



INITIATIVE ON  
Gender Equality

WORKSHOP REPORT

# BUNDLING SOCIO-TECHNICAL INNOVATIONS TO EMPOWER WOMEN AS PARTNERS AND DRIVERS OF CLIMATE CHANGE SOLUTIONS



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## ACRONYMS & ABBREVIATION

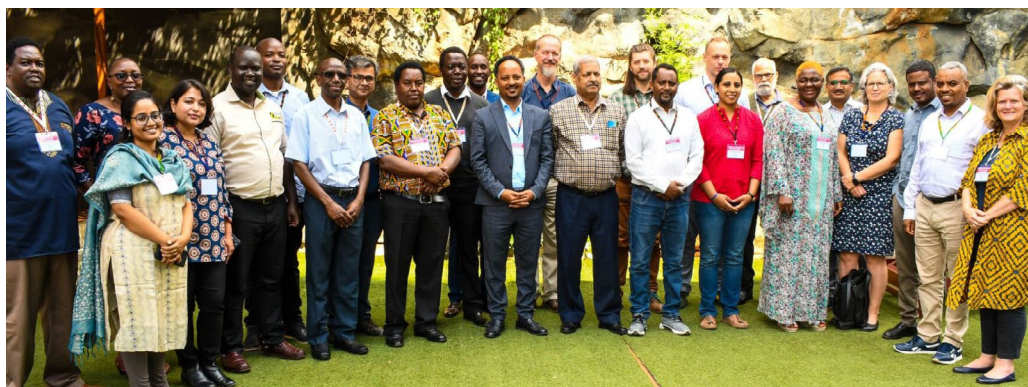
<b>ABC</b>	Alliance of Bioversity International and CIAT	<b>ILRI</b>	International Livestock Research Institute
<b>AFS</b>	agri-food systems	<b>IPM</b>	integrated pest management
<b>CGIAR</b>	Consortium of International Agricultural Research Centers	<b>KALRO</b>	Kenya Agricultural and Livestock Research Organization
<b>CSA</b>	climate smart agriculture	<b>IRRI</b>	International Rice Research Institute
<b>FAO</b>	The Food and Agriculture Organization	<b>SDG</b>	Sustainable Development Goals
<b>FFBS</b>	Farmer Field and Business School	<b>SHG</b>	self help group
<b>FMD</b>	foot and mouth disease	<b>SNV</b>	Stichting Nederlandse Vrijwilligers (Foundation of Netherlands Volunteers)
<b>GALS</b>	gender action learning systems	<b>STIB</b>	socio-technical innovation bundles
<b>GMO</b>	genetically modified organisms	<b>UN</b>	United Nations
<b>HASS</b>	Human, Heterogeneity Spillover, Scientific	<b>VBN</b>	Vegetable Business Network
<b>HERS</b>	Healthy, Equitable, Resilient, and Sustainable	<b>WP</b>	work package
<b>HIV</b>	human immuno-deficiency virus	<b>WVC</b>	World Vegetable Centre
<b>IIED</b>	International Institute of Environment and Development		

## CITATION

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## BACKGROUND

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Climate change exacerbates existing agricultural risks and shocks that farmers and other food system actors face in their everyday practice. Farmers are dealing with the harsh realities of increasing intensity and frequency of flooding and extended drought, due to higher weather variability. Farmers need greater resilience to protect and improve their livelihoods. In responding to climate shocks and other challenges, farmers face choices and opportunities that vary widely, based on their geographic location, gender norms, access to information, technology, and safety nets. Each decision comes with risks and tradeoffs that they must carefully consider. Vulnerabilities are particularly high for women farmers and farmers from marginalized communities, who typically face additional barriers due to constraining social and gender norms.

Increasing the adoption of technical<sup>1</sup> and technological<sup>2</sup> innovations is critical to address the complex challenges posed by climate risks and to build greater resilience in the face of higher climate variability. However, technology adoption is often complex, given the diversity of farmers and their preferences. Women are less likely to adopt technical and technological innovations to address climate change in agriculture, land, and water systems. Evidence on these innovation's impact on women's empowerment or resilience is inconclusive. Gender and social inequalities deeply entrenched within the global agri-food system (AFS) prevent women, especially those dependent on agriculture, from building and enhancing their resilience to climate change shocks. In addition, women and marginalized groups are heterogenous, making it important to apply an intersectional lens (age, experience, class, ethnicity, wealth, gender) to our understanding of agricultural innovation and how to build resilience.

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1 Technical innovations refer to the acquisition of skills through training.

2 These are technologies like seed, inputs, and mechanisation, which often are targeted to men, but today are being co-developed and designed with women and minorities in mind.

Accelerating technology adoption in an equitable and sustainable manner requires a deep understanding of external drivers, social and gender norms, as well as institutional, policy, and regulatory contexts. Technology adoption is not a means to an end, but rather a process that should empower and support women and marginalized groups. Further, it requires a structured and systematic process or pathway towards bundling social, technical, and technological innovations. These pathways to empowerment and resilience should provide meaningful choices, agency and voice, and decision-making power, among other benefits. There is a recognition that we need to understand socio-technical innovation bundles (STIBs) and how they enhance women's and men's empowerment and resilience. How can we co-design and implement context-specific, climate-smart and gender-responsive STIBs? Efforts to understand and improve STIBs need multi-stakeholder collaboration and local community engagement, bringing the most vulnerable to the table alongside government, private, international and national non-governmental organizations (NGO). This way of selecting social and technical innovation bundles can contribute to women's and men's empowerment and resilience in the face of climate change.

To this end, we are building on Barrett *et al.*'s (2022) recent work on socio-technical innovation bundles (STIBs).<sup>3</sup> To move this work forward, the International Institute for Environment and Development (IIED) was contracted to carry out a scoping study and develop a framework for co-designing STIBs that positively impact women's empowerment and resilience. The study aims to guide our work and encourage innovations by relevant CGIAR and non-CGIAR actors. These STIBs should address climate change and increase adoption and impact by building resilience and enhancing empowerment for women and men. We are also piloting diverse co-developed bundles in different learning labs<sup>4</sup> in Africa and Asia. The learning labs bring together diverse actors such as the national agricultural research systems, private sector partners, national and international non-governmental organizations, local community stakeholders, and men and women farmers and livestock-keepers.

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3 Socio-technical innovation bundles (STIBs) are the combination (or combinations) of social, economic, technological, policy, or environmental innovations, and practices that would lead to combined and positive outcomes to farmers' livelihoods (Barrett *et al.* 2022).

4 Learning labs can be understood as multi-sectoral, multi-stakeholder and multi-disciplinary spaces where practice and research interact, and learning occurs through the intervention of STIBs (or the portfolio of activities).

## The CGIAR's Initiative on Gender Equality (HER+)

The CGIAR Initiative on Gender Equality (HER+: Harnessing Gender and Social Equality for Resilience in Agri-food systems) aims to achieve climate resilience by strengthening gender equality and social inclusion across food systems in the Global South. Together with partners, the initiative supports women to increase their agency and to acquire and gain control over resources. The initiative facilitates women's pathways to empowerment and helps them adapt to future climate-related shocks and stresses.

The initiative addresses four areas of gender inequality in the AFS: access to resources, women's agency, social norms and policies, and governance. The work in these four areas is divided into four work packages. This workshop is part of Work Package 2. This work package aims to achieve climate resilience by strengthening gender equality and social inclusion across food systems in the Global South. We develop and test context-specific bundles of social and technological innovations with the aim increasing adoption and benefits for women in agri- food systems.

As a part of this work, the IIED developed a draft framework based on the STIBs concept. The framework links access to productive technologies, resources, and services to achieving healthy, equitable, resilient, and sustainable (HERS) outcomes for farmers (Barrett, 2022). It has a strong focus on gender and empowerment. The framework was developed from a literature review of studies and reports that discussed gender, technology, resilience, climate smart agriculture, and documented outcomes. The team used a realist synthesis methodology to unpack the contexts, mechanisms for change, and the outcomes from the studies identified. The IIED team then interviewed experts who later suggested adjustments based on their experience. In the workshop, the IIED team shared the draft framework with participants who included researchers and practitioners in the agricultural research for development sector. They then sought feedback from participants to fine-tune and validate the framework. IIED also tested the application of this framework to specific projects, selecting context-specific interventions to build suitable STIBs that generate better outcomes and broader impacts. The framework will support the implementation of the learning labs in different agro-ecological and socio-cultural contexts across Africa and Asia.

## WORKSHOP OBJECTIVES

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The main objectives of the workshop were:

1

To share results from the scoping review study conducted by the International Institute of Environment and Development (IIED).

2

To develop stakeholders' shared understanding of the importance of STIBs for women's empowerment and climate resilience.

3

To test the draft framework of what makes STIBs work in specific contexts against participant's experience.

