting and transforming phases, following a clear progression path for Ethiopian participants from highlands and lowlands. Throughout this journey, international events and online sessions provided them with essential inputs and tools to foster leadership and teamwork, while country-specific initiatives facilitated practical application and real-world impact. The participants collaboratively developed three agroecology transformation initiatives. These initiatives include an evaluation of how agroecological principles are embedded in national policy and the integration of these principles into the Afar Pastoral and Agro-pastoral Research Institute.[7] In addition to this, the agroecological principles were demonstrated at a site in the Somali region. The initiative on policy is currently also being incorporated into the draft of the national agroecology strategy which is being driven by partners supported by the action. The World Agroforestry Centre (ICRAF) is leading this effort, with one participant from the leadership academy from Hawassa University, one partner from the established agroecology consortium and the ProSilience manager. The Ministry of Agriculture's state minister established a working group to promote the scaling up of agroecology.

Beyond the local level: from local experiences to scale up

One of ProSilience's trademarks is the collaboration with civil society organisations to promote agroecology at the national level and to generate concrete evidence and use cases for its benefits. One notable outcome was the establishment of the Ethiopian Sustainable Food Systems and Agroecology Consortium which was officially registered in 2024. The consortium, which comprises various local non-governmental organisations (NGOs), aims at facilitating policy dialogue and drafting a national agroecology strategy. Another partnership focused on collecting data and narratives to illustrate how agroecology enhances farmers' resilience and food systems during challenging times.

One outcome was that the farmer-to-farmer extension approach, facilitated by model farmers, has proven to be the most effective during times of crises and should be further scaled up. Discussions with various stakeholders, including government representatives, NGOs and private agro-dealers, are currently underway in collaboration with ProSoil to provide additional incentives and support for this system. Over recent years, conflicts, natural disasters and climate change have severely impacted farmers' production capacities. However, applying agroecological principles has enabled many to adapt and cope with external shocks. For instance, when conflict disrupts farmers' access to external inputs, the ability to multiply improved seed and produce organic fertilisers becomes crucial for survival.

" Thanks to the ambassador in my village, I've acquired many useful skills that enhance my farming activities. It was important for me to see the technologies on his farm before investing in my own, because it's a lot of money for me. I now collect cattle urine and manage vermicomposting on my farm. Using the cattle urine as spray on my vegetables has significantly reduced insect infestations and improved my yields."

