Nutrition smart agricultural extension- Global and Indian initiatives

Atheena U P[1], Smitha S[2], Aparna Radhakrishnan[2], Nikhil KS[3] and Allan Thomas[4]

[1]PhD Scholar, Department of Agricultural Extension Education, College of Agriculture, Vellayani, Thiruvananthapuram, Kerala-695522.

[2] Assistant Professor, Department of Agricultural Extension Education, College of Agriculture, Vellayani, Thiruvananthapuram, Kerala-695522.

[2] Project Fellow, Department of Agricultural Extension Education, College of Agriculture, Vellayani, Thiruvananthapuram, Kerala-695522.

Professor and Head, Department of Agricultural Extension Education, College of Agriculture, Vellayani, Thiruvananthapuram, Kerala-695522.

Corresponding Author: atheenaup007@gmail.com

Abstract

The need to understand how agriculture can improve nutrition has been growing globally and within development institutions. Integrating nutrition-sensitive approaches into extension and advisory services (EAS) enhances sustainability. Hence, there is strong advocacy for Nutrition-Smart Agriculture (NSA). Global initiatives such as FAO's Sustainable Food and Nutrition Security program, CGIAR's A4NH, and Harvest Plus focus on biofortification and dietary diversity. In India, programs like Poshan Abhiyan, ICAR's NARI, and KVK-led models promote nutrition gardens and biofortified crops. Challenges include weak agriculture-health linkages and limited training. Strengthening Nutrition-Smart Agricultural Extension requires interdisciplinary strategies, policy convergence, and participatory learning. This article explores global and Indian initiatives in nutrition-smart extension systems and their role in food and nutrition security.

Key words: Nutrition smart agriculture, Nutrition smart extension systems, Food security

Introduction

The growing global population, projected to reach 9.7 billion by 2050, exerts immense pressure on agricultural systems to produce food sustainably. Despite progress, food insecurity remains a global burden, with an estimated 733 million undernourished people in 2025 (WHO, 2024). Achieving Sustainable Development Goal (SDG)-2, which aims for food security and improved nutrition by 2030, is hindered by population growth, urbanization, resource depletion, climate change, and evolving food consumption patterns. Additionally, the COVID-19 pandemic has underscored the significance of nutrition and immunity in maintaining overall health.

Understanding Nutrition-Smart Agricultural Extension

NSA is an advanced form of agricultural extension that incorporates nutrition-sensitive interventions to ensure improved dietary diversity, food fortification, and sustainable farming practices. It encompasses:

- Biofortification of staple crops
- Diversification of farming systems to include nutrient-rich crops
- Promotion of climate-resilient and sustainable practices
- Behavioural change communication for dietary improvement
- Integration of women and marginalized groups in agricultural decision-making

Recognizing the need to effectively link food production with consumption, efforts to achieve nutrition and health goals through agricultural growth have intensified. Nutrition-sensitive agriculture integrates food-based approaches that prioritize nutritionally rich foods, dietary diversity, and food fortification to combat malnutrition and micronutrient deficiencies (FAO, 2014). This approach optimizes food and agricultural systems to enhance nutritional outcomes while balancing economic and production-driven goals. Emerging from this framework is Nutrition-Smart Agriculture (NSA), which promotes agricultural and agro-processing technologies that enhance both nutrition and farm productivity.

Agricultural extension services play a crucial role in promoting nutrition awareness and improving the dietary health of rural communities. Extension

workers from public, private, and non-government organizations serve as direct links to farmers, influencing decisions on food production and consumption. Integrating agricultural extension with participatory learning and action on nutrition and health can improve the sustainability of food and agricultural programs, ultimately enhancing household food security. Six key factors drive advocacy for incorporating nutrition into extension advisory services: established infrastructure, reach, community trust, cultural awareness, empathy, and a family-centered approach.

Nutrition-Smart Practices Promoted by Extension Systems

Food security is built on three pillars: food availability, food access, and food utilization. Among these, the availability pillar is often used as a framework to categorize extension activities with a nutritional impact. Nutrition-smart extension initiatives focus on four key areas: home gardening, crop diversification, biofortification, and reduction of postharvest losses (Fanzo et al., 2015).

