

# Innovation Packaging and Scaling Readiness Workshop: Mbili Mbili strip cropping system in mixed farming systems of Malawi

## Report

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The [Sustainable Intensification of Mixed Farming Systems Initiative](#) aims to provide equitable, transformative pathways for improved livelihoods of actors in mixed farming systems through sustainable intensification within target agroecologies and socio-economic settings.

Through action research and development partnerships, the Initiative will improve smallholder farmers' resilience to weather-induced shocks, provide a more stable income and significant benefits in welfare, and enhance social justice and inclusion for 13 million people by 2030.


Activities will be implemented in six focus countries globally representing diverse mixed farming systems as follows: Ghana (cereal–root crop mixed), Ethiopia (highland mixed), Malawi: (maize mixed), Bangladesh (rice mixed), Nepal (highland mixed), and Lao People's Democratic Republic (upland intensive mixed/ highland extensive mixed).

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## Abbreviations and acronyms

<b>ABC</b>	Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT)
<b>ATCC</b>	Agricultural Technical Clearance Committee
<b>CIAT</b>	International Center for Tropical Agriculture
<b>CGIAR</b>	Consultative Group of International Agricultural Research
<b>CIMMYT</b>	International Maize and Wheat Improvement Center
<b>DAES</b>	District Agricultural Extension Services
<b>DAESS</b>	District Agricultural Extension Services System
<b>DARS</b>	Department of Agricultural Research Services- Malawi
<b>ICRISAT</b>	International Crops Research Institute for the Semi-Arid Tropics
<b>IITA</b>	International Institute for Tropical Agriculture
<b>IPSR</b>	Innovation Packaging and Scaling Readiness
<b>MFS</b>	Mixed Farming Systems
<b>SDG</b>	Sustainable Development Goals

## Background

### **The One CGIAR initiatives and IPSR workshop**

The Innovation Packaging and Scaling Readiness workshop (IPSR) was held by the One-CGIAR Mixed Farming Systems Initiative (MFS) in Lilongwe Malawi on the 2nd of November 2023<sup>1</sup>. It was attended by diverse group of 32 participants with 11 female participants, including farmers, seed and fertilizer companies, Department of Agricultural Research Services, Department of Agricultural Extension Services, development agencies working on sustainable agricultural intensification in mixed farming systems, as well as agricultural finance, and local media.

Dr Haroon Sseguya (IITA) introduced the One-CGIAR and three One-CGIAR initiatives operating in Malawi, including the Sustainable Intensification of Mixed Farming Systems, Excellency in Agronomy, and Diversification for Resilient Agrifood Systems in East and Southern Africa.

The One-CGIAR is an integrated global research partnership dedicated to transform food, land and water systems for a safe, health and sustainable future, in partnership with national public and private sector actors.

The global research and innovation strategy is based on a portfolio of 33 game changing research initiatives that are grouped into 3 research action areas (Genetic innovation, Systems Transformation and Resilient Agri-food Systems)

The initiatives were developed around five impact areas: i) nutrition, health and food security, ii) poverty reduction, livelihoods and jobs, iii) gender equality, youth and inclusion, iv) climate adaptation and mitigation, and v) environmental health and biodiversity.

The research initiatives are co-defined and co-designed through extensive consultation and dialogue with partners and stakeholders at national, regional and international levels.

The MFS Initiative particularly employs approaches that enhance the sustainable intensification (i.e. production of more food on the same piece of land while reducing the negative environmental impacts) of mixed farming systems, to deliver critical outcomes that result in multiple impacts at scale, minimize sectoral trade-offs and maximize synergies in mixed farming systems.

The IPSR workshop follows a protocol to leading to development of viable scaling strategies. The primary objective of the workshop held in Malawi was to design a context-specific innovation package for Cereal-Legume Intercropping in Malawi to facilitate scaling, drawing on expert knowledge in crop diversification and agricultural finance.

### **Mbili Mbili strip cropping innovation**

Dr Feyera Liben (ABC) introduced the Mbili Mbili strip cropping system, which is being co-validated for Malawi as a country.