PROSILIENCE
Biogas digester
Sidama

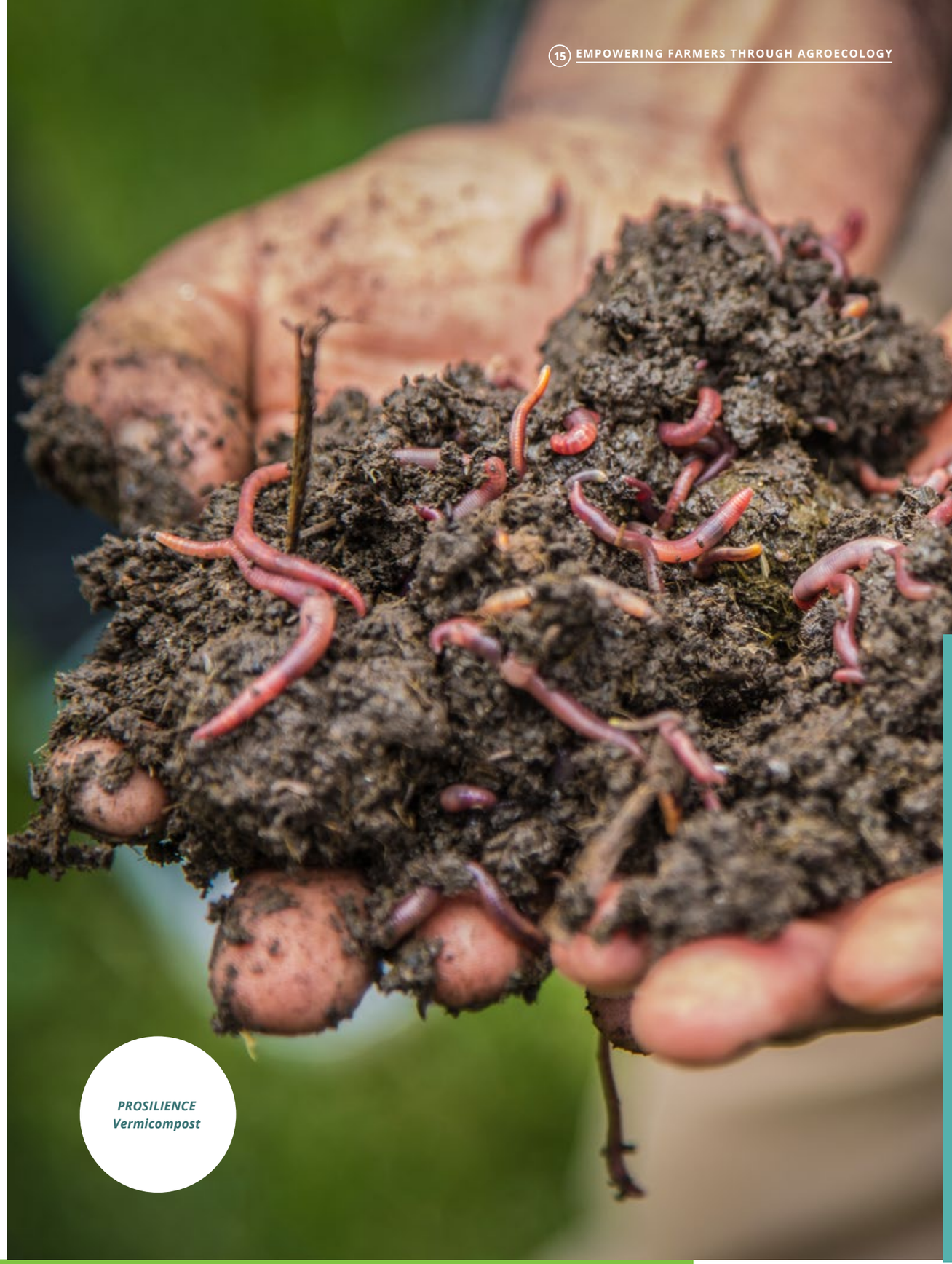
Hidrom Haileselassie, a farmer from the northern Highlands of Ethiopia, affected by recent conflicts, poignantly remarked: “If there is nothing left from the extension system, there is a farmer; don’t worry, if all fails, there is a farmer”. This highlights the critical importance of local input production knowledge for resilience amid conflict, providing valuable evidence for policy makers and reinforcing the integration of agroecology into various initiatives and projects.

To further substantiate the progress of the agroecological transition, ProSilience employed the Tool for Agroecology Performance Evaluation[8] (TAPE) in collaboration with ICRAF. Applied in three districts – Hula, Sodo-Zuria and Wolmera in the Sidama, South Ethiopia and Oromia regions – TAPE assessed the advancement of agroecological practices. The findings were promising, revealing that 83% of participating farms were either transitioning toward advanced agroecological practices or had already achieved them. TAPE was also applied in three other countries as part of the collaborative project MAP.[9] The combined results from all four countries present a compelling narrative: a greater degree of agroecological integration correlates with improved economic, ecological and social performance across many indicators for the households assessed.

The sweeping impact of these efforts is evident in the broader landscape through initiatives that encompass farms, watersheds and policy frameworks – and in collaboration with farmers, government entities, research institutions and sister projects.

2] Afar Pastoral and Agro-pastoral Research Institute, located in Samara, Ethiopia, is dedicated to advancing knowledge and practices in pastoral and agro-pastoral systems, https://research-nexus.net/institution/9001798242/. 3] Developed by the Food and Agriculture Organization of the United Nations (FAO). 4] Measuring Agroecology and its Performance, www.cifor-icraf.org/publications/pdf_files/WPapers/TPP-WP-8.pdf.

15 EMPOWERING FARMERS THROUGH AGROECOLOGY



PROSILIENCE Vermicompost

About the programme
As part of the German special initiative

“Transformation of Agricultural and Food Systems”, the global programme “Soil protection and rehabilitation for food security” (ProSoil) supports and advises smallholder farmers in Benin, Burkina Faso, Ethiopia, India, Kenya, Madagascar and Tunisia on agroecological and climate-smart agricultural practices and transformation processes focusing on sustainable land management.

Alongside the respective government agencies of each country, stakeholders from the scientific community, civil society and the private sector are also actively involved in the measures. The global programme is commissioned by Germany’s Federal Ministry for Economic Cooperation and Development (BMZ) and co-funded by the European Union and the Gates Foundation.

