Workshop Report

Inclusive Scaling to Support Mechanization Adoption in Zambia: Designing Responsible Scaling and Inclusive Business Models for Mechanization Service Providers

Asmara Hotel, Lusaka, Zambia | June 30–July 1, 2026

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PHOTOS

Cover: Workshop participants, Asmara Hotel, Lusaka, Zambia (June 30, 2026). Back cover: plenary presentation during the workshop in Lusaka, Zambia. Photo credits: Namukolo-Nali Rachel

Contents

Acknowledgments 2

List of acronyms 5

Executive summary 6

1. Introduction 7

1.1 Smallholder mechanization in Zambia 7

1.2 Scaling for Impact and the enabling environment 8

1.3 The scaling ambition 11

1.4 Objectives and structure of the report 11

2. Workshop design and program 12

2.1 Setting and participants 12

2.2 Day 1: Responsible scaling with GenderUp 12

2.3 Day 2: Inclusive business models 14

2.4 Data and analysis 15

2.5 Limitations 15

3. Key findings: Responsible scaling of mechanization (Day 1) 16

3.1 Validating the scaling ambition 16

3.2 Mapping core mechanization innovations 16

3.3 Stage 1: Defining the innovations and existing strategies 18

3.4 Stage 2: Social dimensions that shape access 19

3.5 Stage 3: Implications of intersectionality 19

3.6 Stage 4: Mitigating consequences and embracing opportunities 20

3.7 Stage 5: Integrating inclusive scaling into project management 21

4. Understanding inclusive business models for agribusiness growth (Day 2) 22

4.1 The business case for inclusion 22

4.2 GESI self-scoring results 23

4.3 From assumptions to evidence 24

4.4 Moving beyond policies on paper 24

4.5 Gender action plans 24

4.6 Strategic alignment on cooperatives and business policies for MSPs 26

4.7 Progress tracking and the inclusive business model canvas 26

5. How inclusive scaling supports adoption of mechanization 27

6. Recommendations and next steps 28

6.1 Participant commitments 28

References 30

Acronyms

AoW – Area of Work

AR4D – Agricultural Research for Development

CFU – Conservation Farming Unit

CIMMYT – International Maize and Wheat Improvement Center

FAO – Food and Agriculture Organization of the United Nations

GAP – Gender action plan

GESI – Gender equality and social inclusion

IITA – International Institute of Tropical Agriculture

IWMI – International Water Management Institute

MFI – Microfinance institution

MSP – Mechanization service provider

NGO – Nongovernmental organization

NRC – National Registration Card

S4I – Scaling for Impact

SACCO – Savings and credit cooperative

SDGs – Sustainable Development Goals

SME – Small and medium enterprise

ZARI – Zambia Agricultural Research Institute

ZMF – Zimbabwe Mechanization Fund

ZMW – Zambian kwacha

Executive summary

This report shows how inclusive scaling can support the adoption of agricultural mechanization in Zambia. It documents a two-day training workshop on mainstreaming responsible and inclusive innovation scaling approaches under the CIMMYT-led innovation on Scaling Inclusive Mechanization through Rural Entrepreneurship and Financial Innovation in Zambia of the CGIAR Scaling for Impact (S4I) Program, held in Lusaka on June 30–July 1, 2026.

The workshop responded to the solution track's scaling ambition: by 2030, to work with 10 financial institutions on inclusive financing models so that 1,000 mechanization service providers (MSPs) can access finance and USD 300,000 is leveraged for smallholder mechanization. Participants came from government, research, development partners, financial institutions, agribusinesses, nongovernmental organizations (NGOs), MSPs and farmer cooperatives.

Day 1 applied the GenderUp method to test the scaling ambition and to analyze who can use and benefit from priority mechanization innovations. Day 2 turned to business practice: MSPs and cooperatives scored their gender equality and social inclusion (GESI) performance against criteria aligned with the 2X Criteria and drafted gender action plans (GAPs) that would enable inclusive outcomes for mechanization adoption.

Key findings

- Mechanization scales as a package. Participants mapped 12 mechanization innovations and stressed that machines must come with seed, fertilizer, agronomic advice, markets and finance, and should be usable for most of the year to repay the investment.
- Access to finance is the main adoption barrier, and it is unequal. Collateral, land ownership and a 30% down payment favor wealthier men; women, youth, persons with disabilities, older farmers and migrants are most likely to be left out.
- Exclusion comes from overlapping factors. Wealth, land, gender, marital status, age, disability, education and location combine with norms, such as men controlling household income and limits on women's travel, to decide who uses and benefits from machines.
- Practical fixes exist. Groups proposed lighter and adapted equipment, training at times women can attend, local-language communication, revolving funds, using the machine as collateral, links to village banking, role models and partnerships with disability organizations.
- Business systems lag intent. MSPs met five of seven GESI criteria and cooperatives four. Neither had written GESI policies or inclusive training arrangements, and most reported figures were estimates rather than records.
- Cooperatives can drive mechanization only if governance improves. Machinery treated as leaders' property, inactive names on member registers and political interference were reported as risks to shared equipment

What this means for scaling

Inclusive scaling supports mechanization adoption through four linked pathways: widening who can operate and use machines, unlocking finance for a larger and more diverse pool of MSPs, strengthening the institutions that deliver services, and generating the disaggregated evidence that lenders and investors need. Section 6 proposes actions, lead actors and time frames for the solution track team, financial institutions, government and partners.

1. Introduction

1.1 Smallholder mechanization in Zambia

Smallholder mechanization means the gradual use of suitable tools and machines to raise land and labor productivity. Options range from hand tools and animal draft power to two-wheel tractors of 12–18 horsepower and four-wheel tractors above 45 horsepower. Efficiency rises along this range, but affordability falls, so most smallholders rely on low-cost machines or on hired services (Thierfelder 2026).

Mechanization also goes beyond land preparation and planting. It covers several stages of the value chain: transport (trailers); post-harvest handling (maize and groundnut shellers and multi-crop threshers); value addition (roasters and peanut butter machines); and livestock feed (mowers, balers and chopper-grinders). Across these stages, machines reduce labor, cut post-harvest losses and add value in the groundnut, cereal–legume and livestock value chains.

Because equipment is often beyond the reach of an individual smallholder, the work led by the International Maize and Wheat Improvement Center (CIMMYT) promotes a service provision model in which trained mechanization service providers (MSPs) acquire a starter pack of machines and sell services to surrounding farmers. Figure 1 shows the steps in this model. The starter pack (a two-wheel tractor with direct seeder, a 1.5 t trailer, a multi-crop thresher and a maize sheller) is designed mainly for maize and cereal–legume farming systems. The model was first developed in Zimbabwe and is now being adapted and implemented in Eastern, Southern and parts of Central Provinces of Zambia.

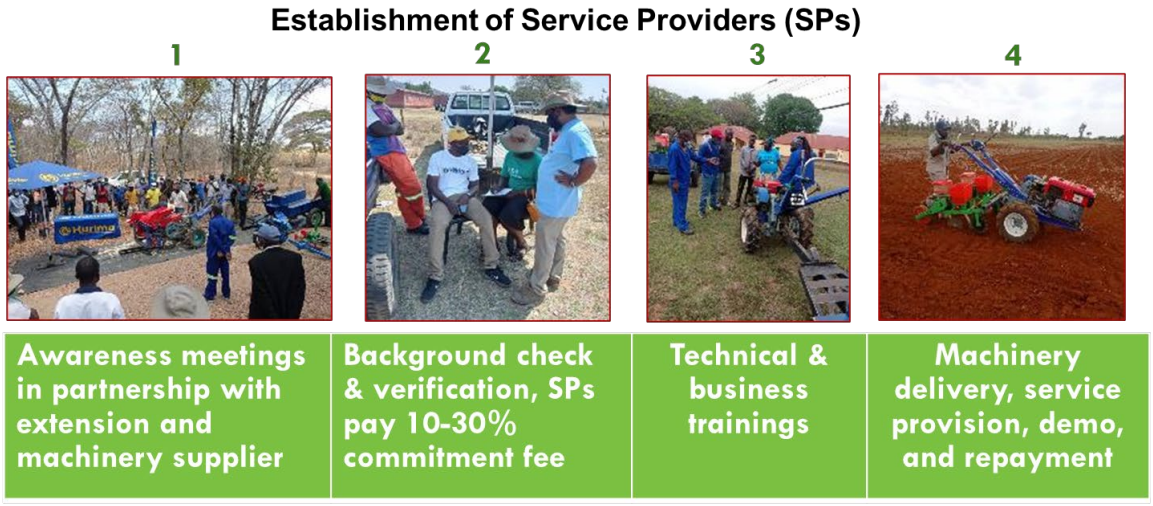


Figure 1. Steps in the mechanization service provision model: awareness meetings with extension and machinery suppliers; background checks; technical and business training; and machinery delivery, service provision, demonstrations and repayment. Source: Thierfelder (2026).

