

Mixed Farming Systems Initiative in Ethiopia



Published by

International Livestock Research Institute, Alliance of
Biodiversity International and CIAT, International Center for
Agricultural Research in the Dry Areas, International Maize
and Wheat Improvement Center

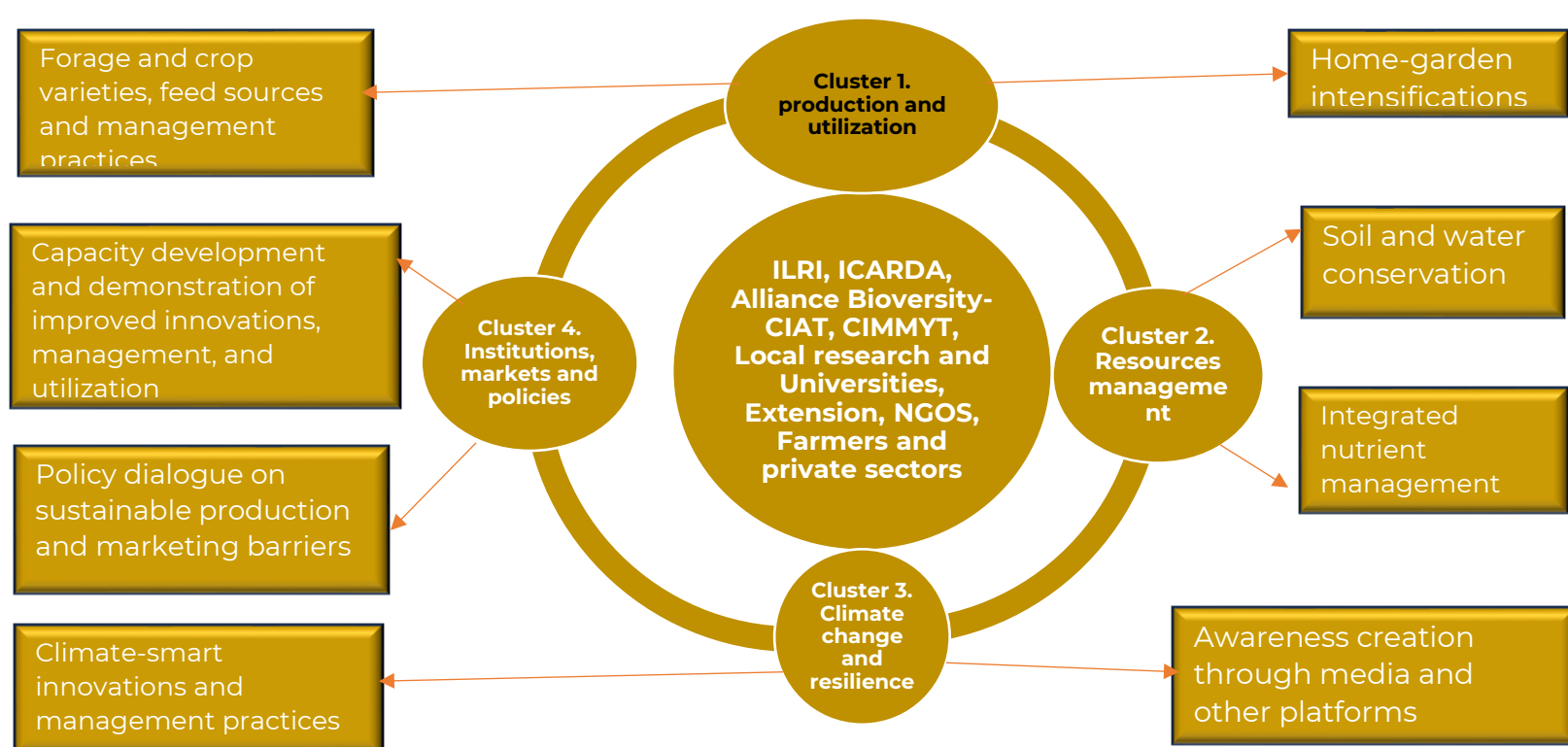
November 2023

Mixed Farming System in Ethiopia

The Mixed Farming System (MFS) initiative in Ethiopia is a multi-partner initiative that aims to increase access to agricultural research and extension service providers, to improve the livelihoods of smallholder farmers who are engaged in mixed farming systems across three regions, including Amhara, Oromia and SNNP. These interventions are designed to help farmers in Ethiopia to increase their productivity and incomes, while also reducing their environmental impact. Mixed Farming System initiative aims in Ethiopia:

- Promoting the use of improved crop varieties: The MFS Initiative promotes improved crop varieties adapted to the conditions in Ethiopia.
- Supporting research and development: The MFS initiative supports research and development of feed and forage varieties that are adapted to the Ethiopian climate and soil conditions.
- Increasing the use of fertilizers and other agricultural inputs: The MFS Initiative provides farmers with access to fertilizers and other agricultural inputs. These inputs can help to improve soil fertility and crop productivity.
- Strengthening farmer organizations: The MFS Initiative supports the formation and strengthening of farmer organizations. These organizations can help farmers to advocate for their interests, and to access resources and services.

Socio-technical Innovation Bundles



Brief MFS Interventions in Ethiopia

Livestock- Feed and Forage-Related Interventions

Description

Ethiopia has the largest livestock population in Africa. However, its productivity is low because of various factors. Substantial investments in the livestock sector are required to achieve a sustainable supply of livestock products for the growing population. Climate-smart animal feed resources, breed improvements, better animal health management and favorable enabling environments are the drivers to improve livestock productivity. The ILRI Mixed Farming Systems (MFS) team has been conducting research on feed and forage interventions to support the effort of bridging the feed gap in Ethiopia and beyond. The ILRI team works closely with local partners and communities including women and youth groups. In addition, the project implemented several capacity development schemes and facilitated scaling of validated feed and forage innovations. The ongoing feed and forage interventions in the mixed crop-livestock system include:

- Feed assessment using GFEAST and feed formulation.
- Selection of forages suitable for SI-MFS sites in Ethiopia (three sites)
- Biomass yield of tree lucerne at different cutting frequencies and height.
- Harvesting frequencies of food-feed oat varieties.
- Identification and piloting of feed conservation practices.
- Commercialization of forage and forage seed production.
- Business plan development for dairy cooperatives.
- Enhancing genetic gain via AI and bull services in dairy cows.
- Stakeholders' engagement in animal health service delivery.
- Innovation packaging and updating innovation profiles.
- Dairy development research group and IP formation.
- Gender transformative approach: Gender norms assessment and community conversation.

Systems perspectives

The livestock interventions are guided by systems perspective at intra and inter-sectoral levels. Within the livestock system, there is a focus on addressing all three key sub-systems, namely feeding, breeding, and animal health innovations. Across sectors, the forage innovations are embedded in the mixed farming system, with innovations focusing on maximizing synergies (such as dual-purpose crops) and understanding trade-offs (such as transition to commercial forage biomass and forage seed).

Benefits to users

The forage plants provide various products and services. They serve as a potential supplement for animal feeding schemes. Supplementing dairy cows and sheep with some of the forage resources increases milk yield and body weight gain. They also provide cash to the livestock keepers and other farm types and create job opportunities for youth groups. The

forage plants help farmers to protect their farms and ecologies from environmental hazards and balance the effects of climate change.

Implementing institutions

ILRI, local research Institutions, Universities, extension offices, NGOs,

Climate Smart and Multifunctional Landscape Related Interventions

Description

Ethiopia has made significant progress in land restoration efforts, but there is still a need for more integrated and evidence-based approaches. The Alliance of Bioversity and CIAT is working to develop and implement integrated climate-smart technologies and practices to create multifunctional landscapes that can provide multiple benefits. To address soil acidity, a lime advisory tool has been developed to recommend site-specific lime requirements. To improve maize and barley productivity, an agro advisory tool is being developed to provide site-specific nutrient management recommendations. To improve food and nutrition security, an intervention is supporting farmers to intensify and diversify their homestead farming systems. These efforts are designed to promote sustainable land management, address climate change, and improve the livelihoods of Ethiopian farmers. The ongoing Alliance of Bioversity interventions in the mixed farming initiatives include:

Cooperatives and unions, private sectors and farmers.

Further reading

<https://access.onlinelibrary.wiley.com/doi/epdf/10.1002/agj2.20853>

<https://www.frontiersin.org/articles/10.3389/fsufs.2023.1080725/full>

- Climate smart and multifunctional landscape framework.
- Lime advisory.
- Fertilizer advisory for Maize and Barely.
- Diversified and multifunctional home gardens.