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<sup>1</sup> Further reading: <https://www.cgiar.org/news-events/news/467282-autosave-v1/>

The Mbili Mbili strip cropping system was introduced to Malawi in 2022, by the Alliance Bioversity and CIAT (ABC), as part of the MFS initiative, in collaboration with the Department of Agricultural Research Services (DARS). In 2022/23 mother trials were conducted with 12 farmers in Kasungu and Mzimba Districts, and field days held, attended by more than 850 farmers. The Mbili Mbili is currently under evaluation in 4 Districts in Malawi, on-station, and on-farm trials.

### **What is Mbili Mbili?**

Mbili-Mbili is a cereal-legume intercropping strategy involving three crops with different growth patterns spatially configured within a field (Kihara and Kinyua, 2022; Kinyua et al, 2023). The name Mbili-Mbili is derived from Swahili word “Mbili” meaning two. In Mbili-Mbili, two maize rows alternate with two multi-purpose legume or forage species.

### **Why Mbili Mbili?**

Legume productivity remains low, e.g., < 250 kg/ha for beans (*Phaseolus vulgaris*) and < 400 kg/ha for pigeon pea (*Cajanus cajan*) in intercropping system (Kihara and Kinyua, 2022; Kinyua et al., 2023). Recognizing this, the International Center for Tropical Agriculture (CIAT), developed and validated a strip-cropping system-Mbili Mbili.

### **Benefits of Mbili Mbili**

- Enhanced productivity
- Labor saving
- Weed control
- Gender sensitive
- Enhanced nutrition
- Enhanced livestock feed
- Improved farm profits
- Improved climate resilience
- Restored soil health

### **Technical information**

The specific focus of Mbili Mbili innovation is to increase the intercropped multi-purpose legumes (food and feed sources) productivity, while maintaining the same productivity as sole maize.

Mbili-Mbili exploits plant spatial configurations and growth patterns to increase light penetration to the legumes, otherwise often shaded by cereals. Interrow spacing (ridges) is at 60 cm.

It takes advantage of the fast, intermediate, and long growth durations of maize, intercropped with common bean, or soya bean or groundnut, with pigeon pea and forages, respectively, which minimizes competition among these crops.

### **Scaling ambition**

By 2026, the MFS and partners will work together with The District Agricultural Extension Service (DAES), Department of Agricultural Research Services (DARS),

development organizations, seed and fertilizer companies, AgFin and other partner institutions to co-validate and refine according to diverse agro-ecological contexts, and scale out Cereal-Legume Intercropping Innovation, complemented by agronomic biofortification, to over 5000 farmers in Malawi to contribute achieving food self-sufficiency, improved feed for livestock, enhanced human and livestock nutrition, soil fertility restoration and adaptation to climate change through crop diversification.

The innovation users and scaling partners

- Farmers: 5,000
- Researchers: 10
- Extension agents: 10
- Policy actors: 10
- Community Based Organizations: 4
- Private sector partners: 3
- NARS/NARES: 5
- Government: 1
- Agro manufacturers: 1
- Agri-input providers: 3
- Agrodealers: 6
- Donors: 2

Mbili Mbili contributes to CCGIAR impact area targets.

- 2.1 Poverty reduction, livelihoods & jobs
- 4. 2 Climate adaptation & greenhouse gas reduction
- 5.2 Environmental health & biodiversity

## Discussion

The plenary discussion raised the following points for clarification:

- The name Mbili Mbili is promoting 2 rows of maize intercropped with two legume types of different growth habit, such as pigeon pea with soya bean, common bean or groundnut. Mbili Mbili is suitable for farmers with small land sizes, as it maximizes the production per unit land through improved integration. The innovation is being assessed under rainfed conditions, and not under irrigated conditions.
- The focus of Mbili Mbili is on the spacing and configuration of diverse crops. Data on the impact of pest and disease resistance through Mbili Mbili were not assessed. Forages will be introduced that might have pest and disease mitigating effects.
- The innovation focus on maize as the dominant cereal crop in Malawi. It can be applied to other cereals as well. The maize varieties for the Mbili Mbili will be recommended by local advisory and agricultural extension services. The maize production will not be suppressed through introduction of legumes, as compared to sole maize, since the spacing between rows will be reduced.
- With regarding the bean varieties, NASFAM has red kidney bean varieties which are highly preferred by farmers to Nua 45 which is under the Mbili Mbili.