Experience from Zimbabwe shows what the model can achieve (Thierfelder 2026):

496	37,322	337,200
mechanization service providers established in Zimbabwe	farmers benefiting from 12,734 services	USD of private-sector investment leveraged

These figures show the reach of the model. On average, each service provider in Zimbabwe served about 75 farmers and attracted roughly USD 680 of private investment. A relatively small number of well-supported MSPs can therefore bring mechanization to many smallholders, provided they can finance their machines.

The Zimbabwe experience also shows that finance is the main constraint on the model, as the lending process illustrates. Securing a lending partner took about 80 meetings with 14 banks, as reported by the CIMMYT mechanization team (Thierfelder 2026). Banks had low liquidity, preferred lending to small and medium enterprises (SMEs), charged high interest over short terms and had little capacity to screen and monitor rural borrowers. Lending became possible only after a needs assessment and bankability study, a 30% down payment, negotiated terms of 12–15% interest over 24 months, decentralized loan applications and a guarantee fund. Under that fund, the Zimbabwe Mechanization Fund (ZMF) guaranteed 50% of the principal in case of default, banks carried the rest, and suppliers provided warranties and valued any repossessed machines. Training of service providers, rural mechanics and local manufacturers further reduced lender risk by keeping financed machines working.

From Zimbabwe to Zambia. Zambia is adapting the Zimbabwe model rather than copying it. Three lessons carry over directly. Lenders need evidence that MSP businesses are viable before they lend. Risk-sharing arrangements, such as down payments, guarantee funds and supplier warranties, make lending possible. Training operators and mechanics keeps financed machines working and loans repaid. What the Zimbabwe figures do not show is who became a service provider and who received services. They count providers, farmers and investment, but not whether women, youth, persons with disabilities and poorer farmers were among them. The Zambian solution track therefore needs to design inclusion into the model from the start.

What this report offers. This report shows how inclusive scaling can help the Zambian model reach, and benefit, more farmers. It documents a two-day workshop at which partners examined who can use and benefit from mechanization, how MSPs and cooperatives can become more inclusive and investable, and what partners will do next. Section 1.4 sets out the workshop objectives and the structure of the report.

1.2 Scaling for Impact and the enabling environment

The CGIAR Scaling for Impact (S4I) Program (2025–2030) is one of CGIAR's science programs. It tests, refines and scales innovations in food, land and water systems, supports partners to scale, and mobilizes finance for scaling. Its Area of Work 3 (AoW3), the Enabling Environment Lab, works as a responsive service platform: requests come from Area of Work 2 (AoW2) solution tracks, which are country-level efforts to scale specific CGIAR innovations, as well as from CGIAR Programs, bilateral projects and partners, and support is modular, short and handed over to partners. Across solution tracks, the Lab has identified six recurring clusters of barriers, namely policy and regulation; access to finance; market coordination; institutional capacity; gender and social inclusion; and climate finance and measurement, reporting and verification.

Several of these clusters bear directly on mechanization, namely the design of mechanization subsidies, collateral requirements and risk-averse lenders, missing spare-parts and repair services, extension systems that reach fewer than 20% of farmers, and women's limited land tenure and access to credit. This report documents one piece of S4I support that responds to these barriers: a two-day workshop to mainstream responsible and inclusive innovation scaling approaches in the CIMMYT-led mechanization solution track in Zambia. The International Water Management Institute (IWMI) and the International Institute of Tropical Agriculture (IITA) contribute gender equality and social inclusion (GESI) expertise to the solution track.

1.2.1 Mainstreaming responsible and inclusive scaling approaches

Responsible and Inclusive Scaling provides a set of key principles for standardization within innovation processes. It is often conflated with responsible innovation, but the two are distinct, complementary frameworks, which together aim to ensure that agricultural innovations are not only technically effective, but also socially just, sustainable and broadly beneficial.
Responsible innovation ensures that innovations are ethically acceptable, environmentally sustainable, and socially desirable. It is framed around six key dimensions that guide the development and assessment of innovations before they are widely deployed as shown in Figure 2. In contrast, responsible scaling focuses on the pathway of moving innovations from pilot phases into wider adoption. It emphasizes ensuring that this transition is equitable, context-sensitive, and inclusive, so that benefits are fairly distributed and adapted to local realities. This approach is guided by four core principles that support effective and responsible expansion of innovations. In summary, while responsible innovation strengthens what is developed, responsible scaling strengthens how it reaches people, places and institutions.



Figure 2. Six dimensions of responsible innovations to support inclusive development of innovations

Scaling increases reach, but it does not automatically distribute benefits fairly. Responsible scaling, in contrast, asks who can access, use, control and benefit from an innovation, and who may face new risks. In this report, these questions are applied to mechanization by examining four areas in which women, youth, persons with disabilities and poorer farmers are often disadvantaged:

- **Access to resources:** Gaps in land, credit, productive assets and timely information limit adoption.
- **Decision-making power:** Limited voice in households and communities restricts technology and investment choices.
- **Market and labor:** Unpaid care work, time poverty and weaker market access reduce participation.
- **Social and exclusionary norms:** Norms may restrict mobility, training attendance, leadership and engagement with extension services.

Without deliberate action, scaling may reproduce inequality. Innovations tend to reach first those farmers who already have the land, capital, information and mobility to adopt them, while women, youth, persons with disabilities and poorer farmers face barriers such as limited access to finance, training and decision-making. Scaling must therefore be intentionally inclusive, with adapted finance, accessible training and disaggregated monitoring so that these groups can also benefit. This is why the workshop asked scaling partners how mechanization, scaled as a bundle of machines, finance and services, can be designed to include these groups and so increase adoption.

An innovation functions only when it works in the real-world setting where it is introduced. This requires equal attention to the technical solution and the social system around it. The technical dimension concerns the machine itself: its functionality, design, safety, efficiency, reliability and performance. For mechanization, this includes whether the machine works as intended, can be maintained and suits the farming system. The social dimension concerns the people and institutions around the machine: affordability, acceptability, accessibility, skills, institutions, culture, power relations and local norms. These factors determine who can use, control and benefit from the machine. For mechanization delivered through MSPs to work, technical robustness and social relevance must be designed and assessed together. This calls for multidisciplinary teams that bring together expertise in engineering, agronomy, finance, business, GESI, extension and local knowledge.

Responsible scaling is not a single pathway and requires coordinated change in reach, practices and institutions. Scaling out widens reach; scaling deep changes mindsets, values and everyday practices; and scaling up transforms the systems and institutions that shape long-term adoption (Figure 3). Wider coverage leads to inclusive adoption and fair benefits only when norms and institutions also change. A multi-pronged scaling approach therefore aims to combine public–private partnerships, strategic communication, finance, research, extension, market actors and community institutions to bridge the gap between innovation development and widespread, equitable adoption. This approach framed the workshop discussions reported in Sections 3 and 4.

