



POLICY BRIEF:

Increasing Wheat Production and Productivity through Science-Based Knowledge and Innovations for a Competitive Wheat Manufacturing Value Chain in Uganda.

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1. Executive Summary

Food security is critical for Uganda's economic growth and resilience. Wheat, a key agricultural commodity, plays a significant role in Uganda's agro-processing sector. However, Uganda currently imports over 90% of the wheat it consumes due to limited domestic production, which is confined to high-altitude areas with scarce land. This over-reliance on imports exposes the country to global supply chain disruptions, such as the Ukraine-Russia conflict.

In response to these challenges, the Uganda National Council for Science and Technology (UNCST), through funding from the Science Granting Councils Initiative (SGCI), supported a project to develop wheat varieties suited for mid and low-altitude regions. The project successfully introduced two high-yielding varieties that have demonstrated their adaptability and potential to thrive in non-traditional wheat-growing areas. These varieties yield over 5 t/ha in mid and high-altitude regions and more than 1.5 t/ha in low-altitude areas.

To reduce dependency on wheat imports and strengthen the country's food security, it is essential to scale up the production of these new varieties, provide technical support to farmers in newly targeted regions, and enhance the wheat value chain. This policy brief presents a unique opportunity to transform Uganda's wheat production, improve rural livelihoods, and promote national economic.

2. Introduction

Wheat is a vital component of Uganda's agro-processing industry, contributing significantly to the country's food security and economy. Despite its importance, Uganda produces less than 10% of its wheat consumption needs, with over 90% of wheat being imported. The limited domestic production is primarily concentrated in high-altitude areas like the slopes of Mount Elgon and the Rwenzori Mountains,

where land scarcity forces competition with other profitable crops such as potatoes and vegetables. This dependency on wheat imports not only limits the competitiveness of locally produced flour but also exposes Uganda to external risks, including global supply chain disruptions, as seen in the ongoing Ukraine-Russia conflict. To reduce this vulnerability, there is a pressing need to expand wheat cultivation into non-traditional areas, particularly mid and low-altitude regions.

The project, titled "Increasing Wheat Production and Productivity through Science-Based Knowledge and Innovations for a Competitive Wheat Manufacturing Value Chain in Uganda," was initiated to address these challenges. With support from the Uganda National Council for Science and Technology (UNCST) through the Science Granting Councils Initiative (SGCI), the project developed wheat varieties capable of thriving in Uganda's mid and low-altitude areas. Through research and collaboration with farmers, the project successfully introduced high-yielding varieties adapted to diverse environments across the country, paving the way for increased domestic wheat production.

3. Methodology

The project adopted a participatory approach to ensure the successful development of wheat varieties adaptable to mid and low-altitude regions. Multiple stakeholders, including researchers, farmers, and local agricultural extension officers, were engaged throughout the process. Field trials were conducted across various locations representing high, mid, and low-altitude areas to assess the performance of elite wheat lines in diverse environmental conditions. Key methods included:

- a. **Phenotyping and Field Trials:** Elite wheat lines were evaluated through multilocation trials in selected regions to determine their adaptability, disease resistance, and yield performance under different altitude conditions.

- b. **Participatory Variety Selection (PVS):** Farmers were actively involved in the decision-making process, providing crucial input on the varieties best suited to their regions. This collaborative approach ensured that the selected varieties were aligned with local farming practices and environmental conditions.
- c. **Data Collection and Analysis:** Data on grain yield, disease resistance (particularly to wheat rusts), and plant quality were collected and analyzed using advanced statistical software (GenStat) to ensure accuracy and reliability of results.
- d. **Seed Bulking and National Performance Trials:** The top-performing wheat varieties were advanced to national performance trials, and pre-release seed multiplication was initiated to ensure a steady supply of high-quality seed for future cultivation.

4. Results and Findings

The project successfully addressed Uganda's wheat production challenges by developing wheat varieties suited for mid and low-altitude areas, significantly increasing domestic wheat yields. This section outlines the key findings and outcomes of the project.

- a. **Variety Development:** Two new high-yielding wheat varieties were developed, demonstrating their adaptability across a wide range of altitudes. These varieties can produce over 5 t/ha in mid and high-altitude areas and over 1.5 t/ha in low-altitude regions, representing a substantial improvement over traditional wheat varieties grown only in highland areas.
- b. **Field Trials and Performance:** The project tested 19 promising wheat lines in six locations spanning low (Apac, Ngeenge), mid (Rwebitaba, Bulegeni), and high-altitude areas (Kalengyere). The trials, conducted using a randomized complete block design (RCBD), assessed the performance of these lines in terms of yield, disease resistance, and adaptability. Four lines with exceptional performance were identified for further development.
- c. **Disease Resistance:** The selected varieties showed strong resistance to common wheat rusts (stem, leaf, and yellow rust), which are major threats to wheat crops in Uganda. This makes the new varieties highly suitable for large-scale cultivation in diverse environmental conditions.
- d. **Seed Multiplication:** To ensure sustainability, the project bulked 1.5 tons of elite foundation seed, ensuring an immediate supply of high-quality seed

to farmers in the target regions. Seed bulking was critical for preparing the varieties for commercial release and scaling.