4

To use selected learning labs to test the framework for its effectiveness as a guide for selecting suitable and relevant bundles of interventions that are tailored to specific agro-ecological and sociocultural contexts.

5

To validate the framework and identify gaps based on learning from the pilot application.

## SESSIONS

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### PLENARY 1: Welcome, setting the scene, expectations

#### **Welcome Remarks by Dr Nicoline de Haan,**

#### ***Director CGIAR Gender Impact Platform, International Livestock Research Institute (ILRI)***

Dr. de Haan noted that past gender work was about giving women technology without much thought about how they would use it. This method did not yield much change because women lacked knowledge on how to use technology, which made it difficult for them to adopt and sustain it. The HER+ Initiative deviates from this norm by unlocking the “how” of empowering women to use technology and involving them as partners and agents of change. Dr. de Haan highlighted the stereotype and belief system that says women can only be involved in certain enterprises compared to others. For example, one stereotype says women can own chicken but not large livestock. Such norms have reinforced gender discrimination and blocked women from benefiting from the wider objective of gender empowerment. She noted the need to question and break such norms in order to widen the scope of women’s empowerment and benefit from research programs. She further noted the pivotal role played by WP2 to the HER+ project and to the CGIAR as a whole. The work package (WP) included issues of climate change, women’s empowerment, how to work with women, and how to make the AFS more resilient.

#### **Workshop expectation**

On behalf Dr Ranjitha Puskur, IRRI’s India representative, Dr Eileen Nchanji – gender and social inclusion expert, Alliance of Bioversity International and CIAT (ABC) – welcomed all participants and partners across Africa and Asia and thanked them for travelling to Nairobi, Kenya. She asked participants to introduce themselves to facilitate networking and information sharing. Then she asked participants to share their expectations for the workshop. Finally, Dr. Nchanji assured participants that workshop organizers would do everything they could to make sure that expectations were met before the end of the workshop.

The participants in the workshop expressed the following expectations:

1

To get a better understanding of STIBs and how to effectively integrate them with their own initiatives.

2

To explore the concept of social innovations and how they can be combined with existing technical bundles to enhance impact.

3

To learn from other stakeholders about existing and successful experiences around bundling of innovations.

4

To learn from partners about inclusivity in project implementation and incorporate lessons learned from their experiences.

5

To explore strategies for integrating digital platforms into learning labs, considering challenges such as limited literacy levels, internet access, and network connectivity.

6

To better define what learning labs are and how they operate.

7

To discuss and define the essential components of an effective learning lab across different initiatives.

# Understanding social and technical innovations in agri-food systems

By Kevin Johnstone and Sam Barrett,  
*International Institute for Environment and Development (IIED)*

## PARTICIPANT EXPERIENCES WITH TECHNOLOGY AND INNOVATION

To set the scene on understanding the social and technical innovations in AFSs, participants were asked to share their individual experiences with technologies and innovations that were revolutionary, stating who benefited. Breakout groups of two or three participants were formed to discuss these questions amongst themselves, and then share their conversations with the whole group. The following questions were presented for discussions.

- What kinds of technology bundles have you seen that are revolutionary for farmers?
- What made them revolutionary?
- Who specifically benefited from these technologies?
- Who did not benefit? Why?

During the discussions participants provided diverse definitions of these terms. For some, technology and innovation were seen as visible and tangible sets of inputs or tools that can be readily provided to farmers to enhance their agricultural methods. However, this definition overlooked the crucial drivers of adoption of these technologies, such as prevailing conditions and farmers' requirements.

Another perspective from participants is that technological innovation bundles are comprehensive combinations of specific inputs and tools, offered to farmers along with the necessary knowledge, information, and processes to facilitate their adoption, usage, and ultimate benefits.

This latter definition aligns with the understanding that merely providing farmers with a technological innovation is insufficient. They need a holistic approach that includes the dissemination of knowledge and information, and access to capital and other critical services necessary for successful adoption to occur. By acknowledging these multifaceted factors, we can enhance the effectiveness and impact of technology and innovation in agriculture. We take a broad view of 'innovations' and 'technologies' where innovations are doing something new and different, whether solving an old problem in a new way or a new problem with proven solution. Types of innovation include technological, social, policy, institutional and financial innovations. Technologies are 'the application of science and knowledge to develop techniques to deliver a new product and/or service or to use a new process to deliver an established product or service.'

**Examples of technological innovations described by the participants:**

The participants provided a diverse list of technologies and innovations, highlighting the fluidity in their definitions and interpretations. Some of the items listed include:

**Crop-related technologies:**

- Improved seeds (e.g. drought-tolerant varieties)
- Fertilizers (nutrient solutions)
- Pest and disease management strategies (e.g. chemical or biological control)

**Crop innovations**

- Improved crop varieties (e.g. indigenous vegetables)
- Cropping systems
- Awareness creation about availability of improved varieties

**Livestock related technologies:**

- Improved livestock breeds
- Livestock disease management practices
- Livestock feed formulation - Technology
- Vaccination against livestock diseases

**Livestock Innovations**

- Urea treatment of straws (value addition of poor-quality forage) - Technology/Innovation
- Chaffing fodder for value addition - Technology/Innovation

**Soil and water management practices**

- Irrigation machinery/Solar powered irrigation
- Animal feed supplementation for improving productivity
- Small agricultural tools/machinery (e.g. Small seed drillers, planters, ploughs, threshers etc.)

**Climate Smart Agriculture (CSA) technologies**

- Climate smart agricultural information advisories
- Provision of weather information to smallest units at farm level (e.g. a radius of 4 km) to ensure that farmers get more specific weather forecasts

**Digitization of agricultural information**

- Integrating business development and entrepreneurship with agricultural information in a single tablet for rural entrepreneurs.

**Technologies and innovation were considered revolutionary for farmers if:**

1. They increase or enhanced production or productivity.
2. They lead to better/premium market prices which lead to increased incomes.
3. They create an enabling environment for commercialization.
4. They improve social welfare.
5. They address household food and nutrition security and health through increased diet diversity (e.g. bio-fortified food with micronutrient).
6. They reduce drudgery, which increases time for other productive activities, especially for women (labour saving technologies).
7. They build climate resilience.
8. They allow production throughout the year.
9. They provide technical training in irrigation leading to water use efficiency.
10. They promote learning and sharing by providing digitized content, giving farmers a one-stop-shop for acquiring information and inputs.
11. They provide livestock vaccination to enhance production through reduced mortality.
12. They provide training, especially on gender, which leads to enhanced equity, where women have more control and participate in decision making of the household.
13. They provide training that helps farmers reduce dependence on extension agents when selecting technologies, facilitating their capacity to produce on time within the season.
14. They are easily accepted in the local cultural contexts.

**Profiles of farmers who benefited**

In terms of benefits, most participants acknowledged that only the targeted farmers benefited from the technologies and innovations that a particular programme worked with. This also meant that many of those who were not included in the ‘target group’ were excluded from the benefits. However, in terms of proportion, it was found that more men (about 60%) benefited from these technological innovations. Some participants noted that training sessions are usually structured so that more men than women can attend, even though the technology was often developed with women in mind. Some participants said that some technologies disenfranchise women by creating extra work, especially where weeding was involved.

Some of the barriers associated with women’s inability to benefit from technologies and innovations include lack of resources (e.g. land). Technology adoption may suffer from a lack of convergence between social innovations and technical innovations, such as an irrigation pump which may be good for increasing production but may not benefit women due to high costs. Sometimes gender norms can limit technology bundling. For example, in some farming communities, certain crop varieties are associated with specific gender roles, such as those traditionally considered as “women’s crops” and others as “men’s crops.” These cultural perceptions can lead to gender-specific preferences and limitations in technology bundling. Overcoming these

limitations will require extensive awareness campaigns that challenge gender norms, promote equality in decision-making, and highlight the benefits of adopting the new crop variety for both men and women. By doing so, technology bundling can address gender-specific barriers and promote more equitable adoption of agricultural innovations. The discussion above set the scene for our dialogue on socio-technical innovations, which is considered in the following section of this report.

### INTRODUCTION TO SOCIO-TECHNICAL INNOVATION BUNDLES (STIBs)

The presentation by the IIED team also focused on AFS resilience, especially with regard to shocks and stresses related to environmental, economic, or political conditions. Such shocks appear to be rising in frequency and/or intensity, and commonly cascade, with one triggering another. These shocks to AFSs increasingly appear to feed socio-political instability around the world in a potentially vicious cycle (Barrett et al., 2022a).