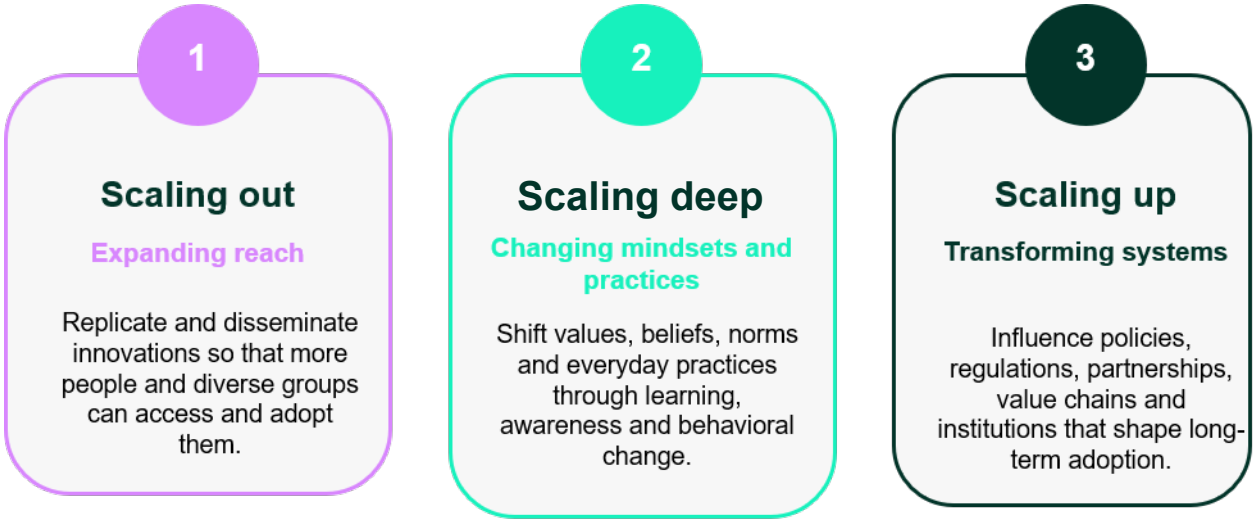


Figure 3. Diagram showing interconnected dimensions of scaling and how responsible scaling remains central to achieving adoption

1.3 The scaling ambition

Each S4I solution track sets a scaling ambition: a time-bound statement of what it aims to achieve at scale, and with which partners. The ambition guides partnerships, investment and monitoring, and progress is reviewed against it. Because the ambition defines who the scaling effort is designed for, the workshop began by examining the ambition for the mechanization solution track, shown below.

> **Scaling ambition for mechanization service providers in Zambia**
>
> By 2030, Scaling for Impact through CIMMYT, IWMI and the Alliance of Bioversity International and CIAT will work with financial institutions to achieve the adoption of inclusive financing models to scale smallholder mechanization through service providers, reaching 10 financial institutions in Zambia, contributing to 1,000 mechanization service providers accessing financing and USD 300,000 leveraged through the financial institutions.

1,000	10	300,000
MSPs accessing finance by 2030	financial institutions adopting inclusive financing models	USD leveraged through financial institutions

Two GenderUp questions shaped how the workshop examined this ambition: does it assume equal access and uptake across all groups, and does it name priority user groups such as women, youth and poorer farmers? As written, the ambition counts MSPs and financial institutions but does not say who the MSPs are or which farmers they serve. This report therefore asks how inclusive scaling can help the ambition reach, and benefit, the groups most likely to be left behind.

1.4 Objectives and structure of the report

This report documents the outcomes of a two-day training workshop on responsible and inclusive scaling of agricultural mechanization in Zambia, held at Asmara Hotel, Lusaka, on June 30–July 1, 2026. It brought together participants from government, research, development partners, financial institutions, agribusinesses, nongovernmental organizations (NGOs), MSPs and farmer cooperatives. The report shares what participants learned and proposed, so that these insights can inform the design and scaling of mechanization innovations in the solution track.

The workshop aimed to help participants:

- Understand the social dimensions that matter to users of mechanization innovations in Zambia;
- Identify how gender intersects with these dimensions to shape the experience of marginalized groups;
- Develop activities that reduce negative impacts on these groups and improve scaling strategies; and
- Co-design gender action plans (GAPs) that make small and medium enterprises (SMEs), cooperatives and other private-sector actors more investment-ready.

The first three objectives were addressed on Day 1, using the GenderUp method to test the scaling ambition and analyze who can use and benefit from priority mechanization innovations. The fourth was addressed on Day 2, when MSPs and cooperatives scored their GESI performance against criteria aligned with the 2X Criteria and drafted GAPs. Section 2 describes the workshop design and program. Section 3 presents the responsible scaling analysis from Day 1, and Section 4 presents the work on inclusive business models from Day 2. Section 5 draws the findings together to show how inclusive scaling supports adoption of mechanization, and Section 6 sets out recommendations and next steps.

2. Workshop design and program

2.1 Setting and participants

The workshop was facilitated by GESI researchers supporting S4I and opened on behalf of the CGIAR Country Convener for Zambia. A CIMMYT presentation introduced the mechanization scaling work and its financing challenges, and the CIMMYT Country Representative for Zambia closed the workshop. Participants represented the main actors in the mechanization scaling system (Table 1). Facilitators deliberately mixed people from different organizations and stakeholder types in each group so that every analysis combined public, private, financial and farmer perspectives (Figure 4).

Table 1. Organizations represented at the workshop, by stakeholder group.

Stakeholder group	Organizations represented
Government and public research	Ministry of Agriculture (agricultural engineering); Zambia Agricultural Research Institute (ZARI); Zambia Agency for Persons with Disabilities
Development partners and NGOs	Food and Agriculture Organization of the United Nations (FAO); Total LandCare; Conservation Farming Unit (CFU); Mulimi; a conservation agriculture project
Finance and agribusiness	Lupiya; a savings and credit cooperative (SACCO) fund; Panuka Agribusiness Hub; Digital Flash Agro; VILMA Enterprise
MSPs and farmers	Individual mechanization service providers and farmer-entrepreneurs
Cooperatives	Tatuyowi Cooperative (Chongwe); Fisuma Fileisa Multipurpose Cooperative; Taras Multipurpose Cooperative
CGIAR	CIMMYT; IWMI; International Institute of Tropical Agriculture (IITA)

Source: Participant introductions and commitments recorded during the workshop.



Figure 4. Participants from different stakeholder groups working together during group sessions, Lusaka, Zambia. Photo credit: Namukolo-Nali Rachel

2.2 Day 1: Responsible scaling with GenderUp

Day 1 used GenderUp, a discussion-based method that helps innovation teams make scaling strategies gender-responsive, socially inclusive and responsible (Becker et al. 2026). Rather than scoring innovations, GenderUp asks who benefits from scaling, who may be left behind and why, and what can be done about it. The method has been applied in more than 20 countries (Yami et al. 2026). GenderUp was developed to ensure that agricultural research, innovation and scaling processes contribute not only to higher productivity but also to broader social development goals. As countries work towards the Sustainable Development Goals (SDGs), there is a growing need for innovations that are equitable, inclusive and responsive to the needs of different social groups (Becker et al. 2026).

Traditional Agricultural Research for Development (AR4D) tools, including innovation scaling approaches, have historically been gender-blind. These approaches often overlook the different roles, opportunities, and constraints experienced by women, men, youth, and other marginalized groups, resulting in unequal access to the benefits of agricultural innovations (Becker et al. 2026). Because adoption, use, and impact of innovations vary across different communities and social groups, factors such as gender, age, disability, socio-economic status, and cultural norms tend to influence who can access and benefit from new technologies and practices.

For this reason, GenderUp was developed to help innovation teams deliberately identify and address these social differences. By integrating gender responsiveness, social inclusion, and responsible innovation into the scaling process, GenderUp helps ensure that agricultural innovations reach and benefit marginalized populations, promote equity, and contribute to sustainable and inclusive development as described in Figure 5 (Becker et al. 2026).

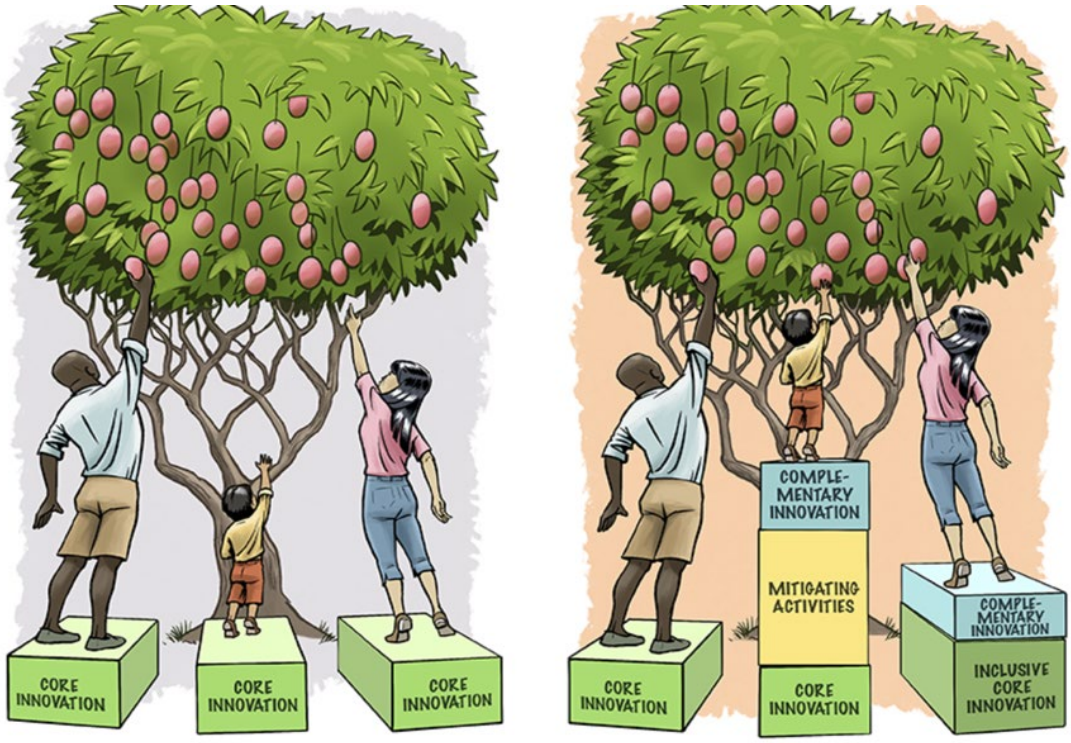


Figure 5. How the application of GenderUp can address issues of inequity within innovation design and implementation. Source: The GenderUp Handbook (Becker et al. 2026).

