Bio-Fortified Crops: India's New Weapon against Hidden Hunger

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ABSTRACT

India produces enough food grains, a significant section of the populace nevertheless experiences hidden hunger due to shortages in vital micronutrients including iron, zinc, and vitamin A. Immunity, cognitive development, productivity, and general health are all adversely impacted by hidden hunger, especially in children and women of reproductive age (Sindhu, 2025). By increasing the nutrient content of basic crops that the population regularly consumes, bio-fortification has emerged as a sustainable agricultural technique to treat these micronutrient deficits (Bouis & Saltzman, 2017). Using traditional breeding, agronomic techniques, and biotechnology, bio-fortification raises crop levels of iron, zinc, and provitamin A without changing dietary patterns or food processing techniques (Better Nutrition, n.d.; IAS Gyan, n.d.). To fight hidden hunger, Indian research organisations like the Indian Council of Agricultural Research (ICAR) have successfully created bio-fortified wheat, rice, pearl millet, maize, legumes, and potato types (ICAR, 2022). Zinc-rich wheat cultivars and high-iron pearl millet have demonstrated considerable promise in enhancing micronutrient consumption in low-income and rural populations reliant on cereal-based diets (HarvestPlus, 2021). The incorporation of bio-fortified crops into national nutrition policies has been reinforced by government initiatives including POSHAN Abhiyaan, seed distribution, and farmer awareness campaigns (NITI Aayog, 2021; IndiaSpend, 2022).

Farmers gain from bio-fortified crops because they provide better market opportunities and livelihood security while keeping yields comparable to traditional types (HarvestPlus, 2021). Large-scale adoption is nevertheless hampered by issues like low awareness, insufficient seed availability, restrictions on market demand, and legislative obstacles (Bouis & Saltzman, 2017; IndiaSpend, 2022). All things considered, bio-fortification provides an affordable and sustainable way to alleviate hidden hunger in India by connecting agriculture, nutrition, and public health (Sindhu, 2025).

INTRODUCTION

India's abundance of food grains, many Indians nevertheless experience "hidden hunger," a condition in which people consume adequate calories but lack vital micronutrients like iron, zinc, and vitamin A. Hidden hunger lowers productivity, compromises growth and cognitive development, and affects immunity, especially in vulnerable groups like children and women of reproductive age. A sustainable agricultural approach to address this issue in India's food and nutrition systems is the development of bio-fortified crops, which are staple crops designed to have increased nutrient content **(Sindhu, 2025).**

Bio-Fortification

The technique of boosting food crops' nutritional value by adding more vital micronutrients is known as bio-fortification. Increasing the amounts of iron, zinc, provitamin A, and other minerals in staple foods can be accomplished through conventional breeding, better agronomic techniques, or biotechnology methods **(Sindhu, 2025; Better Nutrition, n.d.).** Bio-fortified crops provide nutrients more naturally than commercial food fortification because the crop itself has extra nutrients without requiring alterations to food processing or consumption practices **(IAS Gyan, n.d.).**

Development of Bio-Fortified Crops in India

In India, the production of bio-fortified crops has gained traction as a long-term tactic to fight hidden hunger brought on by micronutrient deficiencies **(Sindhu, 2025).** Staple crops like wheat, rice, pearl millet, maize, legumes, and potatoes have been bio-fortified with iron, zinc, and provitamin A by Indian research organisations, most notably the Indian Council of Agricultural Research. **(ICAR,2022).** For rural and low-income populations who rely largely on cereals, high-iron pearl millet and zinc-rich wheat cultivars have demonstrated the potential to greatly increase micronutrient intake **(Harvest Plus, 2021).** According to **Bouis and Saltzman (2017),** bio-fortification by conventional breeding guarantees that nutrient improvement is stable, affordable, and accessible without changing dietary patterns. The significance of bio-fortified crops in enhancing India's food and nutrition security is being strengthened by government backing, integration with nutrition missions, and seed distribution programs **(India Spend, 2022).**

Examples of Bio-Fortified Crops

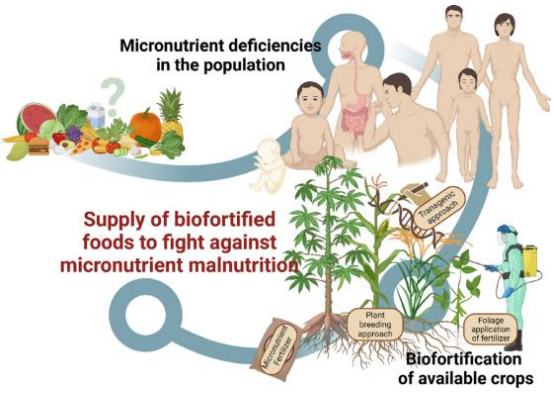
To address micronutrient deficiencies in frequently consumed Indian meals, a number of bio-fortified crops have been developed **(Bouis & Saltzman, 2017).** In areas where millet is consumed, high-iron and zinc pearl millet (Dhanashakti) helps lower anaemia in women and children **(ICAR, 2022).** Immune system performance and the general nutritional value of staple meals are enhanced by zinc-enriched wheat and rice types **(HarvestPlus, 2021).** Orange-fleshed sweet potatoes and provitamin A maize are useful in treating vitamin A deficiency, especially in youngsters **(Bouis & Saltzman, 2017).** Due to their widespread consumption, recently designed potatoes high in iron and zinc further increase dietary micronutrient intake **(Drishti IAS, 2023).**