Since the beginning of the global programme in 2014, soil degradation has been reversed on more than 981 000 hectares of land. This results in an average yield increase of 44%, directly benefitting the lives of 2.5 million people.

CONCLUSION

The Stories of Change presented in this book demonstrate how innovations at various levels, particularly when occurring in the same context, can reinforce and build upon each other to foster transformative changes in agrifood systems.

The observed changes are of different nature: new crops and crop arrangements, new systems of livestock production, new linkages between producers and consumers, new supply chains, new territorial organizations, new agricultural services, or new policies.

For these changes to happen, empowering individuals and communities has proven essential in adopting new values and changing mindsets that unlocked new ways of collaborating, problem solving and scaling innovation towards a joint vision for the sustainable development of agriculture.

These social innovations are often pre-conditions, “in the sense of new skills, products and practices, as well as new attitudes and values” (Bock, 2012), for improved organizations and governance that can translate into more formal organizations - public or private – that provide vehicles for community-led development, adaptation and management of innovations.

These innovations, in turn, have gained sustainability through policy support. While policy changes have often emerged from the demonstrated success of local initiatives and the increased capacity of communities to engage in policy dialogue, the continued engagement of policy makers and the mobilization of regional organizations and alliances help to channel support and investment towards critical innovations and increase their potential for diffusion.

Critical to success across all levels, from micro to macro, of agricultural innovation systems, has been the establishment of multi-stakeholder platforms and mechanisms that enable dialogue, learning, and co-creation. These platforms have facilitated the emergence of local champions, strengthened community organizations, and created spaces for policy influence. They have also helped balance the multiple objectives of DeSIRA projects: environmental sustainability, economic viability, and social inclusion.

Ensuring bridging across levels also required scaling innovation products and support services as bundled innovations. The DeSIRA project teams played a role of orchestration of coupled innovation processes that was often ensured by researchers themselves and by champions emerging from communities involved in the projects. However, this function that requires specific professional skills needs to be formalized and recognized. This would lead to the integration of professional innovation facilitators as essential team members in such R&I projects.

More generally, the set of ad-hoc empirical innovation scaling strategies displayed in this book indicate that for future DeSIRA-like projects to act as “highly complex transformative vehicles” they should be equipped with tailored resources, tools and approaches, different from those used in traditional research projects. The stories also illustrate that projects need to further prepare and integrate at an earlier stage the types of stakeholder engagement strategy; co-creation approaches and scaling strategies they require to deploy their innovations. This is necessary to avoid the risk of not being able to go beyond the design phase and to ensure the establishment of scaling conditions. This also calls for the actions to be carried forward into other projects; often second project phases are needed to consolidate results towards impact.

The stories in this book reflect that although most of the DeSIRA projects did not fully operationalize scaling strategies, they made significant contributions to their design and to establishing scaling conditions within each specific context in which they operated. This was one of their key outcomes.

The sustainability and scaling of DeSIRA innovations requires attention to both economic and non-economic factors. While technological innovations need viable business models and market linkages, suggesting the need for higher mobilization and the establishment of early linkages with the private sector, their widespread adoption often depends on continued capacity building, network facilitation, and policy support.

In view of this, several DeSIRA projects suggest targeted and combined funding strategies that can address both dimensions: public support for enabling activities and private investment in viable enterprises.

Looking forward, the experience of DeSIRA projects highlights the importance of long-term engagement and the value of building on existing initiatives and relationships along innovation trajectories (Sodano, 2019). Success in generating lasting change requires sustained effort across all three levels - individual/community, technological, and policy - with careful attention to the interconnections between them.

Together with improved scaling readiness (Sartas et al. 2020), this integrated perspective and long-term innovation trajectories, sustained with secured adequate funding and policy support, will be crucial for achieving systemic impact in food systems transformation and agroecological transitions beyond the DeSIRA initiative.

Stories of change from Africa, Latin America and Asia

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COLOPHON

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Service Area 1 supports country-based DeSIRA projects to prove and improve their impacts on climate-oriented innovation systems in line with more sustainable food system transitions.
Service Area 2 supports the Comprehensive Africa Agriculture Development Programme (CAADP) ex-pillar IV organizations in their Agricultural Innovation Systems (AIS) related roles.
Service area 3 provides support to policy makers on themes related to agricultural research for development (AR4D) and innovation policies and programming.

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