



Impact Story 28:

A Healthier and Empowered Pakistan Through Biofortified Zinc Wheat

THE OPPORTUNITY

In Pakistan, where wheat is a daily staple, an invisible crisis is unfolding. Over 60 million people suffer from inadequate zinc intake, contributing to malnutrition and economic losses of nearly 3% of the country's GDP. Zinc deficiency plays a critical role in stunted growth among children, leading to impaired cognitive development that hampers learning abilities and future economic opportunities. It also weakens the immune system, making children more vulnerable to recurrent infections and diarrhea, further compromising their overall health and well-being. Children are particularly vulnerable, with 21% at risk with high proportions in deficiency and nearly 40% of preschoolers experiencing stunted growth due to poor nutrition. Zinc deficiency can be addressed through three key strategies: industrial fortification, where zinc is added to staple foods like wheat and maize flour; supplementation, providing zinc tablets to children aged 6-59 months.

And thirdly, biofortification, which is the focus of this article, which is enhancing zinc content in staple crops like wheat through conventional breeding.

Despite wheat's dominance in the diet, a key challenge remains, i.e. the country lacks high-quality, nutrient-rich wheat. Poor seed quality and limited access to certified biofortified wheat seeds mean that millions rely on wheat that fails to meet their nutritional needs.

According to the Economic Survey of Pakistan, the agriculture sector, a backbone of Pakistan's economy, employs 37.4% of the workforce and contributes 22.7% to GDP. Yet, one of the major bottlenecks in wheat production is seed quality. Only 46% of wheat seeds used are certified, leaving a 54% gap in quality supply. This shortage perpetuates low yields and poor nutritional outcomes, reinforcing cycles of poverty and malnutrition. Addressing this challenge is not just about improving agriculture, it's about securing Pakistan's future health and economic stability.

According to USDA wheat flour currently contributes 72% of Pakistan's daily caloric intake with per capita wheat consumption of around 124 kilograms (kg) per year, which is one of the highest in the world. GAIN saw this as a powerful opportunity in addressing this crisis.



THE SOLUTION

GAIN works in collaboration with national research institutions including PARC (Pakistan Agricultural Research Council), BARDC (Balochistan Agricultural Research & Development Centre), AARI (Ayub Agricultural Research Institute), RARI (Regional Agricultural Research Institute), and WRI (Wheat Research Institute) in Pakistan. Through its Nutrient Enriched Crops (NEC) programme, GAIN Pakistan works closely with farmers, seed companies both in the public and private sector, wheat processors (chakkis and flour mills), local NGOs and implementation partners like AGAHE (Association for Gender Awareness and Human Empowerment) to scale up the production and consumption of biofortified zinc wheat (BZW). These biofortified varieties (Zincol 2016, Akbar 2019, Nawab 2021) of wheat are enriched with zinc to combat micronutrient deficiency while maintaining strong agronomic performance.

GAIN is championing BZW as a long-term, sustainable solution to zinc deficiency. This initiative is:

Empowering Farmers: Between January and December 2024, over 14,043 farmers have been engaged, with a primary focus on building their capacity to enhance BZW production. A comprehensive training program equipped these farmers with advanced technologies to improve yield and quality. As a result, they produced enough BZW grain to meet the annual staple food needs of over 1.5 million people in the project districts. Additionally, farmers were trained in seed multiplication and management, enabling them to produce high-quality BZW seed for the next season—benefiting not only themselves but also seed companies and neighboring farmers.



Strengthening Supply Chains:

Small processing units (chakkis) play a crucial role in providing wholegrain wheat flour to local communities. Unlike large mills, these chakkis produce flour with 95% extraction, which helps retain higher zinc levels in biofortified wheat compared to the conventional 80% extraction process. To ensure wider access to BZW flour, GAIN has partnered with chakkis across three project districts, linking them with private sector aggregators for a stable supply chain. Currently, these chakkis are delivering BZW whole wheat flour to 31,916 households in their vicinity, reaching approximately 190,000 beneficiaries. Additionally, they receive ongoing support through demand generation activities, further driving consumer awareness and adoption of nutrient-rich flour.



Elevating Women Entrepreneurs: Women are at the heart of this movement. The initiative focuses on economically empowering women by enhancing their entrepreneurial skills, particularly in producing value-added products from BZW, such as whole wheat snacks and other indigenous products

A selection criterion was established to identify suitable women entrepreneurs. A total of 826 women farmers and 15 women entrepreneurs participated in the entrepreneurship program and the production of BZW crops. These women received training in developing value-added products from Zinc Wheat, enabling them to contribute to the value chain and improve their economic prospects. Three training sessions were organized in project districts to support women entrepreneurs. The sessions covered product development from Zinc Wheat, quality control, effective marketing strategies, and safety standards.