The Day 1 analysis followed the GenderUp methodology, which, as explained above, is a stage-based approach for identifying how gender and other social dimensions shape who can access and benefit from innovations (Figure 6). Before starting Stage 1, participants mapped the mechanization innovations in use or promoted in Zambia and reviewed the scaling ambition in plenary. Four mixed groups then worked through the stages, each taking one or two innovations: the two-wheel tractor and 1.5 t trailer (Group 1); the groundnut sheller (Group 2); the maize sheller and multi-crop thresher (Group 3); and the basin digger and peanut butter machine (Group 4). In Stage 3, participants described their own circumstances in short role-play conversations, and other group members identified the privileges and disadvantages that shaped each person's opportunities.

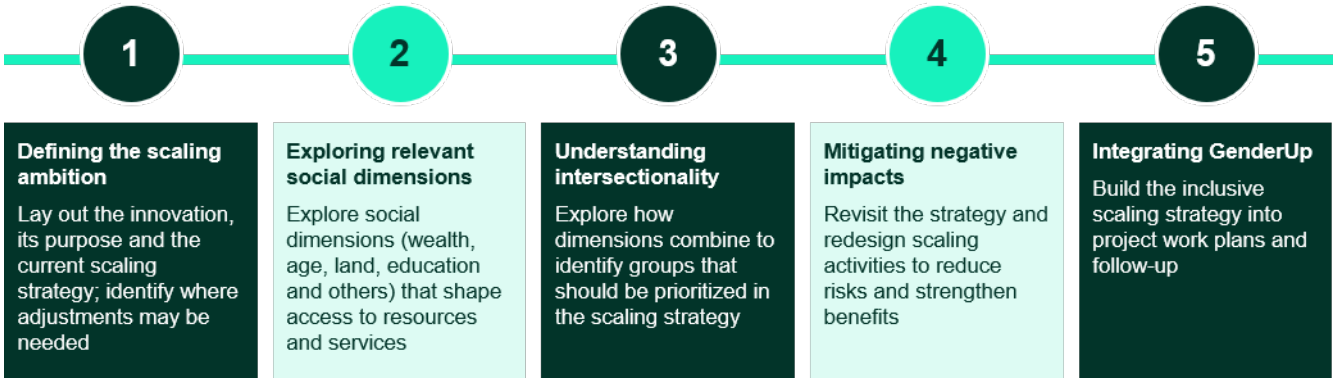


Figure 6. The five stages of the GenderUp method as applied at the workshop. Source: Adapted from The GenderUp Handbook (Becker et al. 2026).

2.3 Day 2: Inclusive business models

Day 2 opened with a recap of Day 1 and moved from diagnosis to action, following three steps for businesses: self-assessment, planning for action and tracking progress. Participants worked in two groups by actor type: MSPs and private-sector actors (Group 1), and cooperatives and farmer associations (Group 2). The tools were:

- **GESI self-scoring checklist: Seven** yes-or-no criteria on ownership, leadership, employment, target market, policies, training accessibility and cultural sensitivity, with thresholds drawn from the 2X Criteria (2X Global 2024). Scores of 0–2 indicate limited, 3–5 moderate and 6–7 strong GESI integration (see Table 2).
- **GAP template: Objectives,** activities, performance indicators and targets, expected outcomes, responsible entities and timeline.
- **Progress trackers and business model canvas: Dashboards** for tracking progress against the 2X Criteria, and an inclusive and responsive business model canvas.

Table 2. GESI self-scoring checklist

Self- Scoring Checklist Criteria	Yes	No
Ownership: At least 20-30% of the business is owned by women.		
Leadership: Women hold at least 30% of senior leadership positions.		
Employment: Women make up at least 30% of the workforce/supply chain.		
Target Market: At least 30% of customers are women or youth.		
Policies: Written gender equality and youth inclusion policies are in place.		
Training Accessibility: Training schedules and locations are inclusive of women and youth.		
Cultural Sensitivity: Measures are taken to address cultural norms that limit women's participation.		

2.4 Data and analysis

Group outputs were recorded on flip charts and worksheets, and a rapporteur documented plenary discussions. For this report, the flip charts were transcribed and checked against the rapporteur's notes. Findings were organized by GenderUp stage for Day 1 and by tool for Day 2, then synthesized against the S4I enabling environment barrier clusters and the scaling ambition.

2.5 Limitations

- Attendance was not recorded by sex, age or disability in the workshop documentation, so participation cannot be disaggregated.
- Self-scoring results are self-reported, rest partly on estimates and cover two mixed groups rather than individual businesses as time did not allow for each MSP or farmer to design their GESI action plans.
- Results reflect stakeholder views at one workshop with a limited number of MSPs, farmer associations and cooperative groups and are not a representative survey of MSPs or farmers.

3. Key findings: Responsible scaling of mechanization (Day 1)

Day 1 asked how mechanization can be scaled so that more people benefit, not only so that more machines are sold. The findings follow the GenderUp stages, starting with the scaling ambition and the innovations themselves.

3.1 Validating the scaling ambition

Participants reviewed the target number of MSPs and the financing behind it. Earlier consultations had proposed 500 MSPs; the current ambition doubles this to 1,000, subject to financing and implementation capacity. Facilitators explained that the figures were deliberately conservative because the service provider model is new to most microfinance institutions (MFIs), which still offer standard collateral-based loans rather than products designed for mechanization businesses. The ambition will be reviewed at the end of 2027 and raised if progress exceeds the target.

Participants questioned the size of individual loans. One farmer argued that Zambian kwacha (ZMW) 250,000–300,000 (about USD 14,000–17,000 at mid-2026 exchange rates) would not be enough for a farmer intent on expanding, and others stressed that many smallholders are commercially viable but underestimated by lenders. They asked MFIs to engage farmers directly and to design technology-specific products based on evidence of which machines perform best in which settings. Flexible down-payment options and repayment after harvest were proposed to make equipment affordable.

The 30% down payment was seen as a major hurdle. One proposal was for cooperatives to include better-off members whose contributions could help the group meet the deposit. This may widen access, but it also risks giving the wealthiest members control of shared machines, a concern that reappeared in Stage 3.



Figure 6. Group discussions with participants exploring the scaling ambition and its differentiated effects on the adoption of mechanized technologies. Photo credit: Namukolo-Nali Rachel

3.2 Mapping core mechanization innovations

Participants listed 12 mechanization innovations relevant to smallholders in Zambia (Table 3). They gave priority to machines that can earn income for about three-quarters of the year. Equipment used for one short season, such as a maize sheller used for about a month, risks standing idle unless it can serve other crops, such as soybean, or other uses; one participant suggested fitting a motor so that idle machines could power workshop tools.

Table 3. Mechanization innovations mapped by participants.

No.	Innovation	CIMMYT-promoted	Group	No.	Innovation	CIMMYT-promoted
1	Two-wheel tractor with direct seeder	Yes	1	7	Ripper	Yes
2	1.5 t trailer	Yes	1	8	Peanut butter making machine	Yes
3	Groundnut sheller	Yes	2	9	Harrow	Not yet
4	Maize sheller	Yes	3	10	Motorized solar-powered sprayer	Not yet (but IWMI promoted)
5	Multi-crop thresher	Yes	3	11	Oil expeller	Not yet
6	Basin digger	Yes	4	12	Irrigation pumps to manage climate shocks	Not yet (but IWMI promoted)

> "Mechanization cannot function alone as a core innovation. It goes together with complementary innovations."