The new mother trials and baby trials will include crops and varieties that farmers prefer.

- Data for soil and biomass analysis were collected for the sites hosting mother trials since to know the soil physical-chemical properties that affect plant growth and development.
- The Innovation is being evaluated for release through the ATTC. A gross margin analysis will be conducted, to substantiate the case. Subsequently business cases will be developed supporting the scaling of the innovation.

## Group work: Mbili-Mbili Innovation Packaging and Scaling Readiness assessment

### Procedures

**Step 1:** Participants were asked to write down the biggest challenges/ problems that could prevent the core innovation Mbili Mbili from getting scaled up. Participants wrote down their answers on sticky notes which were provided, every answer on a separate sheet.

**Step 2:** Participants then clustered the sticky notes according to designated workstations under 10 enabler categories: Design of the innovation, user awareness, user confidence, availability and access to the innovation, access to finance and affordability, compatibility existing farming, market, policy or business models, capacity and know how, gender equality and social inclusion, legal conditions and governance, and other enabler categories to be locally defined.

**Step 3:** Participants allocated to groups based on their expertise to discuss the challenges and come up with each one solution per cluster of challenges.

**Step 4:** The solutions provided were rated from 1-9 in terms of how ready they are and to what extent they are being used; 9 as very ready and 1 less ready. If the solutions suggested were just ideas, they were rated 0. The rating provided basis for prioritizing interventions for Mbili-Mbili going forward.

### Issues and suggested solutions

#### Design of the innovation

The issue identified was unacceptability of pigeon pea as Mbili-Mbili component in parts of Malawi. The suggested solution was promotion of pigeon pea through sensitization, cooking classes and contract farming. The technology is already in existence, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and DARS are already working on releasing more palatable and pest and disease resistant short to medium duration pigeon pea varieties. The supplementary solution was formulation of by-laws to prevent free grazing livestock from destroying the crops, as well as releasing short to medium duration pigeon pea varieties.

#### User awareness

The issue identified was a lack of understanding and need for mindset change for farmers and stakeholders to adopt and support the Mbili Mbili. The suggested solution was conducting awareness campaigns through radio programs (especially community radios that are closer to farmers) and producing documentaries on production guidelines. This will enable farmers and stakeholders to understand the technology. Another solution was orienting front line staff who in turn will pass the knowledge to farmers through Farmer Field Schools and the District Agriculture

Extension Services Systems (DAESS). The innovation is already practiced by the Ministry of Agriculture and various NGOs.

### **User confidence**

The issue identified was farmers fears of the innovation and the solution suggested was use of model farmer approach, also known as lead farmer approach. This utilises use of exemplary farmers in the community who are early adopters of technologies, male and female. This provides hands on and experience learning of farmers from fellow farmers who they know and trust hence easy adoption of technology. The technology is already in use and is widely used by the Department of Agriculture Extension Services (DAES) and various organisation in the agriculture sector.

### **Availability and access to the innovation**

The issue identified was lack of farm inputs and the suggested solution was to enhance availability of inputs (seeds, fertilizer) through Affordable Input Programme (AIP). The practice is already in place, provided by the Ministry of Agriculture, targeting resource poor smallholder farmers. Government targets farmers at club or village level, using asset endowments as selection criteria.

### **Access to finance and affordability**

The issue identified was limited access by farmers to inputs and finance. The suggested solution was tailored agriculture input production, targeting farmers practicing Mbili-Mbili combined with provision of loan products to enable farmers access the inputs. This provides access to attractive finance and encourage farmers to practice Mbili-Mbili cropping technology.

The target groups are rural farmer groups, savings group and financial input organisations. The innovation is also known as Nnggole yosamala nthaka and it partially exists. Banks perceive agriculture loans as risky because of issues of climate change, seed quality and pests and diseases. However, there sharing mechanisms are being put in place. There are climate collateral and participating banks can themselves access cheaper loans. Standard bank and First Capital Bank provide loans to legume farmers and CUMO and Vision Fund have agricultural loans, targeting savings groups.