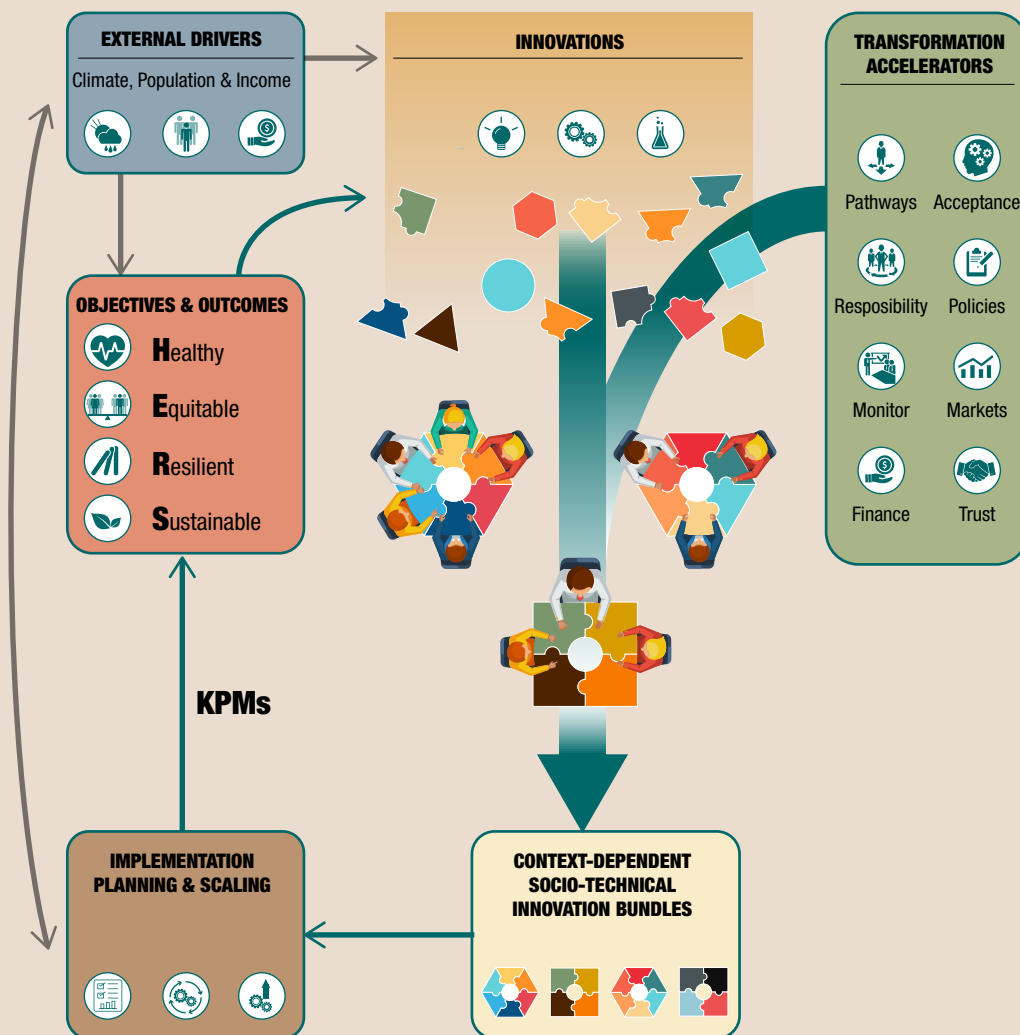
Workshop participants noted that today's AFSs fail to ensure healthy diets for all, a necessary condition for food security. Additionally, AFSs do not provide equitable and inclusive livelihoods for the roughly half of the world's labour force, more than 1.3 billion people, who work in agri-food value chains (Barrett et al., 2022b). To make innovations available, four key AFS features must continuously remain in the forefront: decentralized individual and collective human (H) agency that drives systemic change, the intrinsic heterogeneity (H) of AFSs locally and globally, pervasive spill over (S) effects, and the essential role of scientific (S) research. Attention to these HHSS (pronounced 'his') attributes is essential to avoid adverse unintended consequences and make real progress in the field of AFS (Barrett, et al., 2022b).

The four core objectives for the AFSs as stated in the shared vision 2045–70; beyond the 2030 horizon of the UN Sustainable Development Goals (SDGs) are:

- Healthy (H) and nutritious diets
- Equitable (E) and inclusive value chains
- Resilience (R) to shocks and stressors, and
- Climate and environmental sustainability (S)

To achieve these shared visions, IIED in collaboration with the CGIAR's Gender Equality Initiative, has developed a framework based on the STIB concept, which aims to achieve outcomes that are healthy, equitable, resilient, and sustainable (HERS). To achieve this goal, there is a need to identify and bundle the right innovations, which is intrinsically a social process. The AFS innovation cycle, as shown in Figure 1, consists of external drivers (e.g., demographic change, income growth, climate change) influencing collective objectives (e.g., HERS outcomes) and actor-specific objectives (e.g., firm profits or political power) and, jointly with those objectives, inducing myriad innovations by individuals and organizations.

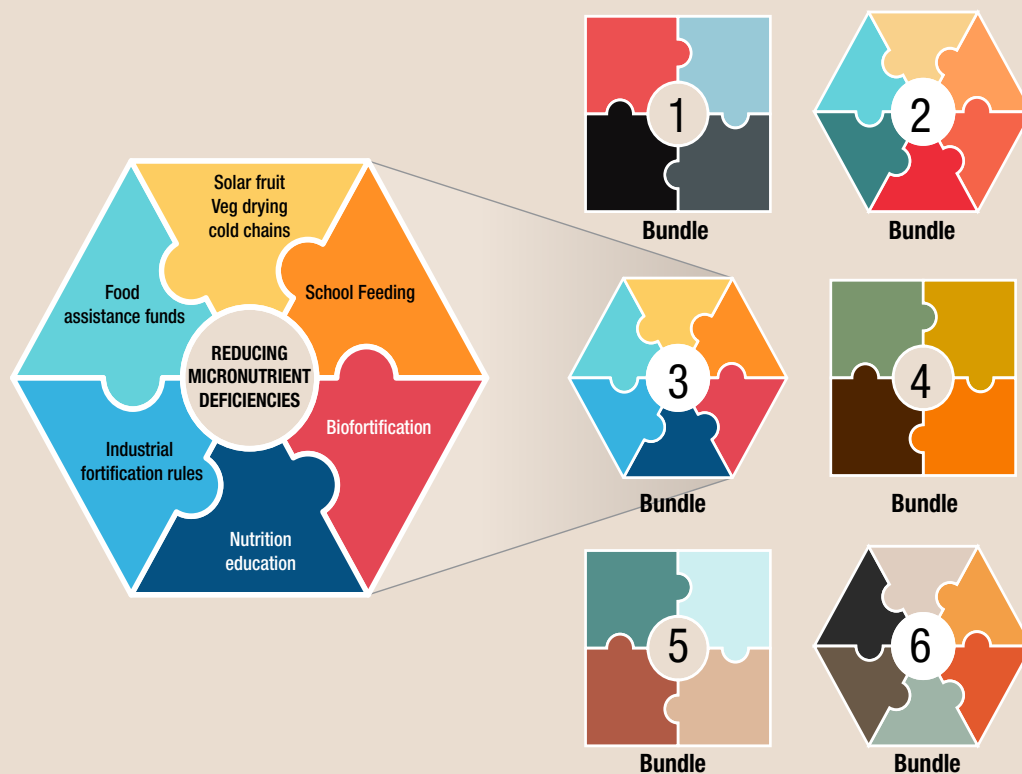
Innovations (represented by puzzle pieces) draw on different (natural or social) science-based methods (represented by different colours) to generate products, processes, or policies with distinct designs and purposes (represented by different shapes). Transformation accelerators, key enabling societal features, help AFS-specific stakeholders redirect some ill-fitting innovations back for adaptation to the local context and accelerate the combination of other innovations.



**Figure 1:** The Agri-food systems innovation cycle

Source: Barrett et al., 2022

Figure 2 shows how the socio-technical bundles should fit a purpose and objective. The context also matters. For example, the right combination for one specific objective in the enlarged case of Bundle 4 is to reduce micronutrient (i.e., mineral and vitamin) deficiencies. The other bundles shown can also fit in different contexts. The key point is that science and engineering can design and adapt the raw materials, but ultimately stakeholders must work together to assemble the right parts into fit-for-purpose innovations.



**Figure 2:** Socio-technical bundles fit for purpose to an objective and context

Source: *Barett et al., 2022*

To achieve a transformational AFS, stakeholders should ensure that the following processes occur:

1. Develop socio-technical innovation bundles
2. Reduce the land and water footprint of food
3. Commit to co-creation with shared and verifiable responsibility
4. Deconcentrate power
5. Mainstream systemic risk management
6. Develop novel financing mechanisms
7. Reconfigure public support for AFSs

## GROUP EXERCISE ON SOCIO-TECHNICAL INNOVATION BUNDLES (STIBs)

To enhance participants' understanding of STIBs, they were randomly divided into three groups. Each group discussed a given set of questions on their understanding of and experiences with STIBs.

