CIMMYT

SIMLESA
Sustainable Intensification of Maize and Legume Systems for Food Security in Eastern and Southern Africa

NARO
NATIONAL AGRICULTURAL RESEARCH ORGANISATION

Australian Government
Australian Centre for International Agricultural Research

COUNTRY POLICY BRIEF

ENHANCING AGRICULTURAL RESILIENCE AND SUSTAINABILITY IN UGANDA

Small Investments, High Returns: Ox-drawn tools transform smallholder agriculture

Summary and key facts

Timely and efficient farm operations are critical to the productivity of rain-fed maize-legume cropping systems, such as those prevalent in Uganda.

Due to reliance on human muscle and rudimentary tools, e.g. hand hoes, about 80% of the farmers fail to open land on time and therefore plant late, resulting in a mismatch between peak rainfall and the critical stages of crop growth

Use of animal draught power with appropriate mechanical devices and implements can help farmers prepare land on time and increase production capacity

Using ox-drawn rippers reduced human labor requirements by 62%; while beans and maize grain yields increased by 44% and 50%, respectively, due to timely operations

What is the problem?

Over reliance on human labor is inefficient and threatens food security in Uganda

In the rain-fed agricultural systems that dominate maize-legume farming in Uganda, timeliness and efficiency are necessary to optimize farm operations for increased production and productivity. Synchronization of farm activities with seasonal rainfall and weather patterns is a critical aspect of profitable farming. However, due to heavy reliance on human labor and rudimentary tools e.g. hand hoes, about 80% of farmers fail to prepare land on time and therefore plant late.This results in a mismatch between peak rainfall and the critical stages of crop growth.

What solutions were identified from research?

Mechanization increases efficiency, resilience and productivity

The use of simple and inexpensive implements powered by draught animals increases farmer control over farming operations and improves production, productivity and profitability. In 2012, the International Maize and Wheat Improvement Center (CIMMYT) introduced the Sustainable Intensification of Maize-Legume cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project in Uganda to increase smallholders' food and nutrition security, and income levels. This was achieved by integrating sustainable intensification practices such as conservation agriculture for increased productivity and protection of the environment. However, access to mechanization was identified as a main barrier to implementing Conservation Agriculture-based Sustainable Intensification (CASI). Mechanization was introduced to enable farmers to open land on time and at the same time practice conservation tillage using animal draught power to facilitate direct seeding using riplines. The conservation tillage approach involved ripping narrow slits or furrows 15–20cm deep in the soil surface where seeds are planted directly. Soil ripping breaks up the surface crust or a shallow hard pan which impedes crop growth. The results from five seasons of using riplines showed that farmers using the ripper technology reduced their labor requirements by 62% as compared to those using the conventional tillage method.

Labour requirements for land preparation (workdays per hectare)

	Work days	Oxen days	Work days	Oxen days	Work days	Oxen days
Bush clearing	17.5	5	17.5	5	17.5	5
First plowing	37.5	2	0	0	0	0
Second plowing	18.7	1	0	0	0	0
Spraying herbicide	0	0	2	0.333	2	0.333
Making planting station	9	0	18	0	9	1*
Sowing	4.5	0	6	0	4.5	0
Total	87.2	8	43.5	5.333	33	6.333

Additional data from Nyende et al. (2007)
a1 workday = 4 hours of effective working; b1 oxen day = 6 hours of effective working

*Simultaneously making planting lines and sowing

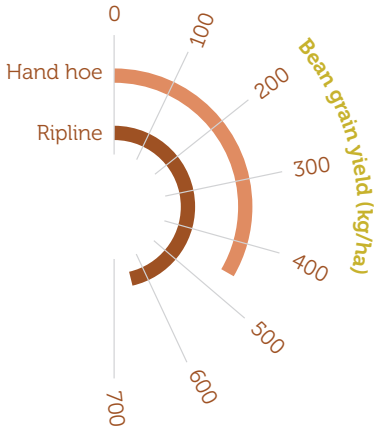
The use of riplines also increased maize and bean grain yields relative to the conventional production method of using hand hoes. Bean grain yields rose from an average of 460 kg/ha using conventional production methods, to an average of 660 kg/ha, using CASI technologies. This represents a 44% increment. Similarly, maize grain yields rose, on average, from 2,000 kg/ha using conventional methods to 3,000 kg/ha using CASI approaches, representing a 50% increment. The yield improvements were attributable to increased nutrient and water use efficiency accorded by the ripper technology.