Global Initiatives on Nutrition-Smart Extension Systems

Globally, there is growing interest in leveraging agricultural extension services for food and nutrition security. Pluralistic extension services (public, non-profit, and private organizations) have the potential to influence both production and consumption decisions, particularly in developing countries. Several global initiatives highlight the role of extension systems in nutrition promotion:

- USAID's SPRING Program (Bangladesh): Focused on preventing stunting and anemia in mothers and children by integrating nutrition messages into the agricultural extension system and providing comprehensive training (SPRING Nutrition, 2013).
- Ethiopia's Agricultural and Health Extension Program: Promotes behavioral change, gender equity, and empowerment of women as change agents through model family programs, improving both nutrition and agricultural productivity (Ramundo, 2012).
- Kulima and Afikepo Program (Malawi): A joint initiative of the Malawian government, FAO, and UNICEF that strengthens nutrition coordination at community levels and establishes nutrition learning centers operated by extension agents (FAO, 2021).
- Scaling Up Nutrition (SUN) Movement: A global initiative launched in 2010 that unites governments, civil society, businesses, and donors to implement evidence-based interventions for improving nutrition through multi-sectoral approaches, including agricultural extension.
- Helen Keller International's Enhanced Homestead Food Production (EHFP) Program: Implemented in several countries, this initiative integrates agriculture, nutrition, and gender equity by promoting home gardening, poultry rearing, and nutrition education to improve dietary diversity.
- FAO's Nutrition-Sensitive Agriculture Approach: Works across multiple regions to integrate nutrition into agricultural policies, extension services, and food security programs, ensuring that nutrition is a key component of agricultural development.
- GAIN's Marketplace for Nutritious Foods (Kenya, Mozambique, Tanzania): Supports small and medium enterprises in producing and marketing nutritious food products, strengthening the link between agricultural production and nutrition.

Nutrition-Smart Extension Initiatives in India

India has implemented several nutrition-smart agricultural extension initiatives:

- ICAR's Nutrition-Sensitive Agricultural Research and Extension: The Indian Council of Agricultural Research (ICAR) has initiated various research programs focusing on NSA. The All India Coordinated Research Project on Home Science has contributed significantly to nutrition education and biofortification (ICAR, 2021).
- Krishi Vigyan Kendra's (KVKs) and Nutrition Interventions: KVKs under ICAR have been instrumental in disseminating nutrition-sensitive technologies, including kitchen gardens, biofortified crops, and dietary diversification (Rai et al., 2022). Nutritional Gardens (KVK Kerala): KVKs have implemented nutrition gardens in households

and Anganwadi, distributing seeds and conducting training at the panchayat level. *Kudumbashree* mission's Agri Nutri Garden campaign aims to meet family nutrition needs through home-grown vegetables and fruits.

- Poshan Abhiyaan and Agri-Nutrition Convergence: Launched in 2018, Poshan Abhiyaan (National Nutrition Mission) integrates agriculture and nutrition through community-based interventions and Agri-extension programs (MoWCD, 2019).
- Agri-Nutri Gardens and Biofortified Crops: Several Indian states have adopted Agri-Nutri Garden Models to ensure dietary diversity at the household level. Studies by Sharma et al. (2021) highlight the role of biofortified wheat, pearl millet, and lentils in improving nutritional security.
- Millet Promotion through the National Food Security Mission (NFSM): India has revived the cultivation of nutrient-dense millets, such as finger millet and sorghum, through the NFSM. The International Year of Millets 2023 has further accelerated efforts to mainstream millets into dietary patterns (Singh et al., 2023).
- Nutri-SMART Village (Madhya Pradesh): Established in Jabalpur in 2017 to ensure food availability and meet household nutritional requirements. The initiative promotes the traditional *Poshan Thali* concept, addressing both nutrient deficiencies and chronic health issues (Anupam et al., 2019).
- Nutrition Gardens in Schools (Chhattisgarh): Developed by KVK-Kanker, this program ensures a balanced diet for students through school-based kitchen gardens growing nutrient-rich vegetables and fruits (Suri, 2020).
- Akshara Kaitoota Kitchen Gardens (Karnataka): A Karnataka Horticulture Department initiative to promote fruit and vegetable intake in government schools using MGNREGA funding (Dev & Padey, 2022).
- Roof Gardens in Schools (Tamil Nadu): A collaboration between the Horticulture and School Education Departments, utilizing school-produced vegetables in noon meal schemes.
- Poshan Vari (Jharkhand): Backyard kitchen gardens empowering women to grow and consume nutrient-rich crops while earning additional income (Suri, 2020).
- Rainbow Diet and Biofortified Crops (ICAR-CTCRI): A campaign promoting biofortified tuber crops to address micronutrient deficiencies, particularly vitamin A, through a multi-stakeholder approach (Sivakumar et al., 2020).
- Haritha Keralam (Kerala): An umbrella mission integrating organic farming, waste management, and water resource management to promote self-sufficiency in vegetable and fruit production.