Benefits

- Land rehabilitation and restoration thereby promotes community resilience and carbon sequestration.
- Improve ecosystem services and recover biodiversity.
- Lime advisory tools help improve the soil health condition.
- Fertilizer advisory tools guide to use proper amount of fertilizer in the context of farmers' fields and crop requirements.
- Home gardens diversify and intensify farming systems and increase resilience to various shocks.

Implementing institutions

Alliance of Bioversity and CIAT, local research institutions, Universities, extension offices, NGOs, Cooperatives and unions, private sectors and farmers.

Crop Varieties, Management and Livestock Interventions

Description

Traditionally in Ethiopia's highlands, the mixed cropping system has relied on cereal-legume rotations. However, recent challenges such as diseases, pests, and low productivity of cool-season legumes have led farmers to adopt unsustainable cereal-after-cereal practices. To address this, participatory variety selection was conducted, and farmers' preferred cereal and legume varieties were identified. In parallel to this transformative approach to empower rural youth and women through sheep fattening is being implemented in Ethiopia aspiring sheep fatteners receive training and form cooperatives to fatten using locally available feeds. MFS initiative empowers youths with knowledge and skills to produce livestock feed, ensuring the sector's profitability and sustainability. Additionally, dual-purpose forages enhance soil and water conservation, providing livestock feed while protecting land resources. The deep roots of Desho and Guatemala grass improve soil structure, reduce erosion, and increase water infiltration.

The Gender Transformative Approach (GTA) tackles underlying causes of gender inequality in agriculture through community engagement and education. Efforts are underway to measure and promote the recognition and compensation of women farmers'

contributions. These efforts aim to enhance food and nutrition security in Ethiopia's highlands. Some of the interventions include:

- Food crop varieties and management interventions.
- Whole crop optimization of barley:
 - i. Food-Feed Barley Production.
- Whole crop optimization of barley:
 - ii, multi-stakeholder approach to evaluating barley traits and preferences.
- Market-oriented Sheep Fattening for youth and women.
- Feed Mechanization and Commercialization for sheep fattening youth and women groups.
- Dual-purpose forages.
- Gender Transformative Approach.

Systems perspective

MFS addresses multiple challenges in the barley-livestock market value chain through a combination of crop diversification, participatory approaches, seed production, and disease management. This holistic and participatory approach ensures that the development of the barley-livestock market value chain is inclusive, sustainable, and responsive to the needs of all stakeholders involved. It also ensures that the development and distribution of barley for the barley-livestock value chain are inclusive, demand-driven, and responsive to the diverse needs of the stakeholders involved.

Livestock intervention combines technological innovation, inclusive gender-sensitive community

empowerment, entrepreneurial development, and multi-stakeholder collaboration to create a sustainable and scalable model for rural economic development. It focuses on local resources and needs to address the immediate needs of feed processing for livestock while also aiming at broader goals of empowering youths and women in agriculture, fostering entrepreneurship, enhancing economic development, and ensuring sustainability of optimal supply of balanced compound feed in the livestock sector.

Benefits to users

- Research centers will produce quality breeder seeds to produce pre-basic seeds.
- Pre-basic seeds will be provided to community seed growers and seed unions for further multiplication.
- Farmers will have access to quality seeds from nearby seed growers and increase their crop productivity.
- Potato and garlic are important crops for home consumption (60%) and income generation (25%).

Integrated Nutrient Management, Intercropping Maize and Improved Forage Varieties Interventions

Description

Soil fertility is declining in many parts of the tropical region, including Ethiopia. This is due to a number of factors, including low inherent soil fertility, loss of nutrients through erosion and crop

- The introduction of the two crops in the farming system would diversify the incomes and diets to the farming communities.
- Sheep-fattening groups are growing and women's participation is increasing, reflecting a commitment to gender equality and empowerment in rural communities.
- Feed processing units donated to 13 groups of youth and women, empowering them to process their feed resources
- Gender Transformative Approach (GTA) will lead to permanent livelihood transformation and benefits for both men and women farmers.

Implementing institutions

ICARD, Amhara Regional Agricultural Research Institutes, Debre Berhan Agricultural Research Center, Debre Berhan University, Areka Agricultural Research Center, Wachemo University, John Farm, ElectroMecce Engineering.