Participants stressed that machines are only one part of an innovation package. Improved seed, fertilizer, agronomic practices, market access and financial services determine whether a machine pays for itself. Mechanization therefore needs to be scaled as a bundle, together with the finance and services that make it usable. Figure 8 shows the seven complementary innovations named at the workshop. Access to seeds and pest management protect yields, so that mechanized fields produce enough to pay for services. Irrigation extends the season, so machines can also serve dry-season crops. Access to markets and access to credit let farmers sell the extra output and pay for services. Supportive policy and regulation, for example on subsidies and machinery standards, and farmer awareness of what machines can do determine whether demand for services grows.



Figure 8. Complementary innovations that should be bundled with core innovations discussed in the workshop. Source: CGIAR Scaling Readiness

3.3 Stage 1: Defining the innovations and existing strategies

Each group described the problem its innovation solves, what it replaces, where it will be used and who should benefit (Table 4).

Table 4. Innovations defined by the four groups in Stage 1.

Innovation	Problem addressed	What it replaces	Context	Intended users and beneficiaries
Two-wheel tractor and 1.5 t trailer (Group 1)	Moving inputs and produce between field, homestead and market; time and drudgery	Oxcarts, head carrying, bicycles	Rural and peri-urban areas; community to national level	Farmers and grain traders; MSPs, cooperatives and entrepreneurs
Groundnut sheller (Group 2)	Labor-intensive hand shelling; aflatoxin risk from soaking shells; lost revenue from selling unshelled nuts	Hand shelling and hired labor	Rural and urban communities in Eastern, Central and Southern Provinces	Farmers, aggregators and local fabricators; consumers of safer food
Maize sheller and multi-crop thresher (Group 3)	Labor, cost and time in shelling and threshing; grain quality	Beating grain with sticks in sacks	Chongwe District, Lusaka Province; farms of 0–5 ha; rain-fed and irrigated crops	Smallholders; MSPs; women and youth; maintenance providers
Basin digger and peanut butter machine (Group 4)	Low productivity, soil degradation and late land preparation; little value addition or employment	Hoe and manual labor	Rural districts, including Chongwe, Chibombo, Kabwe, Mkushi, Mumbwa, Shibuyunji and Kapiri Mposhi	Small-scale farmers, women and youth

All groups planned training in operation and maintenance, and most added agribusiness, financial literacy or climate-smart agriculture. To share information about the innovations and how to use them, groups planned to rely on extension officers, NGOs, cooperatives, service providers, demonstrations, roadshows, radio, television and social media. Three groups judged their communication appropriate; Group 4 noted that face-to-face contact works best in rural areas and social media in urban areas. Groups 3 and 4 named women and youth as intended users, but at this stage no group described how training or communication would be adapted to reach them, for example through timing, language or channel. This gap was taken up in Stages 3 and 4.

3.4 Stage 2: Social dimensions that shape access

Groups identified the resources and services needed to use the innovations and to benefit from them. All four groups chose financial resources; knowledge and skills, market linkages, land, labor and advisory services followed. Groups then examined how access to these resources varies across social groups (Table 5).

Table 5 Social dimensions and gender differences in access to key resources.

Resource	Social dimensions affecting access	Gender differences reported
Financial resources and services	Wealth, location, age, land ownership, education, marital status, disability, household structure	Men hold more wealth; women have less access to and control over finance; few women own land to use as collateral; girls are less likely to inherit; rural women have less time to reach financial services
Knowledge and skills	Wealth, education, gender, age, marital status, disability, household structure	Girls have less time for education; married women have less time for training; female-headed households are disadvantaged; men were seen as more likely to have mechanical skills
Market linkages	Location, education, wealth, marital status	Married women have little time to gather market information; rural women have less access to information; education affects women's market access
Land	Wealth, age, gender, marital status	Women face disadvantages in access to land linked to wealth, gender and marital status

Groups expected the innovations to reduce labor, save time, cut post-harvest losses and improve food safety, income and employment. They also identified effects that depend on social position:

- **Decision-making:** Participants warned that women may lose decision-making power over marketing produce once transport is mechanized.
- **Power and roles: Women** can operate two-wheel tractors, which can shift gender roles if women are trained and financed as operators.
- **Livelihoods: People** who earn income from manual transport or hired shelling may lose work, and migrants may face social risks.
- **Production risk:** Some participants linked production risk to gaps in knowledge and education among both women and men.
- **Environment: No** group expected environmental harm; groundnut-based innovations were seen to improve soil fertility through nitrogen fixation, and shells can be reused as manure, fuel briquettes or furniture material.

3.5 Stage 3: Implications of intersectionality

Stage 3 of the GenderUp process examined how social identities combine to shape who can use and benefit from an innovation. To demonstrate the exercise, the facilitator first described her own circumstances as a young female researcher who is employed, multilingual, able-bodied and supported at home by her spouse. Participants then identified how each of these factors shaped her opportunities, distinguishing the privileges from the disadvantages. Groups then repeated the exercise for typical users of their assigned innovations. Table 6 summarizes the groups judged most at risk and the norms behind their exclusion.

Table 6. Groups most at risk of exclusion and the causes identified in Stage 3.

Group (innovation)	Most at-risk groups	Main consequences	Underlying causes and norms
Group 1 (two-wheel tractor and trailer)	Migrants on rented land; married women; younger and older farmers; less-educated farmers; persons with disabilities	Overcharging for services; weak negotiating power; ineligibility for loans; difficulty preparing business plans or operating machines	Banking conducted only in English; husbands' influence over decisions; religious restrictions on credit for some borrowers; reliance on old farming methods
Group 2 (groundnut sheller)	Older farmers; persons with disabilities; women; child-headed households	Exclusion from training, credit and inputs; being seen as nonviable; lack of collateral	Beliefs and perceptions; patrilineal inheritance; gender stereotyping
Group 3 (maize sheller and thresher)	Persons with disabilities (most at risk); women; youth; migrants	Left behind in adoption; continued manual labor; machine breakdowns; post-harvest losses; lower income and food security	Men control household finances; persons with disabilities and youth not seen as earners; women expected to stay home; women who travel stigmatized
Group 4 (basin digger and peanut butter machine)	Women; youth; persons with disabilities	Limited finance; insecure land tenure; low productivity; stigma; lack of support systems	Traditions favoring men's land ownership; cultural and religious values; high poverty; exclusion from empowerment programs

Across groups, the same pattern emerged. People with wealth, land, education and social standing are best placed to use and control machines, while women, youth, persons with disabilities, older people and migrants face combined disadvantages. Workshop participants also noted that people with power can either open access or capture benefits; for example, a wealthy member may bypass collective grain aggregation to pursue individual gain. If scaling ignores these dynamics, adoption is likely to stay concentrated among farmers who are already advantaged.

> "If meetings are held in the afternoon, women may be unable to attend because they are occupied with household responsibilities and preparing meals for their families." (Workshop participant, Day 1)

3.6 Stage 4: Mitigating consequences and embracing opportunities

During Stage 4 of the GenderUp process, groups revisited their scaling strategies and proposed measures to reduce risks and strengthen positive effects for priority groups. Table 7 sorts these measures by the part of the scaling strategy they change. Together they form an innovation package, namely, the core machine plus the complementary arrangements that make it usable by different groups.

Table 7. Measures proposed to make mechanization scaling more inclusive.

Lever	Proposed measures	Priority groups
Equipment design	Lighter, user-friendly machines; adaptations for different disabilities; upgrading manual machines to motorized, electric or hybrid power; regular checks on how users perform with machines; design partnerships with research institutions and universities	Persons with disabilities, older farmers, women
Training	Needs assessments; practical, hands-on sessions; timing and duration that suit women; support for nursing mothers; training both household heads and spouses; business skills and financial literacy; operation, maintenance and repair; exposure visits	Women, youth, persons with disabilities
Communication	Local languages and interpreters; radio, social media and drama; community meetings and roadshows; role models from the same communities; images of women in training materials; outreach through NGOs, churches and disability organizations	Migrants, women, youth, persons with disabilities
Finance	Revolving funds, matching funds and pass-on schemes; using the machine as collateral; links to village banking groups and banks' programs for women; finance targeted at youth; concessions for persons with disabilities	Women, youth, older farmers, persons with disabilities
Services and access	Mobile repair workshops; training local artisans; bulking centers; priority and resources for rural areas; written service rates to prevent overcharging; quotas for persons with disabilities	Migrants, rural users, persons with disabilities
Rules and institutions	Gender-sensitive safeguarding and non-discrimination policies; land reforms for equitable land acquisition; monitoring and feedback sessions; engagement of civic and opinion leaders	Women, youth, persons with disabilities

All four groups judged that it is realistic to expect positive outcomes for their priority groups, in some cases through affirmative action. For example, Group 4 expected financial independence for women, productive work for youth and greater inclusion of persons with disabilities. Participants also named new partners, such as communication specialists, disability organizations, machinery suppliers, research and academic institutions, digital technology providers, village banking groups and youth programs.