Impact of Nutrition-Smart Agricultural Extension

The integration of nutrition-sensitive interventions into agricultural extension has yielded significant positive outcomes, including reduction in micronutrient deficiencies through biofortification, improved dietary diversity via promotion of kitchen gardens and diversification, higher productivity and income for farmers adopting NSA practices, and strengthened linkages between agriculture, health, and education sectors.

Challenges and Future Directions

Despite notable successes, several challenges persist in scaling up NSAE, including limited awareness among extension workers regarding nutrition-sensitive practices, fragmented policies leading to poor inter-sectoral coordination, access barriers to biofortified seeds and knowledge, sociocultural constraints affecting dietary changes, and the need for digital and ICT-based interventions for wider reach. Future efforts should focus on strengthening capacity-building programs for extension professionals, developing mobile-based extension tools for remote advisory services, encouraging public-private partnerships in biofortification, and enhancing community-led nutrition education initiatives.

Conclusion

Agricultural extension is one of the most crucial avenues for addressing nutrition, encompassing not only food production but also the broader food system approach, including value chains, markets, ecosystems, and biodiversity. Given

its extensive reach and influence, agricultural extension has immense potential to accelerate improvements in nutrition and overall well-being. A nutrition-smart agricultural extension system serves as a vital channel for disseminating nutrition messages to rural communities, improving dietary choices, and addressing the underlying determinants of nutrition. By incorporating nutrition-sensitive approaches into extension services, such as promoting biofortified crops, kitchen gardens, and improved food storage practices, significant progress can be made in combating malnutrition and ensuring food security. Strengthening these initiatives requires policy integration, capacity-building for extension personnel, multi-sectoral collaboration, and increased investment in nutrition-sensitive agricultural research. Additionally, empowering women farmers and promoting indigenous knowledge systems can further enhance the sustainability of nutrition-smart agricultural extension. With increased attention and investment, nutrition-smart agricultural extension systems have the potential to create transformative impacts, ensuring a healthier population and more resilient food systems on a global scale.

References

Anupam, M., Singh, S.R.K., Moni, T., & Raut, A.A. (2019). Nutrition-sensitive agriculture through nutri-smart village. In Anupam, M., Singh, S.R.K., Singh, A.K., & Raut, A.A. *Nutrition Sensitive Agriculture and Nutrition Literacy* (pp. 218). ICAR-ATARI, Jabalpur.

Dev, S. M., & Padey, V. L. (2022). Indian agriculture towards 2030. *India Studies in Business and Economics*, Springer, 39–82.

Fanzo, J., Marshall, Q., Dobermann, D., Wong, J., Merchan, R. I., Jaber, M. I., Davis, K., et al. (2015). Integration of nutrition into extension and advisory services: a synthesis of experiences, lessons, and recommendations. *Food and Nutrition Bulletin, 36*(2), 120–137.

Food and Agriculture Organization. (2014). *Annual Report*. Food and Agriculture Organization, Rome.

Food and Agriculture Organization. (2021). *Making extension and advisory services nutrition-sensitive: The link between agriculture and human nutrition*. Rome.

Ramundo, K. (2012). The female "army" leading Ethiopia's health revolution. *USAID Frontlines*.

Sivakumar, P.S., Kumar, H.K., Sheela, I., Sheela, M.N., Jayaprakas, C.A., Murugesan, P., Mohan, C., & Ravi, V. (2020). Rainbow diet campaign: An extension strategy for scaling up biofortified tuber crop varieties.

SPRING Nutrition. (2013). *SPRING's priority areas*.

Suri, S. (2020). Nutrition gardens: A sustainable model for food security and diversity. *ORF Issue Brief, 369*, 2–18.

World Health Organization News. (2024). Hunger numbers stubbornly high for three consecutive years as global crises deepen: UN report.

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