



More meat milk and eggs by and for the poor

EthiopiaGrass

Perennial grassland mixtures: A novel approach to forage and food production, land restoration, and climate resilience in Ethiopia

FAST FACTS

Project lead: [Norwegian Institute of Bioeconomy \(NIBIO\)](#)

Partners: [Norwegian University of Life Sciences \(NMBU\)](#), [Alliance of Bioversity International and the International Center for Tropical Agriculture \(CIAT\)](#), [Hawassa University](#), [Bahir Dar University](#), [Trinity College Dublin](#)

Regions: Amhara and Sidama Regions, Ethiopia

Goal: Improve feed provision for livestock while increasing the food crop productivity, soil quality, and climate resilience of farmers in Ethiopia

Duration: 3.5 years

Funder: The Norwegian Research Council

Co Financiers: NMBU, CGIAR Research Program on Livestock

Keywords: Forage, grassland, livestock production, food production, land restoration, climate resilience



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CHALLENGE

Animal husbandry provides significant rural employment and is central to the Ethiopian economy. Livestock elevates farmer livelihoods and functions as a nutritious food source. About 90% of livestock feed is currently derived from shared grazing on community pasturelands. These communal lands are highly overgrazed, exacerbating soil and land degradation. Widespread soil losses and nutrient depletion diminish agricultural productivity and farmer incomes. Around 85% of the total land in Ethiopia suffers from moderate to very serious levels of land degradation, costing about US\$4.3 billion per year. Climate change is predicted to increase temperatures and rainfall intensity, while disrupting climatic patterns, leading to more frequent droughts. Coupled with overgrazing, these climatic changes threaten ecosystems and livelihoods. Novel agricultural production systems including livestock could augment food availability, counteract land degradation, and facilitate economic growth in Ethiopia. Measures to improve livestock feed provisions through intensification without compromising food crop production or landscape health are among the prime objectives for sustainable development.

In the highlands, livestock is predominantly managed in mixed crop-livestock systems. Enhancing these agricultural systems involves shifting towards heightened forage production. The number of farmers using improved pastures has increased in the last decade but remains relatively low at under 14%. The potential of grassland species to ameliorate soil quality, lessen land degradation, and raise farmer incomes remains widely unexplored. To date, there are no studies from Africa that examine the effects of grassland mixtures containing diverse tropical grasses combined with legumes on forage and food crop yields.



Napier grass (*Pennisetum purpureum*) and Desho grass (*Pennisetum pedicellatum*) grown as contour line in a farmer's crop field in Sidama region to reduce soil erosion and provide forage for livestock. While Desho grass is the most commonly grown forage grass planted in Ethiopia, other improved forage varieties including *Brachiaria* and *Panicum* grasses have received little attention, despite their promising properties including higher yields and quality as well as tolerance to drought, waterlogging or low soil fertility. © An Notenbaert/ CIAT

RESPONSE

Sustainable and scalable grassland mixtures and practices will boost livestock productivity and enhance soil quality. Increased livestock productivity results in elevated farmer livelihoods and greater food availability. This project supports combining the intensification of livestock feed systems and betterment of farmer livelihoods with land restoration.

Project objectives:

1. Identify the effects of pasture mixtures containing diverse tropical grasses and legumes on forage and food crop yields.
2. Study the plant-soil interactions of selected grassland species grown in pure stands and in pasture mixtures.
3. Recommend climate-resilient pasture mixtures that are preferred by smallholder farmers across various mixed crop-livestock production systems.
4. Assess the potential of pasture mixtures to create synergistic benefits between farmer livelihoods and landscape restoration.

Project approach and methods:

1. Selection of forage species most suitable for the project experiment by international and local experts with site-specific soil and climate knowledge.
2. Controlled on-station field experiments with advanced statistical design combined with climate chamber experiments that study grassland mixtures and soil-plant interactions to identify effects on forage yield and quality, soil quality, carbon storage, and nutrient cycling
3. On-farm controlled experiments to assess the performance of grassland mixtures under farmers' agroecological conditions.
4. Large-scale farmer-led testing using citizen science to understand farmers' choices and preferences.
5. Co-production and dissemination of research results to relevant stakeholders through Multi-Actor Platforms.

THE ROAD TO OUTCOMES

Ethiopia experiences severe barriers to increasing agricultural productivity, such as limited quality and quantity of livestock feeds and degraded soils. This project aims to generate scientifically sound evidence for novel grassland mixtures that can improve farmers' livelihoods while contributing to land restoration. Various steps are taken to translate this novel research into development outcomes:

- i. EthiopiaGrass brings together agronomists, soil scientists, and social scientists with policy makers, funders, non-governmental organizations, the private sector, and smallholder farmers in Multi-Actor Platforms to overcome barriers in a transdisciplinary way. These Multi-Actor Platforms convene regularly to provide feedback about the research objectives and approach, and to disseminate knowledge for enhanced research uptake.
- ii. Large-scale testing of >600 smallholder farmers using citizen science approaches can help in identifying those grassland species and mixtures that are best adapted to farmers' environments and objectives. Such adapted technologies have higher adoption and dissemination potential.
- iii. Synthesized evidence packaged and intended for specific stakeholders will enable them to guide and target further investment in sustainable intensification of mixed crop-livestock systems and land restoration. Communication and outreach in Africa and Norway will support dissemination beyond the project participants.

This project contributes to the 2030 agenda of the Sustainable Development Goals (SDGs) – people, planet, and prosperity – mainly by targeting three SDGs: SDG 2, zero hunger; SDG 13, climate action; and SDG 15, life on land. The project is aligned with Ethiopian strategies such as the Sustainable Land Management Programme (SLMP), the Climate-Resilient Green Economy (CRGE), and the Livestock Master Plan (LMP). The SLMP has been implemented across the country to achieve multiple aims such as lessening soil erosion and land degradation while promoting land restoration and soil fertility, thereby increasing agricultural productivity. The CRGE strategy aspires for Ethiopia to become a lower middle-income country by 2025, and to cut its net greenhouse gas emissions by 64% by 2030. The LMP focuses on the development of the livestock sector to improve the livelihoods of smallholder farmers, reduce poverty, and increase food security.