3.7 Stage 5: Integrating inclusive scaling into project management

The final session on Day 1 discussed how the revised strategies can be built into the solution track's work plans. Facilitators stressed that the workshop should not be a one-off event. Partners agreed to follow up through regular meetings, including virtual check-ins, to track whether agreed actions are implemented, record any challenges partners face in putting them into practice, and adjust the scaling strategies in response. Section 6 turns these commitments into recommendations.

4. Understanding inclusive business models for agribusiness growth (Day 2)

Day 2 focused on the businesses that deliver mechanization , namely MSPs, private-sector firms and cooperatives. The aim was not to teach new business models but to show how existing models can become more inclusive and, as a result, more investable.

4.1 The business case for inclusion

Facilitators presented inclusion as a business decision, not only an ethical one. Women make up more than 40% of smallholder farmers in agricultural value chains and about 43% of the agricultural workforce globally, so businesses that do not serve them leave a large market untapped (see Figure 9). Women reinvest up to 90% of their income in their families and communities, which sustains demand for products and services. Women often lead value addition, such as peanut butter processing, while youth are drawn to processing, branding and digital services. Persons with disabilities are a further, often overlooked, customer group.

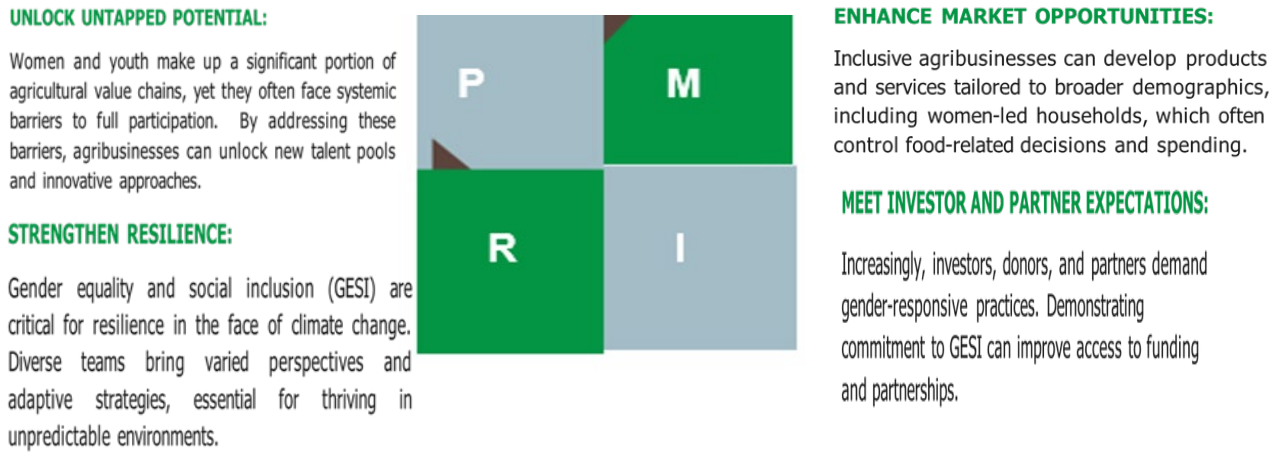


Figure 9. Why inclusive business models matter. Source: Njiru et al., (2025).

Investors and lenders increasingly assess social as well as financial performance. The 2X Criteria are a global standard for gender-lens investing; alignment rests on thresholds for women's entrepreneurship and ownership, leadership, employment, supply chains, and products and services, which vary by country and sector (2X Global 2024). At the workshop, businesses in which women own or lead 20–30% of the enterprise, or that target women as customers, were presented as better placed to access impact-focused funding. To make this case, businesses need disaggregated data on women customers, leaders and employees, and on youth participation.

For MSPs, customers are the market. A machine that women cannot operate, or a service that women cannot book or afford, limits both adoption and the provider's income. Inclusive design and services raise the number of days a machine works, which in turn supports loan repayment.



Figure 10. Picture of participant expanding on the business case for MFIs to prioritise women-led businesses. Photo credit: Namukolo-Nali Rachel

4.2 GESI self-scoring results

Each group answered the seven yes-or-no questions in the self-scoring checklist (Table 2) by discussion, drawing on members' knowledge of their own businesses. Each "yes" scored one point, giving a total out of seven: 0–2 indicates limited, 3–5 moderate and 6–7 strong GESI integration. Both groups reached the moderate band (Table 8). MSPs and private-sector actors met five of seven criteria; cooperatives and farmer associations met four. A moderate score means that women are present as owners, leaders, workers and customers, but the businesses lack the written policies and inclusive training arrangements that would sustain inclusion and show it to investors. Both groups missed the same two criteria, policies and training accessibility, which points to where support is most needed.

Table 8. GESI self-scoring results by actor group.

Criterion	Threshold used	MSPs and private sector (Group 1)	Cooperatives and farmer associations (Group 2)
Ownership	At least 20–30% of the business is owned by women	Yes	Yes
Leadership	Women hold at least 30% of senior leadership positions	Yes	Yes
Employment	Women make up at least 30% of the workforce or supply chain	Yes	Yes
Target market	At least 30% of customers are women or youth	Yes	Yes
Policies	Written gender equality and youth inclusion policies are in place	No	No
Training accessibility	Training schedules and locations are inclusive of women and youth	No	No
Cultural sensitivity	Measures are taken to address norms that limit women's participation	Yes	No
Total score		**5/7 (moderate)**	**4/7 (moderate)**

Plenary discussion qualified these scores. MSPs estimated that only 20–30% of businesses are owned by women and reported unfair competition from informal and illegal operators. Cooperatives estimated that about 30% of leaders and 30% of those active in value chain activities are women. In both cases, "yes" answers rested largely on estimates and on assumptions about gendered tasks, for example that women do most planting, weeding and harvesting, rather than on records. Facilitators encouraged participants to treat the thresholds as minimums and to aim for 50% participation.

4.3 From assumptions to evidence

Participants agreed that credible GESI reporting needs beneficiary registers that record each person's full name, sex, age, National Registration Card (NRC) number and, where relevant, disability status, because names alone do not reliably indicate gender. Such records help in three ways. They replace estimates with verifiable figures. They show MSPs and cooperatives which groups they are, and are not, reaching. And they provide the evidence that lenders and impact investors ask for during due diligence. The cooperatives group proposed an empowerment register for all value chain participants and attendance records for training. These records are also the raw data for progress dashboards aligned with the 2X Criteria.

> "We want to know if you have a register or a book where you record the name, the gender and maybe the age."
> *Facilitator, Ojongetakah Baa*

4.4 Moving beyond policies on paper

Participants noted that government and NGO gender policies exist but rarely reach cooperatives: "Policies do exist, but they are found in those offices." Rather than waiting, organizations can adapt national policies to local conditions and start with practical documents such as operational guidelines, codes of conduct, safeguarding procedures, occupational safety guidelines and maternity leave provisions. They should translate key policies into local languages and request targeted technical support, for example on safeguarding or preventing sexual harassment, rather than general gender training.

Policies on paper also need to be matched by practice in the communities where businesses operate. Participants therefore treated cultural sensitivity, the seventh self-scoring criterion, as part of putting GESI commitments into practice. Service providers stressed consulting traditional leaders and headmen before introducing services, and respecting local customs, for example by pausing operations on the day of a funeral. They also described norms that bar women from some activities, such as beekeeping, which can only change through engagement with community gatekeepers.

4.5 Gender action plans

A gender action plan (GAP) turns the results of a GESI self-assessment into concrete objectives, activities, indicators, responsibilities and timelines. GAPs matter for investment readiness because they show lenders and investors how a business will improve its inclusion and how progress will be measured. Facilitators emphasized that each GAP needs an accountable person, even where there is no human resources department; measurable indicators that can show investors progress over five years or more; and realistic timelines.