Beyond tillage: Emphasizing multifunctionality

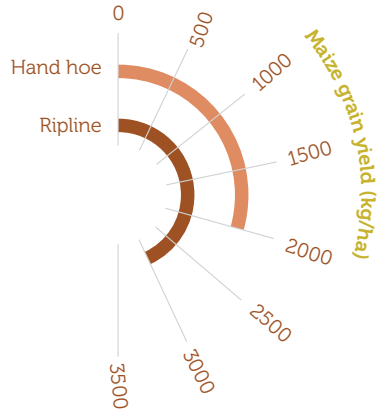
Mechanization covers all levels of farming and processing technologies, from simple basic hand tools to more sophisticated and motorized equipment. Mechanization:

- Eases and reduces hard labor
- Relieves labor shortages
- Enables row planting, precise fertilizer application and timely planting
- Enhances market access
- Contributes to mitigating climate related hazards

The impact of different tillage practices on bean grain yield



The impact of different tillage practices on maize grain yield



Opportunities for policy action

Continued research, training and business development

Invest in adaptive research to customize appropriate mechanization tools suited to smallholder farming

The Government of Uganda, through the Ministry of Agriculture, Animal Industry and Fisheries, is currently reviewing its mechanization policy and should use this opportunity to mainstream smallholder adapted mechanization as a tool to optimize farm operations and improve production.

Invest in appropriate business models and private sector engagement for scaling appropriate mechanization

To ensure the uptake of sustainable appropriate mechanization, the involvement of the private sector to create the supply chains for mechanization will be critical, especially the fabrication, training and business transactions, which also includes the operation of customized hire services. Customized hire service provision has proven to be a good model to reach the majority of farmers without the capital to buy small machinery.

Invest in training for machine servicing and repair

To mainstream smallholder mechanization, large cohorts of technicians are needed.

Invest in the development of multifunctional machinery

Besides investing in research and development for appropriate machinery, it is necessary to invest in the development of machinery that provides flexibility and multifunctionality. For example, two wheel tractors can be used, not only for crop production, but also for transportation and post-harvest operations such as shelling and threshing.

Why act now?

Appropriate and efficient mechanization of agriculture is a key element of modernizing agriculture in Uganda. Uganda has approximately 6 million farming households with 68% of these in the smallholder farming category. Limiting the policy orientation and discussions to tractorization will leave out the core farming community. Without smallholder-adapted mechanization, low productivity will persist and opportunities for saving labor and economic diversification will be lost.
This will undermine efforts aimed at agricultural modernization, economic diversification and income growth.

References and sources

1. Mubiru D.N., Namakula J., Nanyeenya W., Lwasa J., Otim G.A., Kashagama J., Nakafeero M.. (2019). Enhancing resilience and sustainability on african farms: Key findings and recommendations for Uganda. SIMLESA Project Country Synthesis Report. CIMMYT/NARO. El Batan/Entebbe.
2. Mubiru D.N., Namakula J., Kashagama J., Nanyeenya W. (2018). Conservation agriculture: Enhancing resilience and sustainability in Uganda. Proc. 2nd Africa Congress on Conservation Agriculture (2ACCA). 9 – 12 October, 2018. Johannesburg, South Africa.

Please also visit us at:

www.simlesa.cimmyt.org for more publications and data on Uganda and other SIMLESA program countries

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For further enquiries please contact:

Drake N. Mubiru, National Agricultural Research Laboratories (NARL) – Kawanda/ National Agricultural Research Organization (NARO).
P.O. Box 7065, Kampala, Uganda.
drakenmubiru@yahoo.com

William N. Nanyeenya, National Livestock Resources Research Institute (NaLIRRI)/ NARO.
P.O. Box 5407, Kampala, Uganda
will04nan@yahoo.com

Charlotte Kemigyisha, NARO Secretariat.
P.O. Box 295 Entebbe, Uganda.
ckemigyisha@naro.go.ug

Jalia Namakula, National Agricultural Research Laboratories (NARL) – Kawanda/ National Agricultural Research Organization (NARO).
P.O. Box 7065, Kampala, Uganda.
jalianamakula7@gmail.com

Joselyn Kashagama, National Agricultural Research Laboratories (NARL) – Kawanda/ National Agricultural Research Organization (NARO).
P.O. Box 7065, Kampala, Uganda.
joselynleah@yahoo.com