The questions were:

- How do we define STIBs?
- What are examples of STIBs across regions and crop-livestock systems?
- What are existing frameworks or pathways to STIBs?

### Specific group work discussions on STIBs

#### GROUP 1

##### *How do we define STIBs?*

The group defined a social bundle as a process or a method describing how technologies are implemented to allow farmers to use them. It includes people, culture, finance, marketing, economics, policy frameworks, extension etc. On the other hand, the technical aspect of a bundle includes training and information systems that build shared knowledge. STIBs were seen as something that works in a particular context, minimizes trade-offs and gender inequalities, and optimizes synergies. The bundles should be co-developed by bringing all actors together.

##### *Example of STIBs across regions and crops/livestock*

The team cited the example of The Veggies 4 Planet and People project, being implemented by World Vegetable Centre (WVC) and the Foundation for Netherlands Volunteers (SNV) in Ethiopia. That project's objective is to generate income and employment by promoting regenerative agricultural practices and technologies, such as crop rotation, green manuring, bio-slurrying. The project combines technical skills and business components. The project uses a group-based approach – the Vegetable Business Network – composed of key vegetable value chain actors. The project's producers, aggregators, service providers, and others enhance cohesion among farmers and open spaces for networking and engagement to increase incomes.

##### *Existing frameworks or pathways to STIBs*

Existing frameworks include:

- Participatory approaches to the process of developing and adapting technologies, with active involvement of farmers, researchers, and other stakeholders.
- Innovation Platforms to collaborate and co-create solutions to agricultural challenges, which bring together diverse stakeholders, such as farmers, researchers, policymakers, and private sector actors.
- Farmer Field Schools which promote experiential learning and knowledge sharing among farmers.

## GROUP 2

This group provided different definitions for technology packaging and bundling. They defined “packaging” as the process of assembling technology information for specific entities. Bundling, on the other hand, was described as a seamless approach that combines multiple interrelated technologies to achieve better outcomes. Technologies were broadly defined as people-friendly processes, products, or advisory services that improve the way things are done, making them more meaningful and easier to implement.

Moreover, the group defined social technology innovations as decentralized and democratized mechanisms or processes that involve co-creation among multiple actors. These innovations combine different technologies to develop relevant and context-specific solutions. The group shared their perspective that bundling was more successful than packaging, suggesting that integrating multiple technologies in a coherent manner yields better results.

### Examples of STIBs

- Sheep fattening practice in the highlands of Ethiopia (bundling husbandry practice, labor relations, aggregation, and market negotiation (
- Integrated Pest Management (IPM) practice in India where the insect trapping is bundled with bio-insecticides and FAO-approved chemicals (Bun)
- VBN (Vegetable Business Networks) came together for production, market linkage and access to finance(also given as an example in group 1)

The team further described a STIB as a contextualized text message and training session designed to meet the desired needs of smallholder farmers. For example, a story-telling video production in Zambia trained women farmers to use climate advisories. Other farmers are learning from this experience. The process of empowering women farmers can be seen as a social innovation.

## GROUP 3

In Group 3, STIB was defined as a practical process of making theoretical approaches more applicable and outcome driven. They viewed STIB as a tool for intervention that enables the use of technology by addressing what is needed for different stakeholders to effectively apply a technology of interest. The focus was on achieving high-order outcomes such as household food security, resilience, and market linkages. The group emphasized the importance of addressing bottlenecks, such as the heterogeneity of beneficiaries, through targeted and tailored interventions.

Furthermore, the discussion highlighted the importance of multi-sectoral and stakeholder consultations using a transdisciplinary approach to build consensus and overcome divergence of opinions. The use of learning labs was suggested as a practical way to facilitate convergence. In India, “convergence” is a common concept that brings together different organizations with

different mandates to work towards a shared goal, encompassing input suppliers, credit institutions, output markets, technologists, cooperatives, etc.

The participants equated STIB to an “innovation system,” emphasizing the need to identify gaps and define specific activities to improve the implementation of practices. The framework under the HER+ project is characterized by addressing both individual and systemic aspects of the AFSs while prioritizing women’s empowerment. It consciously tracks interactions between social, economic, and technical components rather than treating them as an afterthought. Gender norms are a critical reference point for the STIB approach, involving scoping studies and listening to people to understand the underlying reasons for certain practices.

The group recognized that STIB should consider women’s empowerment as an impact area and goal, while also addressing precursors and process indicators. They emphasized the need to assess effectiveness and areas of struggle. Additionally, bundling should account for the politics of certain change processes, the vested interests that promote technologies, and the intervention strategies, including those advocated by scientists. This comprehensive approach ensures a holistic and inclusive implementation of STIBs in AFSs.

### Examples of STIB in group 3:

During the group discussions (Plate 1), participants mentioned India livestock vaccinations programs against foot and mouth disease (FMD), efforts that required stakeholder cooperation. However, implementations of STIBs get challenged by knowledge gaps and mistrust. Another example was the beans work in Kenya by CIAT and partners where stakeholders had built trust over time. In this project, farmers are involved from the beginning in identification and selection of indicators, climate Smart technologies are availed, and the training incorporate information on nutritional benefits.



**Plate 1:** Sessions of group discussions

### Summary of groups' definition of Socio-technical Innovation bundling (STIB)

In summary, there was no single definition of socio-technical innovation bundling (STIB). However, participants perceived STIB as a process that involves combining social, technical and technological innovations in a specific environment influenced by external drivers such as gender issues, institutions, climate change, and policies that affect adoption of innovations. For instance, an example of STIB in crops would entail improved seeds accompanied by the necessary input package, credit, market linkages, and training on management practices and gender considerations. In livestock, it might involve an improved breed along with feeding regimes, health/vaccination practices, credit access, and market opportunities.

Some participants defined STIB as a combination of technologies and innovations that collectively ensure the desired quality and quantity of produce to meet market demand. This includes various management practices, post-harvest management, value addition, market access, and better pricing arrangements.

Discussions highlighted that social bundles can be both tangible and intangible and involve influencing people's mindsets, which may take time. Awareness creation about new innovations or technologies, followed by individual processing of information, precedes the decision to adopt. Examples of social bundles include education/training, financial systems, policies, and institutions. Training provides information and knowledge about the technology, financial systems enable access to credit and loans for adopting innovations, and enabling policies and institutions create a conducive environment for adoption. These aspects trigger the individual's mindset to recognize the benefits of the technology.

Social bundles were also perceived as involving group approaches, collective actions, community-based, and interdisciplinary approaches, with an emphasis on building trust and learning from others. In contrast, technical innovation bundles were seen as primarily providing information about the technology, its operation, and benefits.

The discussions emphasized that STIBs should be demand-driven rather than supply-driven, emphasizing the importance of co-creation and co-development. Understanding the true needs of beneficiaries is crucial before delivering the bundles, as STIBs must focus on providing need-based solutions. Considerations of the socio-economic aspects of the farmers, such as land ownership, farm size, and intra-household dynamics, play a key role in selecting the appropriate STIB that can deliver the intended impacts. Employing interdisciplinary perspectives and involving diverse stakeholders, especially women and youth, while focusing on broader goals like empowerment and equity is essential.

Prioritizing technologies with the target beneficiaries can assist in selecting and bundling the most preferred STIBs. Understanding the reasons for technology adoption and identifying the

best pathways to deliver them are vital in the process. Considerations in STIB adoption includes building trust, understanding the ripple effects, and identifying potential trade-offs to ensure successful implementation.

### ***Main Considerations for Bundling***

During the workshop, all the groups discussed and compiled a comprehensive list of important considerations to keep in mind when bundling technologies and innovations (STIBs). These include:

- Understanding the farmers' context: Before bundling, it is crucial to thoroughly understand the farmers' resources, socio-economic circumstances, and environment. STIBs must be compatible with their specific conditions.
- Co-Creation with farmers, especially women: Optimizing impacts requires involving farmers, especially women, from the very beginning in the design of STIBs. Their active participation ensures that the bundles meet their needs effectively.
- Digital technology component: When incorporating digital technology in STIBs, assess the community's ability to own or access smartphones, availability of electricity and internet, and their familiarity with using digital services.
- Use of a suitable language: Consider using language that is suitable and easily understood by the target beneficiaries.
- Managing heterogeneous bottlenecks: Address both individual and systemic bottlenecks that may hinder adoption and impact. Farmers' specific aspirations and systemic challenges should be considered.
- Need for clear objectives and reference points: Define clear objectives for the STIBs. Whether it's empowerment, increased productivity, or resilience, develop a set of indicators to monitor progress. Recognize that women's empowerment indicators may not always align with the project cycle.
- Recognition of social norms and economic perspectives: Technology development and bundling should consider social norms and economic factors influencing farmers' decision-making.
- Context specific bundling: Recognize that farmers may have diverse objectives, such as food security, income, and reduced labor. Tailor the bundles to suit the specific context.
- Flexibility: Be open to flexibility in bundling. If a component is not beneficial, it can be removed. Consider how different technologies may have different requirements and impacts.
- Encourage adaptive learning: Promote adaptive learning to continuously improve the effectiveness of STIBs based on feedback and outcomes.
- Balance between local context and global ideas: Strike a balance between incorporating local context and adopting innovative global ideas (Disruptive STIBs).
- Prior assessment of technologies: Not all technologies are suitable for bundling. Evaluate their relevance and appropriateness for the specific context.
- Gender sensitivity: Be mindful of gender considerations and ensure that STIBs are designed

with gender equity in mind.