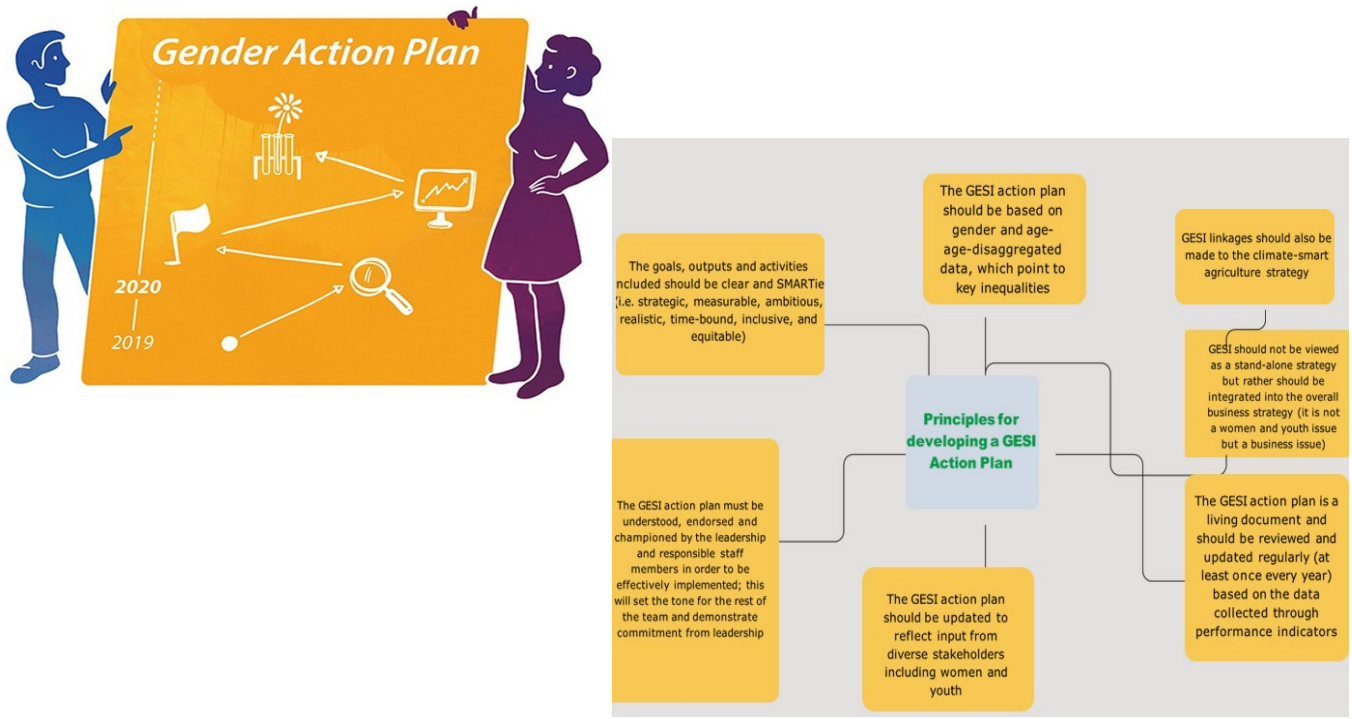


Figure 11. Picture of how GAPs can be designed by teams with key components for consideration. Source: Njiru et al.,(2025).

Each group then turned its findings into a GAP, using the components shown in Figure 11 (Table 9). MSPs chose cultural sensitivity, which they wanted to strengthen even though they had scored it as met; cooperatives chose policies and by-laws, their main gap.

Table 9. Gender action plans drafted by the two groups: Cooperatives and MSPs.

Element	Group 1: MSPs and private sector	Group 2: Cooperatives and farmer associations
Focus	Cultural sensitivity	Policies and by-laws
Objective	Increase the contribution and involvement of women and youth in development through "cultural resetting"	Customize by-laws; strengthen gender equality and youth inclusion in cooperative policies
Activities	Awareness creation with civic and opinion leaders; building rapport with civic leaders; protective gear (for example, beekeeping suits); mentorship; stakeholder engagement	Call a members' meeting; sensitize the community on gender equality; review and document by-laws; collect data on representation of women, youth and persons with disabilities; create record-keeping templates
Indicators and targets	Awareness activities twice a year; 250 beekeeping suits; quarterly stakeholder engagement	Meetings twice a year; at least 50% representation of women, youth and persons with disabilities; simplified, documented by-laws; up-to-date records
Expected outcomes	Greater involvement of women and youth; wider adoption of new innovations; increased awareness	Higher participation; more efficient cooperatives; viable businesses with defined roles; higher profits; investor and partner confidence; member retention; access to training
Responsible	Traditional counselors; chief executive officers; traditional leaders	Chairperson (meetings); secretary (records and minutes); treasurer (finances); trustees and committee (oversight); publicity coordinator (mobilization)
Timeline	9–12 months	30–90 days

The two plans start from different places. The MSP plan works outward, through traditional and civic leaders, to shift norms that limit women and youth, and runs over 9–12 months. The cooperative plan works inward, on by-laws, representation targets and records, and could be completed within 30–90 days. Together they show that inclusion needs both community-level change and internal business systems. Both plans set measurable targets, but the MSP plan's indicators track activities (awareness sessions and protective suits) rather than outcomes. Group 1 drew its example from beekeeping, reflecting the mixed value chains of participants. For the mechanization solution track, the same structure should be applied to equipment services, for example with targets for women and youth among operators and customers.

4.6 Strategic alignment on cooperatives and business policies for MSPs

Inclusive business models depend not only on individual businesses but also on the institutions through which mechanization services reach farmers. Because cooperatives are a main channel for MSP services, a plenary session considered what institutional arrangements and business policies would allow cooperatives to play this role. Participants proposed three arrangements:

- The Cooperative Department under the ministry responsible for SMEs should lead cooperative development and the implementation of business policies for MSPs.
- FAO support on cooperative development should be embedded in the Ministry of Agriculture's extension training materials.
- A cluster approach should be applied at district level, with District Cooperative Unions responsible for ensuring good governance.

Participants with cooperative experience traced many equipment problems to weak governance. Examples included machinery treated as leaders' personal property and left unused, member lists that included people unaware of their registration, leadership concentrated in a few hands and political interference. They recommended separating boards (oversight) from management (operations), strengthening monitoring by cooperative inspectors and building on recent registration and verification reforms. Cooperative unions could pool members' resources to employ specialized service providers for land preparation, planting, threshing and irrigation, making services more affordable. Participants also called for integrated extension that gives mixed crop–livestock households one coherent set of advice.

4.7 Progress tracking and the inclusive business model canvas

The final sessions introduced two tools for tracking progress. The first is a progress dashboard that sets out GESI objectives, activities, performance indicators and targets, expected outcomes, responsible entities and timelines (Table 10). Businesses update it at regular intervals to check progress against the 2X Criteria. The second is an inclusive and responsive business model canvas, which helps businesses design products and services around the needs of different customer groups. Group work on these tools was not documented in detail, so this section focuses on how they will be used. Under Recommendation 3 (Section 6), the IWMI GESI team will coach MSPs and cooperatives to complete both tools using data from their own beneficiary registers.

Table 10. A dashboard to track progress on inclusion within key interventions.

GESI Objectives	GESI activities/actions	Performance indicators targets	Expected Outcomes and Benefits	Responsible Entities	Timeline
2.1: To enhance GESI consciousness of leadership at individual level (GESI mainstreaming sensitization)	2.1.1: Conduct regular GESI sensitization training for management team	2.1.1: Number of GESI sensitization trainings held annually (aim for a minimum of one)	• Increased awareness about GESI in workforce development and its implications to business performance outcomes • Increased commitment to GESI goals and outcomes • Improved working culture • Increased employee retention • Improved knowledge • Improved confidence in female and young managers	HR Department	Indicate which quarter you aim to achieve and track progress

5. How inclusive scaling supports adoption of mechanization

Taken together, the two days show that the main limits on mechanization adoption in Zambia are not technical. Low-cost machines exist and work. What limits adoption is who can pay for them, operate them, reach the services and be trusted by lenders. Inclusive scaling addresses these limits through four linked pathways (Figure 12).