Impact of Bio-Fortified Crops on Farmers and Families

By increasing nutritious consumption while preserving yields equivalent to conventional kinds, bio-fortified crops benefit farmers and families **(Bouis & Saltzman, 2017).** Stable production and market demand for nutrient-rich crops benefit farmers and can improve income prospects and livelihood security **(HarvestPlus, 2021).** Regular family consumption of bio-fortified staples boosts iron, zinc, and vitamin A intake, which helps improve child growth and cognitive development, build immunity, and lessen anaemia **(Sindhu, 2025).** Due to decreased micronutrient deficiencies and better general health outcomes, women and children benefit the most **(ICAR, 2022).** Biofortification provides a sustainable and affordable nutrition option for households without necessitating dietary modifications **(IndiaSpend, 2022).**

Government Support and Public Initiatives

In an effort to fight malnutrition and hidden hunger, the Indian government actively promotes bio-fortified crops **(IndiaSpend, 2022).** Several bio-fortified varieties of cereals, pulses, millets, and vegetables with increased iron, zinc, and vitamin A content have been produced and made available by the Indian Council of Agricultural Research. **(ICAR,2022).** In order to improve the dietary quality of vulnerable populations, these crops are promoted under national nutrition projects as Poshan Abhiyaan **(NITI Aayog, 2021).** Adoption and impact are being accelerated by government-led seed distribution, farmer awareness initiatives, and connection with public food systems **(HarvestPlus, 2021).** In India, these programs improve the relationship between agricultural, nutrition, and public health outcomes **(Bouis & Saltzman, 2017).**



Challenges in Large-Scale Adoption

Inadequate demand in local markets and low farmer and consumer awareness are obstacles to the widespread adoption of bio-fortified crops. **(Bouis & Saltzman, 2017).** Access to

bio-fortified cultivars is limited, especially for smallholder farmers, by insufficient seed availability and ineffective distribution channels **(HarvestPlus, 2021).** Nutritional results are further impacted by differences in nutrient bioavailability brought on by dietary and cooking choices **(Sindhu, 2025).** Widespread adoption is further hampered by policy constraints, a lack of incentives, and a sluggish integration with public procurement processes **(IndiaSpend, 2022).**

FUTURE PROSPECTS AND CONCLUSION

In order to scale nutrient-rich cultivars across the country, research, seed systems, and governmental support must be strengthened for bio-fortified crops to succeed in India **(Bouis & Saltzman, 2017).** Including biofortified foods in public nutrition initiatives like POSHAN Abhiyaan and midday meals can greatly increase vulnerable populations' intake of micronutrients **(NITI Aayog, 2021).** Increased consumer acceptance, market incentives, and farmer awareness will all hasten uptake and impact **(HarvestPlus, 2021).** Ultimately, by directly connecting agriculture with nutrition and public health objectives, biofortification provides a long-term, economical solution to hidden hunger **(Sindhu, 2025).**

REFERENCE

Bouis, H. E., & Saltzman, A. (2017). Improving nutrition through biofortification: A review of evidence from HarvestPlus. *Global Food Security, 12*, 49–58. https://doi.org/10.1016/j.gfs.2017.01.009

Drishti IAS. (2023). *Biofortified potatoes*. https://www.drishtiias.com/daily-updates/daily-news-analysis/biofortified-potatoes

HarvestPlus. (2021). *Biofortification progress in India*. https://www.harvestplus.org

IAS Gyan. (n.d.). *Hidden hunger & biofortification basics*. https://www.iasgyan.in/daily-current-affairs/hidden-hunger

ICAR. (2022). *Biofortified crop varieties released in India*. Indian Council of Agricultural Research, New Delhi.

IndiaSpend. (2022). Fighting hidden hunger: Why India is betting on biofortified crops. https://www.indiaspend.com

IndiaSpend. (n.d.). *Fighting hidden hunger: "Our mission is 90% of crops must be biofortified"*. https://www.indiaspend.com/fighting-hidden-hunger-our-mission-is-90-of-crops-must-be-biofortified

NITI Aayog. (2021). *POSHAN Abhiyaan: National nutrition strategy*. Government of India.

Sindhu, G. (2025). *Biofortification: A sustainable solution to hidden hunger*. Archives of Current Research International, 25(8), 592–599. https://doi.org/10.9734/acri/2025/v25i81442.