- **Gender transformative:** Consider how STIBs can contribute to gender-transformative outcomes, challenging existing gender norms and roles.
- **Addressing conflicts:** Anticipate potential conflicts and address them proactively in the design and implementation of STIBs.
- **Decision-making processes and risks:** Understand the decision-making processes involved in adopting STIBs and assess associated risks.
- **Select optimal bundles:** Aim for optimal combinations of technologies and innovations that lead to desired outcomes.
- **Accountability:** Ensure accountability in the implementation of STIBs and monitor their impact.
- **Cost, livelihood fulfilment, and market considerations:** Take into account the costs, impact on livelihoods, and market potential of STIBs. Use available qualitative and quantitative data, including historical data from existing projects.
- **Identifying elements and partners:** Identify the key elements of STIBs and collaborate with relevant partners to maximize their effectiveness.
- **Glossary of terms:** Provide a glossary of terms and their definitions to enhance understanding and communication.
- **Political will:** Strong political support is essential for successful implementation of STIBs.
- **Individual definition:** Contextualize and define STIBs based on the unique needs and preferences of farmers.
- **Farmer context:** Tailor STIBs to suit the needs and circumstances of individual farmers.
- **Managing politics and power dynamics:** Be aware of and navigate the political and power dynamics at both the country, research, and household levels.

By taking these considerations into account, the development and implementation of STIBs can be more effective, efficient, and sustainable.

### **Existing Frameworks and Pathways to STIB**

The workshop discussions revealed that most of the frameworks for socio-technical innovation bundling (STIB) are flexible and highly dependent on the specific project objectives. Participants acknowledged the contextual nature of these frameworks, considering the diverse needs of the target beneficiaries. Therefore, it is essential to adopt more exploratory and participatory frameworks, which are oriented to multiple stakeholders and can be adapted at different levels of implementation. Building such frameworks requires identifying suitable entry points, such as asking farmers about their aims, defining clear objectives, envisioning the necessary steps, identifying data requirements and sources, and designing and operationalizing frameworks to effectively empower women.

Examples of existing frameworks that were shared during the discussions include:

- **Agriculture information systems:** These frameworks focus on utilizing information and communication technologies to disseminate relevant agricultural knowledge, innovations, and market information to farmers.
- **Partnership and stakeholder involvement:** This framework emphasizes collaboration among various stakeholders, such as government agencies, NGOs, research institutions, and private sectors, to jointly develop and implement STIBs.
- **Scaling platforms:** These platforms are designed to scale up successful technologies and innovations from pilot projects to broader adoption.
- **Leveraging partnerships:** This framework emphasizes leveraging the strengths and expertise of different partners to create effective and comprehensive STIBs.
- **Innovation platforms:** These platforms bring together diverse actors, including farmers, researchers, and policymakers, to co-create and share innovative solutions.
- **Multi-actor platforms:** Similar to innovation platforms, these frameworks involve various actors working together to address complex challenges in agriculture and rural development.
- **Lobbying and policy dialogues:** This framework focuses on engaging with policymakers and stakeholders to advocate for supportive policies and regulations that enable the successful implementation of STIBs.
- **Roundtable workshops:** These workshops bring stakeholders together in a facilitated setting for collaborative work to address key challenges and take advantage of opportunities related to STIBs.
- **Farmer field and business schools (FFBS):** FFBS is a participatory learning approach that empowers farmers with practical skills and knowledge to improve their agricultural practices and business skills.

To develop effective STIB frameworks, it is crucial to consider the specific context, target beneficiaries, and project objectives. By adopting more inclusive and participatory approaches, we can ensure the successful implementation of STIBs and achieve meaningful impacts, particularly in women's empowerment in agriculture and rural development.

## Introduction to what an STIB framework for women's empowerment and resilience can look like

**By Kevin Johnstone and Sam Barrett**

The development of the STIB framework followed diverse data collection pathways.

### CGIAR INDICATORS

IIED worked with 61 specific indicators under the following five domains:

- Technological innovation and innovation capacity
- Climate resilience and adaptive capacity
- Livelihoods and income resilience
- Social innovation
- Empowerment

### GENDER NORMS AND STRUCTURES INHIBITING WOMEN

Gender equity and equality is about the relationship and dynamics between men and women rather than women alone (Scambor et al., 2014). Some of the issues that women face include:

- a) Prohibited and inhibited from owning productive land due to legal systems and patriarchal norms (Imburgia et al., 2019; Doss et al., 2018).
- b) Unable to access credit to support productive processes and business enterprises (Mwololo et al., 2022).
- c) Double burdened with domestic labour and disproportionate child-care responsibilities, while balancing productive and commercial activities (Davison, 2019).
- d) Have lower levels of literacy, basic skills and find it harder to access suitable agricultural training and extension (Collett and Gale, 2009).
- e) Hold relatively less intra-household agency in terms of household decisions and control over resource allocation (Crossland et al., 2021).

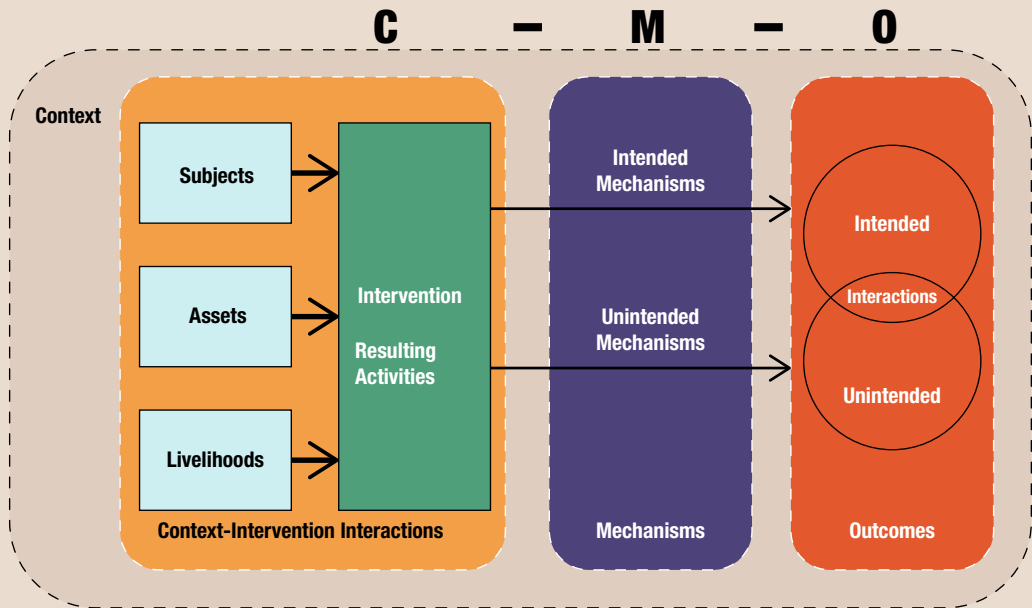
### RESEARCH BARRIERS

Some of the research barriers related to gender include:

- The research literature on agriculture, technology, and climate, and other topics has lacked a gender lens until only recently.
- As a result, limited gender disaggregated data and analysis are available.
- Vulnerabilities have been well studied, but applying an intersectional lens is more recent.
- Households are mostly treated as 'units' without unpacking intra-household dynamics around gender (individual agency, breakdown of labour, etc.).

### DEVELOPMENT OF THE STIB FRAMEWORK

IIED developed the STIB framework from a literature review of studies and reports that discussed documented outcomes of innovations in gender, technology, resilience, climate smart agriculture, and related fields. The team used a realist synthesis methodology (Figure 3) to unpack the contexts, the mechanisms for change, and the outcomes from the studies identified.