The development of these new wheat varieties presents a significant opportunity to reduce Uganda's dependence on wheat imports, increase food security, and boost the agro-processing industry. Expanding wheat cultivation into mid and low-altitude areas will create new economic opportunities for smallholder farmers and align with Uganda's National Development Plan III (NDP III) goals of agricultural transformation. This research directly contributes to the Sustainable Development Goals (SDGs) related to food security and poverty reduction. To fully capitalize on these achievements, continued investment in seed production, farmer capacity building, and marketing will be essential.

5. Policy Implications & Recommendations.

The development of new, high-yielding wheat varieties offers a transformative opportunity for Uganda to reduce its dependency on wheat imports, enhance food security, and create economic opportunities for smallholder farmers. However, realizing these benefits requires a coordinated policy approach to support the adoption and scaling of these innovations.

5.1 Policy Implications:

- a. **Food Security:** Expanding local wheat production is essential for reducing Uganda's vulnerability to global supply chain disruptions. Increasing domestic wheat cultivation will enhance food security by reducing the country's dependence on imports and ensuring a steady supply of wheat for both consumption and agro-processing industries.
- b. **Economic Development:** Increasing wheat production in non-traditional areas will boost the livelihoods of smallholder farmers by creating new economic opportunities. This will contribute to rural development, poverty alleviation, and the broader agricultural economy by increasing incomes and employment in wheat-growing regions.
- c. **Agricultural Competitiveness:** The project aligns with Uganda's National Development Plan III (NDP III) goals of enhancing agricultural productivity and integrating smallholder farmers into competitive value chains. By fostering wheat production across diverse regions, Uganda can strengthen its agro-processing sector and increase the competitiveness of domestically produced wheat.

5.2 Recommendations:

- a. **Seed Production and Distribution:** The government, in collaboration with private sector stakeholders, should prioritize the large-scale production and distribution of the newly developed wheat varieties. Partnerships with seed companies and farmer cooperatives can facilitate the multiplication and availability of foundation and certified seed in mid and low-altitude areas.
- b. **Farmer Training and Extension Services:** Targeted farmer training programs should be implemented to support the adoption of these new varieties. Extension services need to be strengthened to provide farmers with the necessary technical knowledge on wheat production, disease management, and post-harvest practices.
- c. **Incentivizing Wheat Farming:** Financial incentives, such as subsidies and grants, should be provided to encourage wheat farming in non-traditional regions. Support for inputs, farm equipment, and irrigation systems will help farmers mitigate risks and improve productivity.
- d. **Market Infrastructure and Value Chains:** Strengthening the wheat value chain is crucial for market access and profitability. The government should invest in rural transport and storage infrastructure to reduce post-harvest losses and connect farmers with agro-processors and millers. Efficient value chains will ensure that farmers receive fair prices for their produce and remain competitive.
- e. **Research and Innovation:** Continuous support for agricultural research is essential to develop more

climate-resilient wheat varieties. Investment in research institutions, such as the Uganda National Council for Science and Technology (UNCST), should be prioritized to address challenges such as drought and disease, ensuring the sustainability of Uganda's wheat sector.

By implementing these recommendations, Uganda can transform its wheat production landscape, strengthen its food security, and create a more resilient and competitive agricultural sector.

6. Conclusion

The development of two high-yielding, climate-resilient wheat varieties presents a significant opportunity to transform Uganda's wheat sector. Expanding wheat production into mid and low-altitude areas will not only increase domestic production but also provide economic opportunities for smallholder farmers, contributing to poverty reduction and rural development.

This initiative supports Uganda's National Development Plan III (NDP III) by aligning with the goals of agricultural transformation and value chain development. It also advances the country's progress toward achieving the Sustainable Development Goals (SDGs) related to food security and economic growth. To fully realize the potential of these new wheat varieties, ongoing investment in seed production, farmer capacity building, and value chain development is essential. By implementing these measures, Uganda can significantly reduce its reliance on wheat imports, improve national food security, and strengthen the resilience of its agricultural sector in the face of global supply chain challenges.

References

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