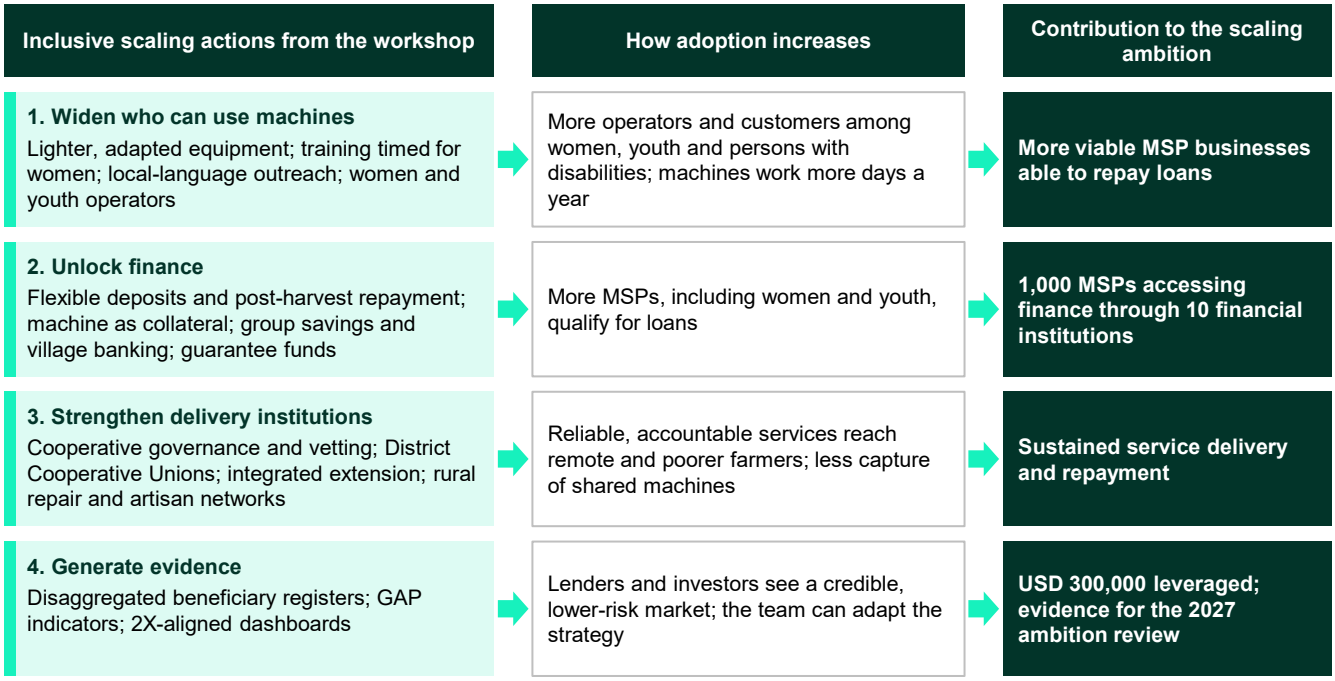


Figure 12. Four pathways through which inclusive scaling supports mechanization adoption and the scaling ambition. Source: Authors' synthesis of workshop findings

Pathway 1: Widening who can use machines

Machines designed with only able-bodied adult men in mind exclude many potential operators and customers. Lighter equipment, adaptations for disability, training scheduled around women's workloads and communication in local languages expand the pool of operators and clients. Because MSP income depends on how many days a machine works, a larger and more diverse customer base also improves repayment capacity.

Pathway 2: Unlocking finance for more, and more diverse, MSPs

Collateral and the 30% down payment screen out women, youth and poorer farmers. The workshop proposals lower this barrier: using the machine itself as collateral, flexible deposits with repayment after harvest, group savings and village banking, and guarantee funds such as the one used in Zimbabwe. They respond directly to the ambition's focus on inclusive financing models with 10 financial institutions.

Pathway 3: Strengthening the institutions that deliver services

Cooperatives and MSPs are the channels through which machines reach smallholders. Clear governance, vetting before equipment is provided, oversight by District Cooperative Unions and cooperative inspectors, and local repair capacity reduce the risk that shared machines are captured by a few people or left idle.

Pathway 4: Generating evidence that makes inclusion investable

Registers, GAP indicators and dashboards aligned with the 2X Criteria turn inclusion from a claim into evidence. This is what lenders and investors ask for in due diligence, and it will allow the solution track to show, at the 2027 review, whether the MSPs being financed and the farmers they serve include women, youth and persons with disabilities.

The pathways reinforce each other: without evidence, lenders are unlikely to adapt products; without adapted products, few women and youth can become MSPs; and without accountable institutions, financed machines may not reach the farmers who need them most. Naming and tracking these groups will make the ambition both easier to achieve and more meaningful.

6. Recommendations and next steps

Table 11 sets out recommendations drawn from the workshop findings. Lead actors and time frames are proposed for discussion and agreement with partners.

Table 11 Recommendations, proposed lead actors and time frames.

No.	Recommendation	Proposed lead actors	Proposed time frame
1	Revise the scaling ambition to name priority user groups (women, youth and persons with disabilities) and add sex-, age- and disability-disaggregated targets for MSPs and the farmers they serve	Mechanization solution track team (CIMMYT, IWMI, Alliance of Bioversity International and CIAT) with S4I AoW3	Before the end-2027 ambition review
2	Co-design inclusive, technology-specific loan products with partner financial institutions, including flexible deposits, repayment after harvest, machine-as-collateral and links to group savings	CIMMYT with partner MFIs and banks; S4I AoW3	2027 farming season
3	Introduce beneficiary registers and simple dashboards aligned with the 2X Criteria for MSPs and cooperatives, and coach them to complete the business model canvas	IWMI GESI team with MSPs and cooperatives	Within 90 days, then quarterly
4	Support implementation of the two GAPs and adapt the MSP plan to equipment services, with targets for women and youth operators and customers	IWMI and CIMMYT with MSPs and cooperatives	Quarterly follow-up through 2027
5	Set cooperative eligibility and governance criteria before providing equipment, working through District Cooperative Unions and cooperative inspectors	Ministry responsible for cooperatives and SMEs; Total LandCare; CFU	Before the next equipment distribution
6	Support adaptive research on lighter, accessible and multi-use machines suited to women, older farmers and persons with disabilities	ZARI with local manufacturers and CIMMYT	2027
7	Apply inclusive training standards (timing, duration, local language and support for nursing mothers) in extension and MSP training, scheduling cooperative training for July–September	Ministry of Agriculture extension; FAO; Mulimi; Lupiya	Next training cycle (July–September 2027)
8	Partner with the Zambia Agency for Persons with Disabilities on disability inclusion in training, equipment design and finance	S4I GESI team; Zambia Agency for Persons with Disabilities	2027

6.1 Participant commitments

Participants made the commitments listed in Table 12. Personal contact details were collected separately and are not published in this report.

Table 12. Commitments made by participants at the close of the workshop.

Organization or participant	Commitment
Mulimi	Share workshop lessons at the summit on September 3–5, 2026, and train others; ensure mechanization, finance and market programs target women, youth and persons with disabilities; train cooperatives on scaling, ventures and financial record keeping
Lupiya	Train cooperatives on scaling, impactful ventures, capacity building and financial record tracking
Total LandCare	Provide the Cooperative Act and linkages to cooperatives
NGOs working with farmers	Collaborate with Total LandCare on mechanization awareness campaigns among cooperative members
FAO	Support linkages with key stakeholders and the development of capacity-building materials and strategies
ZARI	Undertake adaptive research on small-scale mechanization packages to increase adoption
Zambia Agency for Persons with Disabilities	Take part in further capacity building on disability inclusion
CFU	Mobilize cooperatives in Central, part of Copperbelt and Southern Provinces for training
VILMA Enterprise	Provide practical mentorship in local languages to support mindset change
Cooperative members and farmers	Share information with cooperative members and the Ministry of Agriculture; support mobilization through local leaders; link the team with the cooperative inspector and raise concerns about political interference
Service providers	Encourage the involvement of small-scale farmers in capacity-building meetings

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Appendices

Appendix A – Authorship Decision Log

Date	Contributors	Credit roles	Proposed Author order	Notes/Agreements
20 April 2026	Ojongetakah Enokenwa Baa	Conceptualization – original outline, workshop facilitation, formal analysis, writing – original draft, writing – review and editing	Ojongetakah Enokenwa Baa, Millicent Lodenyi Liani, Consent Sibeso	The authors declare that they have no known competing interests or personal relationships that could have appeared to influence the work reported in this paper
28 May 2026	Millicent Lodenyi Liani	Conceptualization – original outline, methodology, workshop facilitation, investigation.		
June 20 2026	Consent Sibeso	workshop coordination.		

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.



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