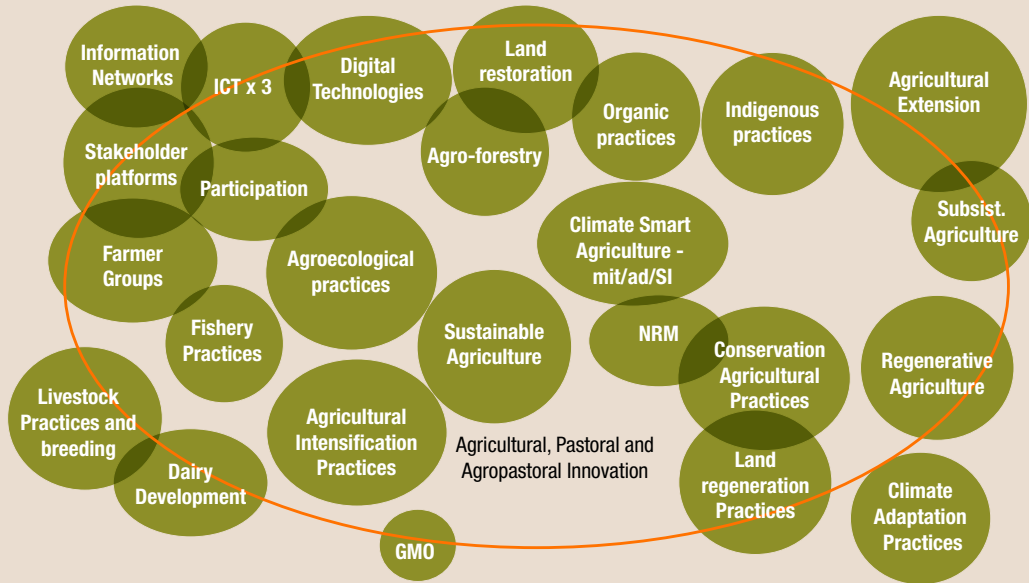
**Figure 3:** Realist/synthesis Methodology

**Source:** IIED

The literature review process applied a systematized sampling technique to Google Scholar, Scopus, and Research Gate. Approximately 600 abstracts and about 122 documents were reviewed to select sample studies, based on whether they addressed these topics or questions:

- Gender and women
- Gender and technology relationship
- Are there outcomes? Positive or negative?
- Technologies with outcomes such as empowerment and resilience

The review identified 25 example studies with clear mechanisms and outcomes. Figure 4 shows the technologies and related STIBs identified in the review.



**Figure 4:** Technologies and related STIBs identified by literature review.

## FINDINGS ON LITERATURE REVIEW

The literature review was summarized in several topics as presented in the following sections:

### Social capital

- Po and Hickey (2020) analysed household survey data and found women used social capital to compensate for limited or no access to financial and physical capital.
- Otieno et al., (2021) conducted a network analysis of farmer-to-farmer groups for exchanging seeds in Kenya, Tanzania and Uganda, finding that women favoured these social engagements and therefore supported the planting of varieties adapted to climate extremes.
- Ingutia and Sumelius (2021) found that farmer groups support relationships that build social capital for women's empowerment and participation in agriculture, leading to greater crop yield that would not have been achieved without these relationships.

### Groups and collective actions

- Farmer's groups, cooperatives, women's self-help groups, and other groups lead to better outcomes for women, in areas such as food security, income, knowledge and access to finance (Bizikova et al., 2020; Bernard et al., 2008; Abate et al., 2014).

### Groups and exclusions

- Farmer groups may not attract the most marginalised women (Abate et al., 2014; Bernard and Spielman, 2009).

- Bizikova et al., (2020) found that farmer's groups tended to be less beneficial to younger, less literate, female farmers.
- Poorer and landless women usually do not use or benefit from social networks since they often reside in remote areas, have no access to credit and have limited household decision-making power, (Ingutia and Sumelius, 2021).
- Insufficient financial resources to pay group membership fees and to make cash contributions to the farmer group can limit access to these groups (Bizikova et al., 2020).

### **GALS Methodology**

- Farnworth et al., (2018) explore the role of the Gender Action Learning Systems (GALS) household methodology in fostering women's empowerment in rural Malawi.
- GALS promotes joint decision-making in the household through experiential engagement workshops.
- Both men and women grow in confidence by sharing assets, resources, and agency to manage the household and take credit for its achievements.
- The GALS methodology improves intra-household equity outcomes by:
  - Men taking on a greater proportion of household and childcare work, and by
  - Women feeling they have greater recognition and social standing.

### **Gender responsive methods**

- Proactive, timely and effective adoption of the dialogical feminist approach would strengthen women's participation in solar-powered irrigation technologies.
- Adoption can be increased by improving access to information for women, specifically using solar radios, and ensuring that women's voices are given equal weight to men in adoption and implementation decisions (Adisa et al., 2020).

### **Gender responsive tools**

- G+ Toolbox is a customer profiling tool (i.e. segmenting and targeting customers) that can evaluate the gender sensitivity and suitability of particular crop characteristics and traits.
- Applying the G+ Toolbox technology raises the belief in users that gender is accounted for in the selection of crops and crop breeding (Tarjem 2022).
- However, crop varieties often described as 'women's crops' in different societal contexts are not cultivated necessarily through meaningful choice. These crops often require high amounts of labour and are of low value, and thus relegated to women. When farmer choice is more gender equitable (Polar et al., 2021).

### **Extension and training delivery**

- In Vietnam, more women attended training events if other women were present and if women delivered the training (Farnworth et al., 2017).

- In Ghana, Muslim women found it particularly difficult to access information from male extension agents because of cultural norms (Nyantakyi-Frimpong 2019).
- Further, women were secondary invitees to elderly men or male heads of households (Nyantakyi-Frimpong 2019).
- Women-to-women communication and on-farm demonstration raise the confidence of women to adopt technologies. Involving female communicators ultimately reduces gender inequality in technology, information, and knowledge diffusion (Kinkinginhoun et al., 2023).

### **Role of external shocks and drivers**

- Consistent multi-decadal migration of males to urban areas has resulted in the feminisation of many rural areas and of agricultural production (Gartaula et al., 2010; Neog and Sahoo, 2020).
- Women have taken on an ever-greater role in agriculture, from field preparation to marketing, negotiation, and processing, which increasingly includes livestock management (Satyavathi et al., 2021).
- As a consequence, women are increasingly more important agents of change, especially with improving access to digital information and technologies, social capital, and socio-cultural innovations (Vepa, 2005; Singh et al., 2012; Patil and Babus, 2018).
- Economic and political shocks in Zimbabwe pushed men to migrate seeking jobs. Back on the farm, women were given greater autonomy and cash from remittances —including decision-making power on how to invest that cash.
- The politicization and inadequacy of food aid during a time of crisis also forced households to try new agricultural methods.
- This dynamic opened a window for women to adopt conservation agriculture, ultimately increasing household food security (Mediel et al., 2018).

### **Structural barriers**

- Women in Zimbabwe often faced competing domestic duties, which made the creation and application of organic fertilizer difficult for them given the labour requirements (Mediel et al., 2018)
- Agency is not simply the exercise of choices but relies on external agents and institutions that structure the choices that are available to male and female farmers.
- For example, ‘when [plant] breeders make decisions about which varietal traits to select for in a new variety, they are determining whose preferences are going to be privileged or restricted’ (Polar et al., 2021).

## TESTING APPLICATION OF THE STIB FRAMEWORK

This part of the workshop aimed at testing the application of this framework (Figure 5) to specific projects. The framework aids selection of context-specific interventions to build suitable STIBs, generating better outcomes and broader impacts. The frameworks will support the implementation of the learning labs in different agro-ecological and sociocultural contexts across Africa and Asia.

### Group Discussion on Framework

The following questions were discussed:

1. What contexts would provide a supporting environment that ensures people with different adaptive capacities can thrive?
2. What bundles of innovations would lead to women's empowerment and resilience in these contexts?
3. What methods, processes, tools, or mechanisms would be most appropriate for identifying social, technical, technological, and institutional entry points to adopt STIBs implementation or to operate learning labs?

The discussions surrounding the STIB framework raised several questions and observations from the participants (Plate 2):

- Participants noted that there are significant gaps in the existing indicators of empowerment and resilience for women as was presented. The facilitator noted that STIBs should aim to address these gaps and include additional indicators that are missing in the current literature, such as human development, adaptive capacities, and digitization.
- Clarifications were sought regarding how STIBs can effectively empower women, considering the structural constraints, prevailing norms, and existing practices that often limit women's opportunities and agency.



**Plate 2:** Discussions around participants

- Participants noted that the framework recognizes that empowerment dimensions are intrinsic to both the context and outcomes. The framework does not assume that women are mere victims of climate change. Instead, it acknowledges the complexities of women's empowerment and their agency in various contexts.
- To ensure a common understanding among stakeholders and participants, the framework needs to provide clarity on the definition of resilience.
- Participants observed that the perceived empowerment of women can sometimes be linked to the perceived disempowerment of men. In this context, power dynamics and intra-household relations may have unintended consequences, such as gender-based violence. These factors also influence the resilience capacities of individuals and communities.