Further reading

<https://repo.mel.cgiar.org/handle/20.500.11766/12906>

<https://repo.mel.cgiar.org/handle/20.500.11766/6779>

harvest, and little or no addition of external inputs in the form of organic or inorganic fertilizers. Evaluation and identification of appropriate integrated nutrient management practices suitable for the intervention area are needed. MFS aimed to evaluate the effects of different rates of combination (organic + inorganic) fertilizers and to identify appropriate combinations for optimizing crop yield, soil fertility and economic benefit to farmers.

The introduction of promising as well as improved forage crops such as desho grass, elephant grass and brachiaria is an important strategy to alleviate the prevailing feed shortage in the country. MFS aims to address feed shortages, elephant, brachiaria, and desho grass species were evaluated for their forage production and bund stabilization potentials. In addition, intercropping maize with legumes like *Cajanus cajan*, soyabean, and lablab was introduced to farming communities in Ethiopia. This practice improves resource-use efficiency, crop yield, soil fertility, and nutrient cycling. Legumes can increase crop yield stability under stressful conditions, ensuring sustainable intensification of production systems. The ongoing integrated nutrient management, intercropping Maize and improved forage varieties interventions include:

- Evaluation of integrated nutrient management and its economic analysis on wheat at Omo-Nadda District in Jimma Zone, Southwestern Ethiopia.
- Evaluation and identification of Improved forage grass varieties used for bund stabilization in crop fields.
- Intercropping maize with available legume crops (Forage soyabean, pigeon pea, lablab) for improving crop yield and soil fertility.
- Screening of forage legume and grass species at Eladale research site.

[Benefits to users](#)

- Increase farmers' awareness on implementing integrated use of organic and inorganic fertilizers for soil fertility improvement.
- Increased yield of wheat compared to conventional practices.
- Introduce implementation of improved agronomic practices to smallholder farmers.
- Introduce farmers to integrated approach of physical and biological conservation measures for soil and water conservation.
- Provide additional forage biomass for livestock.
- Introduce farmers to the role of intercropping legume with cereals for soil fertility management and crop productivity.
- Provide farmers with additional yields of legume crops like soya bean for household consumption and nutritional security.

[Implementing institutions](#)

CIMMYT, ILRI, Jimma University, Omo Nada Agriculture office, Jimma Zone Agriculture office, JARC, Omo Nada Agriculture office, Kersa district Agriculture office.

Crowdsourced Crop Variety Selection, Evolutionary Plant Breeding and Organic Protocol for Durum Wheat Production Interventions

Description

To enhance the productivity and resilience of Ethiopian agriculture, MFS has implemented key strategies in

crowdsourcing for promising crop varieties and evaluating the effects of organic and inorganic fertilizer combinations on durum wheat. Crowdsourcing has proven effective in identifying and disseminating high-performing varieties that are well-suited to local conditions. Evolutionary Plant Breeding (EPB), a methodology that harnesses natural diversity and evolutionary processes, offers a promising approach to improving farm resilience and reducing environmental impact. MFS's evaluation of fertilizer combinations seeks to optimize crop yield, soil fertility, and economic benefits for farmers in the East Shoa Zone. The ongoing crowdsourced crop variety selection, evolutionary plant breeding and Organic protocol for durum wheat related interventions include:

- Farmers crop varietal portfolio enhancement through crowdsourcing.
- Enhancing farm diversity through evolutionary plant breeding.
- Upscaling of crop varieties identified through the crowdsourcing approach.
- Development of Organic protocol for durum wheat production.

Benefits to users

- Increase farmer access to diversified crop varieties.
- Harness the potential of natural selection for the identification of high-yielding and adaptable populations.
- Improved nutritional security due to enhanced nutritional content of the populations.

- Improved resilience to climate change-related stresses like diseases.
- Reduce dependency on imported chemical fertilizers.
- Enable gradual build of local soil fertility and enhanced crop productivity.
- Reduction of environmental pollution
- Production of healthy and nutritious foods that improve the health of the consumer.

Implementing institutions

Alliance of Bioversity International and CIAT – (Bioversity), Gimbichu district office of agriculture, Chefe Donsa community Seedbank, Basona Worena, Hadiya office of Agriculture, Debre Berhan University.



Contact person for the initiative in Ethiopia

Anthony Whitbread: a.whitbread@cgiar.org

Wuletawu Abera: wuletawu.abera@cgiar.org



This publication is licensed for use under the Creative Commons Attribution 4.0 International Licence.2023