Azra Bibi from Bahawalpur expanded her home-based vermicelli-making business after receiving modern equipment and training. Her production efficiency increased by 50%, generating a stable income while improving access to nutritious food.



Shazia Bibi was finally able to break free from the cycle of debt. For years, she watched much of her income go toward repaying high-interest loans, leaving little for her children's future. By securing a 40,000 PKR interest-free loan (IFL) through the programme, she redirected funds toward fertilizers and irrigation, increasing her wheat yield and reducing financial pressure. Now, she has the resources to grow her farm without the weight of crushing debt.

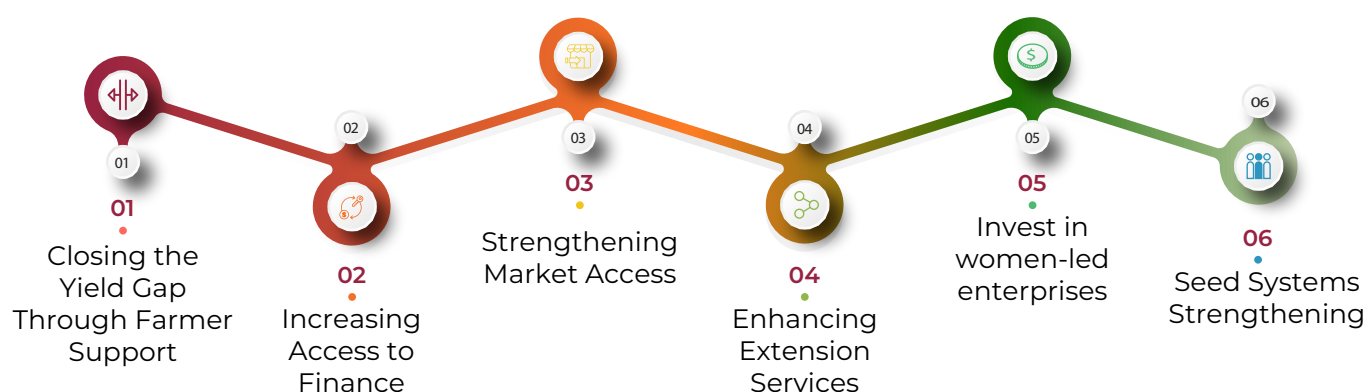
Driving Policy Change:

Biofortified wheat has been incorporated into the Punjab Multi-Sectoral Nutrition Strategy (2024-2030), ensuring long-term government commitment.



LESSONS AND WAY FORWARD

With 90% of Pakistan's 7.4 million farmers being smallholders and about 80% of farmers in Pakistan growing wheat, the potential to scale BZW is immense. However, limited financing, poor seed access, and market inefficiencies are keeping the farmers from thriving. Addressing these challenges is key to ensuring better nutrition and stronger farmer incomes.



1. Closing the Yield Gap Through Farmer Support

Wheat productivity in Pakistan is just 2.26 tons per hectare, far below its 6.8-ton potential. On the other hand, GAIN's field trials showed that farmers using certified BZW seeds and optimized farming techniques achieved a 32% higher yield compared to non-biofortified varieties and a 44% increase over conventional farming methods. Scaling up training, improved seed access, and modern farming practices is key to further closing the yield gap.

2. Increasing Access to Finance

Smallholders lack access to bank loans and rely on high-cost informal lenders. Only 14.81% of total bank loans go to agriculture and commercial banks do not serve farmers with less than five acres of land. Expanding access to finance including interest-free loan (IFL) programs is crucial for farmers to invest in better inputs.

3. Strengthening Market Access

Organizing farmers into CBOs (Community-Based Organizations) and improving supply chains with better access to formal markets, including Punjab Food Department procurement centers facilitates fair pricing, reducing reliance on middlemen.

4. Enhancing Extension Services

Digital advisory platforms and farmer-led training programs can drive the adoption of modern agricultural practices. Provision of hermetic bags (1 bag is enough for 1 acre land) for storage to smallholders can significantly reduce the losses.

5. Invest in women-led enterprises

With nearly 67% of women in rural areas working in the agriculture sector, largely on family farms, where most of their labour is unpaid even when they spend more hours per day on productive activities than men, the scope and need to invest in women-led enterprises is huge.

6. Seed Systems Strengthening

A robust seed system is essential for enhancing agricultural productivity and ensuring food security. In 2022-23, only 69% of the total wheat seed produced by seed companies through contract farming was certified by the Federal Seed Certification & Registration Department (FSC&R). This certified wheat seed accounted for just 46% of Pakistan's total wheat seed requirement, limiting farmers' access to high-yield, nutrient-rich biofortified wheat varieties.

With policy alignment, financing, and supply chain improvements, Pakistan can scale BZW adoption nationwide, ensuring nutritious food, stronger rural economies, and a more resilient agriculture sector.



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