The STIB framework aims to address these questions and observations by adopting a holistic approach that considers the complexity of gender dynamics, power relations, and context-specific challenges. By incorporating additional indicators and a nuanced understanding of resilience and empowerment, the STIB framework seeks to promote gender equality, women's agency, and enhanced resilience in the face of climate change and other challenges.

### **Discussions on Context and Considerations for STIB Implementation:**

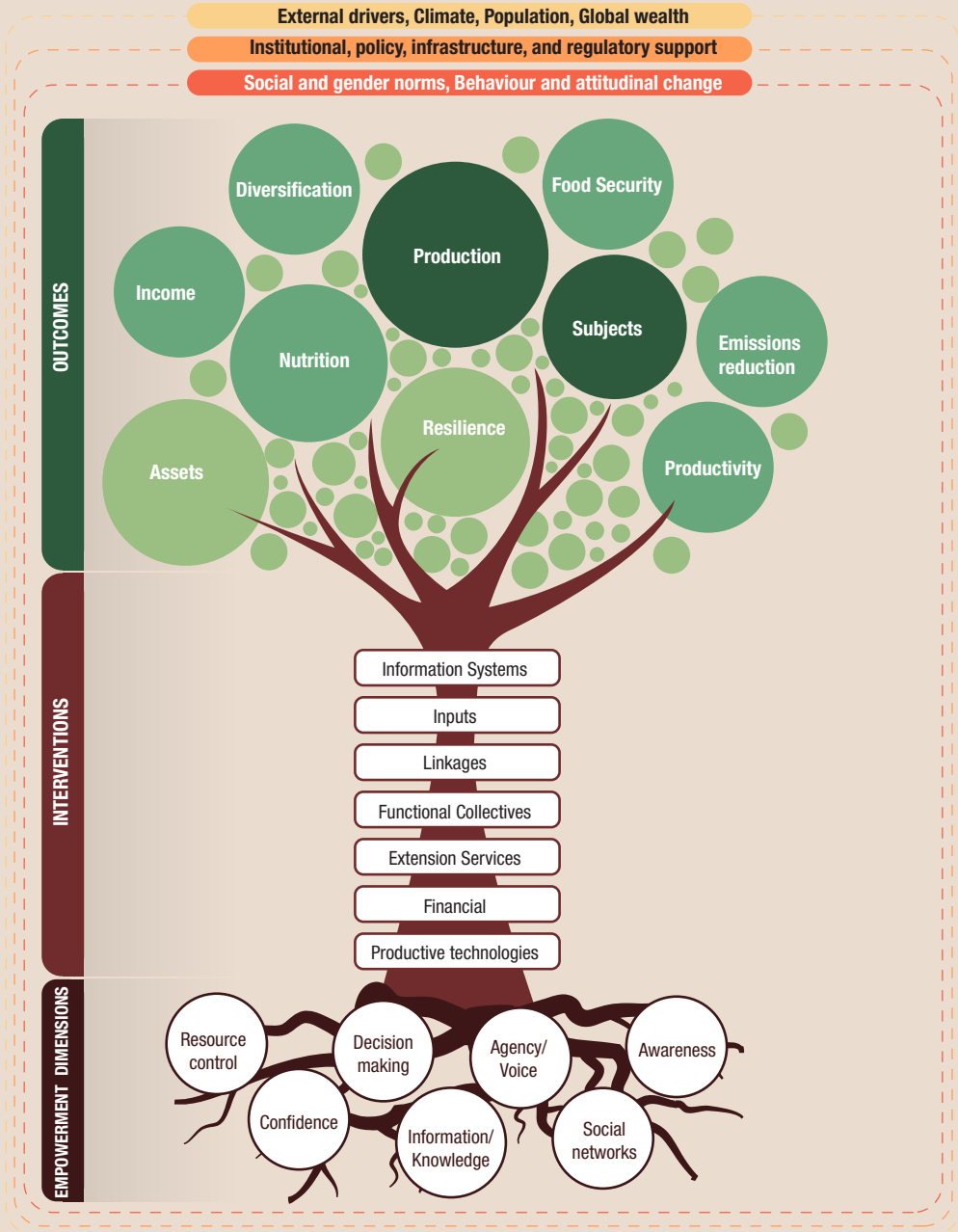
#### ***Q1. What contexts would provide a supporting environment to ensure people with different adaptive capacities can thrive? What are the enablers, levers, and barriers?***

- The majority of households follow a patriarchal structure, which has significant implications for the adoption of STIBs, particularly with regard to gender dynamics and decision-making. Land ownership is often concentrated among older men, which can negatively impact the productivity and agency of women and youth in agriculture.
- Climate change affects men and women differently. For example, drought conditions may lead to male migration in search of water and pasture, leaving women with increased responsibilities and vulnerability.
- Men, women, and youth have varying capacities to respond to severe climate change, leading to diverse adaptive needs.
- Context-specific climate-resilient technologies that cater to the needs of different groups are crucial for successful adoption.
- Health issues affecting humans, livestock, and plants must be considered as they can impact agricultural productivity and livelihoods.

#### **Enablers:**

- Existing learning labs and inclusive platforms that promote peer learning, especially among women across communities.
- Supportive policies that promote sustainable production systems and gender-inclusive development initiatives.

## STIBs FOR RESILIENCE OF WOMEN – A FRAMEWORK



**Figure 5:** STIBs for women's resilience – a framework.

- Coherence between sectors and levels of governance to enhance collaboration and effective STIB implementation.
- Management of household dynamics to create an open space for discussion and to ensure the benefits of new technologies are shared equitably.
- Group-based approaches and collective actions in production and marketing that empower women and vulnerable groups.
- Integrating local knowledge and innovation into interventions.
- Involving both men and women in group activities, while being sensitive to contextual norms.
- Using community and social networks for effective knowledge sharing and capacity building.
- Exchange visits and engagement of successful farmers as influencers to scale up adaptive practices.
- Providing accessible education, information, and digital platforms to enhance knowledge dissemination.

**Barriers:**

- Existing gender norms and limited decision-making power of women within households may hinder their participation in training and awareness programs.
- Land tenure systems that limit access to production activities for certain family members.
- Deep-rooted social norms that resist change and reduce the effectiveness of interventions.
- Diversion of resources and funds meant for interventions by certain family members, usually males.
- Lack of clean water and essential resources, which affects women's time and productivity.
- Insecurity and marginalisation of some family members during interventions.

In summary, addressing complex contexts and gender dynamics is essential for successful STIB implementation. Enablers such as supportive policies, community engagement, and integration of local knowledge can enhance the adoption of climate-resilient technology. On the other hand, barriers such as existing gender norms, limited access to resources, and the internalization of social norms must be carefully addressed during interventions to promote inclusive and sustainable development outcomes.

**Q 2 -What bundles of innovations would lead to women's empowerment and resilience in these contexts?**

The discussions identified several bundles of innovations that can lead to women's empowerment and resilience in different contexts. These innovative approaches include:

- CSA water management with solar-powered irrigation: Successful approaches implement climate-smart agriculture practices, combine water management with solar-powered irrigation, and provide proper financing and training targeted at women. A case in Zambia successfully enhanced women's empowerment.

- Aquaculture integration with crop and livestock systems: Through cooperatives, farmers integrate aquaculture with crop and livestock systems, empowering women and improving overall farm productivity.
- Onion farming in India: Targeting and specialized training on spraying, while involving men in ploughing. Providing online training on sowing and harvesting, improved farming techniques, market linkages, and access to small-scale machinery for reducing women's workload. Formation of groups and training on IPM are also crucial aspects of this approach.
- Enabling access to financial services: Ensuring women have access to financial services to manage risks, invest in both farm and non-farm businesses, and guarantee financial security.
- Enhancing technical, financial, and digital literacy: Providing training to increase women's technical, financial, and digital literacy, thereby improving their access to information, resources, and opportunities.
- Farmer-to-farmer training and information exchange: Encouraging farmer-to-farmer training and information exchange to break down hierarchies that hinder meaningful participation of men, women, young, and old.
- Participatory training and follow-up: Implementing participatory training and follow-up to create a sense of importance and ownership among the trainees regarding the innovations introduced.
- Effective extension systems: Strengthening the extension system through appropriate staffing and motivation, paying attention to the composition of extension staff to address field dynamics effectively.
- Creating and sustaining linkages: Establishing and sustaining linkages with government and private sectors to create supportive environments for women's empowerment.
- Access and utilization of technology: Facilitating access to technology that enables women to achieve multiple objectives in their agricultural activities.
- Climate information and technology: Providing climate information and technology that aligns with local contexts in terms of markets, environment, productivity, and trade-offs.
- Holistic approaches: Integrating social, technical, financial, and educational approaches to empowering women in farming communities.
- Mobile money access: Enabling access to mobile money services, combined with the adoption of intended technologies, to enhance financial inclusion for women.
- VBN project in Ethiopia: Implementing the Vegetable Business Network project, where small-holders, mostly youth and women, engage in vegetable farming. Providing improved seeds and training on organic and regenerative agriculture practices to empower these farmers.