### **Compatibility existing farming, market, policy or business models**

The issue was that the different plant configuration would require additional labour from the conventional, because of moving from 75cm to 60cm distance between planting rows. As solution identified was to establish solid gross margins analyses. There is need to compare the gross margins from Mbili Mbili with conventional field lay out, and quantify other indicators as well, such as soil fertility improvement. Farmers, extension workers and researchers already use the methods, which can be applied to establish clear benefits from Mbili Mbili.

### **Capacity and know how**

The issue was lack of access to and availability of extension services during roll out. There is need to make resources available to adequately train extension services. There is need for engagement of government and other stakeholders to mobilize resources for roll-out, to address knowledge gaps. Government and NGOs are working towards making these resources available.

### **Gender equality and social inclusion**

The issue identified was extra labor that comes in with multiple crop arrangement in the Mbili-Mbili system. The suggested solution was to reducing labour intensity through introduction of labour-saving technologies e.g., broad spectrum herbicides like harness, dual magnum, thereby making the technology friendly to all gender categories. The innovation is already in existence and the broad-spectrum herbicides are available in various agro-dealer shops.

### **Legal conditions and governance**

The issue identified was failure of government to release or clear technologies timely. The suggested solution was involvement of the Agricultural Technology Clearing Committee (ATCC) in the validation of the Mbili-Mbili technology as well as conducting both on station and on farm trials in the different agro-ecological zones, tested for at least 2 seasons, with harmonized systems of data collection, to ensure credible results. This targets all stakeholders including ATCC, implementing partners and farmers who are the adopters of the technology. The innovation already exists and the Department of Agricultural Research (DARS), CG centres and various NGOs collaborate.

### **Climate variability**

Under other enabler categories climate variability was identified. The suggested solution was a service provider model for appropriate-scale irrigation. The approach allows farmers to get loans from banks to buy irrigation equipment and give services to other farmers. This helps farmers to cope with climatic shocks such as dry spells and erratic rainfall patterns and reduces competition between companion crops. The targets groups are farmers as well as private companies supplying equipment. The approach already exists and is currently used by CG centres e.g. CIMMYT, IWMI, as well as Kulima, a private company, and the Department of Irrigation.

### **Innovation scoring**

Table 1 informs about the scores given to the various solutions rated in terms of innovation readiness and innovation use.

Table 1. Innovation readiness and use of complementary innovations to Mbili Mbili as identified by IPSR workshop participants

<b>Innovation</b>	<b>Innovation readiness</b>	<b>Innovation use</b>
Core innovation:	7	2
• Mbili-Mbili cropping system		
Complementary innovations		
• Model farmer approach	9	8
• Seed systems strengthening (pigeon pea seed banks, by-laws, contract farming)	9	5
• Multimedia sensitization campaigns	9	4
• Subsidy program	9	8
• Gross-margin/business case model analysis	9	2
• Training program for extension staff	9	2
• Use of multipurpose agro inputs	9	2
• Approval of the innovation (through technology clearing committee)	9	7
• Mbili-Mbili loan product	3	2
• Appropriate-scale irrigation service provide model	6	3

## **Farmers' voices on Mbili Mbili**

'Intercropping of maize and legumes has been a common practice for generations. What I noted with the Mbili-Mbili cropping system is that the productivity of the component crops in the system is enhanced compared to the traditional way of intercropping. Beans and maize in the Mbili-Mbili grew as vigorously as sole crops, which is a plus to my family needs', narrated Mercy Shaba, a mother trial farmer from Kamatao section of Champhira EPA in Mzimba district, while also highlighting the nutritional importance of biofortified crops in the Mbili-Mbili system. 'The demonstration plot attracted interest from passersby who used to stop and ask how it was done so that they can practice on their own farms'.

Ernest Mpinganjira, a mother trial farmer from Kantuwale Section of Chulu EPA in Mzimba found higher maize yield from his Mbili-Mbili plot intercropped with pigeonpea and common beans, compared to the sole maize plot. He also narrated that legumes like beans were regarded as crops for only female farmers but there has been mindset change after what was observed from his demonstration plot.



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