**Q 3 - *What methods, processes, tools, or mechanisms would be most appropriate for identifying entry points in STIBs (social, technical, technological, institutional) implementation or running learning labs?***

The discussions highlighted various methods and activities for identifying entry points to developing STIB implementation processes and for operating learning labs:

- **Mixed methods approach:** Utilizing a mixed method approach to comprehensively understand the entry points for STIB implementation. Stakeholders combine quantitative and qualitative data to gain a deeper understanding of the social, technical, technological, and institutional considerations in STIB implementation.
- **Baseline and situational analysis:** Conducting a baseline study and situational analysis to better understand the local context and identify specific needs and challenges. The needs assessment should be carried out in a participatory manner to ensure stakeholders' active involvement.
- **Understanding existing interventions:** Gaining a good understanding of existing interventions in the local context. Stakeholders should be cautious, as farmers or local organizations may not reveal all existing interventions, especially if they believe more support is needed.
- **Identifying gaps and missing links:** Analysing the existing technological and social innovations to identify gaps and missing links that need to be addressed during STIB implementation.
- **Stakeholder mapping and analysis:** Conducting stakeholder mapping and analysis to identify all relevant actors and their roles in STIB implementation. Validating the findings and comprehensively engaging with stakeholders, even if they are already involved in similar initiatives.
- **Group-based approach and co-creation:** Utilizing group-based approaches and co-creation to encourage collective action, risk-sharing, trust-building, and trust networks. Engaging community-level actors in this process is essential for meaningful and sustainable outcomes.
- **Exposure visits:** Organizing exposure visits to enable stakeholders to learn from successful experiences in other areas or contexts. These visits help broaden perspectives and inspire innovative solutions.
- **Gender action learning:** Incorporating gender action learning approaches to ensure gender-responsive solutions and address the specific needs and challenges faced by women.

In conclusion, adopting a combination of these methods and processes will help identify effective entry points for STIBs implementation and will foster successful learning labs. These approaches must be context-specific and participatory, involving the active engagement of all relevant stakeholders to ensure the best possible outcomes.

## NEXT STEPS FOR STIBS GENDER AND RESILIENCE WORK

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1. Consolidate participant feedback to redesign and validate the framework, and produce a working paper.
2. Give participants an opportunity to review the draft working paper.
3. Commission seven experts to validate the framework.
4. Consolidate work into CGIAR 'Evidence Explainer' and IIED 'Policy Brief'.

## REFLECTIONS AND CLOSING

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1. Participants noted that STIB involves relations and interactions between components in bundles. Stakeholders need to think of how component fit together or otherwise relate to each other.
2. STIBs as processes or pathways are useful for thinking beyond the life cycle of a project. What happens when the project ends?
3. STIB advocates should also look at relations between different types of actors: within households, within communities, power relations between farmers, researchers, donors, government agents etc.

## KEY FINDINGS

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IIED's scoping review study provided a comprehensive overview of socio-technical innovation bundling, drawing from a wide range of data and information. Using the realist model, the study evaluated the context, mechanisms, and findings of various studies. The realist approach focuses on identifying underlying causal mechanisms and exploring how they operate under specific conditions. The review process involved defining the scope, searching for and examining evidence, extracting and synthesizing data, and developing a narrative, including hypotheses. The review covered various topics, including social capital, group and collective approaches, gender-responsive tools, extension services, and structural barriers.

The discussions on STIBs for women's empowerment and climate resilience revealed diverse perspectives and interpretations of the framework. However, the presentation by IIED successfully established a common understanding of the STIB framework. Testing the draft framework against real-world experiences highlighted the importance of defining the specific context in which STIBs are implemented. Participants shared their experiences of different STIBs that empower women and build resilience, such as the Vegetable Business Network in Ethiopia, which bundled improved technologies with business coaching using a group approach. However, the development of an optimal STIB requires careful consideration of several factors before initiating the process. Key considerations include understanding the local context and creating an environment that encourages co-creation and co-development.

## CONCLUSIONS

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IIED's scoping review study and subsequent discussions shed light on the potential of socio-technical innovation bundling (STIB) to empower women and to build climate resilience in agriculture, land, and water systems. STIBs offer a pathway to bridge gender and social gaps in access to and use of technical and technological innovations. By adopting a gender-responsive and context-specific approach and by fostering multi-stakeholder collaboration, STIBs can lead to transformative and sustainable outcomes in AFSs.

STIB advocates can achieve meaningful impact by addressing the diverse needs and challenges faced by women farmers and marginalized communities. Empowering women through STIBs requires an understanding of women's contexts, their agency in households and farming systems, and the complex gender dynamics they face. STIBs can contribute to gender equity, resilience, and sustainable agricultural development by promoting more inclusive decision-making and project development.

Moving forward, the development and implementation of STIBs will require policymakers, researchers, and stakeholders to prioritize gender-responsive and context-specific development approaches. This collective effort can create an enabling environment for women's empowerment, foster climate resilience, and ultimately lead to more equitable and sustainable AFSs.

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## ANNEXES

### Annex 1: workshop agenda

TIME	AGENDA	LEAD
<b>DAY 1: TUESDAY 23 MAY 2023</b>		
08:30-09:00	<ul style="list-style-type: none"> <li>Meet and greet with morning tea/coffee</li> </ul>	Eileen
09:00-09:15	<ul style="list-style-type: none"> <li>Welcome and setting the scene</li> </ul>	Nicoline
09:15-09:30	<ul style="list-style-type: none"> <li>Welcome and expectations</li> </ul>	Ranjitha
09:15-10:30	<ul style="list-style-type: none"> <li>Elicit experiences from participants on technology and innovation in the agri-food system</li> </ul>	IIED
10:30-11:00	<ul style="list-style-type: none"> <li>Health break – tea/coffee</li> </ul>	
11:00-11:30	<ul style="list-style-type: none"> <li>Defining and exploring STIBs and introducing the groups for breakout sessions.</li> </ul>	IIED/CGIAR
11:30-13:00	<ul style="list-style-type: none"> <li>Contextualizing STIBs (breakout groups: parallel sessions) Group 1 (How are we defining STIBs)</li> <li>Group 2 (Examples of STIBs across regions and crops/livestock)</li> <li>Group 3 (Existing frameworks or pathways to STIBs)</li> <li>Group photo before lunch break</li> </ul>	IIED/CGIAR
13:00-14:00	<ul style="list-style-type: none"> <li>Lunch</li> </ul>	
14:00-15:30	<ul style="list-style-type: none"> <li>Groups report back to the plenary on bundling, examples, experiences, etc.</li> </ul>	IIED/CGIAR
15:30-16:00	<ul style="list-style-type: none"> <li>Health break – tea/coffee</li> </ul>	
16:00-17:00	<ul style="list-style-type: none"> <li>Introducing the framework on STIB identification and bundling</li> </ul>	IIED
19:00	<ul style="list-style-type: none"> <li>Group cocktail and dinner</li> </ul>	
<b>DAY 2: WEDNESDAY 24 MAY 2023</b>		
08:30-09:00	<ul style="list-style-type: none"> <li>Meet and greet with morning tea/coffee</li> </ul>	
09:30-10:00	<ul style="list-style-type: none"> <li>Recap of and reflection on Day 1</li> </ul>	Rapporteur
10:00-10:30	<ul style="list-style-type: none"> <li>Introduction to group work</li> </ul>	IIED
10:30-13:00	<ul style="list-style-type: none"> <li>Test application of framework in the context of learning labs breakout groups, parallel sessions)</li> <li>Group 1 (learning lab 1)</li> <li>Group 2 (learning lab 2)</li> <li>Group 3 (learning lab 3)</li> <li>Group 4 (learning lab 4)</li> </ul>	IIED/CGIAR
13:00-14:00	<ul style="list-style-type: none"> <li>Lunch</li> </ul>	
14:00-15:30	<ul style="list-style-type: none"> <li>Groups report back to the plenary on bundling, examples, experiences, on the framework they discussed</li> </ul>	CGIAR
15:30-16:00	<ul style="list-style-type: none"> <li>Health break tea/coffee</li> </ul>	
16:00-17:00	<ul style="list-style-type: none"> <li>Next steps on finalizing the framework and testing the framework as learning labs evolve- discussion with participants</li> </ul>	IIED
17:00-17:30	<ul style="list-style-type: none"> <li>Reflection and closing</li> </ul>	Eileen

