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Nutri-gardens: A sustainable tool for capacity building of rural farm women towards achieving household food security

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Abstract

Nutri-gardens is an innovative project initiated in India under the supervision of ICAR with the prime objective of providing relief for the masses on daily vegetable needs and creating a safe and sustainable environment with healthy people. It is now well conceived that by simply adding greens to the available food grains, the diet of the average Indian can be substantially upgraded. Homestead production of fruits and vegetables provides the poor with direct access to important nutrients that may not be readily available or within their economic reach. This study aimed to establish nutri-gardens in the selected villages of Faridabad district: Chirsi, Tajupur, Bhopani, Badarpur Said, and Nachuli by KVK, Faridabad. A total of 100 packets of improved varieties of vegetables from the summer season and 100 packets from the winter season were distributed during 2022-2023 among enthusiastic farm women volunteers. Results indicated that assuming an average saving price of Rs. 40 per kg for purchasing vegetables during the summer season and Rs. 20 per kg during the winter season, around Rs. 4614 were saved by each family on vegetable expenditure. Due to increased vegetable production, food variety and dietary diversity scores increased from 19.46 to 26.53 and from 5.90 to 8.70 in their daily diets. Per person, the availability of vegetables increased from 28.63 g to 286.21 g with increased production of vegetables at the household level. Increased per-person availability of vegetables had contributed 35 to 59 per cent of the recommended dietary allowances of calcium, iron, vitamin C, and β -carotene.

Keywords: Dietary diversity, food security, micronutrients, nutri-garden, undernutrition, vegetable intake

Introduction

Based on four major indicators undernourished population, child stunting, child wasting, and child mortality, India ranks 105th out of 127 countries in the 2024 Global Hunger Index and suffers from a serious level of hunger, with a score of 27.3 (GHI, 2024) [1]. Although there is considerable economic growth and development in India, the prevalence of malnutrition has not decreased significantly. NHFS-5 (2019-21) [7] findings highlighted an increased incidence of triple burden of malnutrition in India. Food security remains a significant concern for India. Despite being the second-largest food producer, India is home to the world's second-largest undernourished population at 194.6 million. A direct association between food insecurity and malnutrition was observed among children in middle-income countries, corroborating the undernutrition and stunting as consequences of household food insecurity (Suri, 2020) [12].

The adequate intake of greens can help combat micronutrient malnutrition by providing essential vitamins, minerals, and antioxidants required for children's development and overall good health. India's present vegetable production level permits per capita consumption

of only 120 g, against the recommended daily intake of 400 g per day. The hidden hunger can be combated by reverting to the age-old practice of growing vegetables in the backyard in rural areas, and as rooftop or terrace or vertical, or container gardening in urban areas. Fruits and vegetables cover a large number of food groups, including green leafy vegetables, roots and tubers, other vegetables, fresh spices and condiments, citrus fruits, yellow and orange skin fruits, and purple pigment fruits that contribute largely to increasing dietary diversity. Establishing a nutri-garden or kitchen garden is directly linked to increased dietary diversity (Rani *et al.*, 2023) [9].

The nutri-garden is an advanced version of the kitchen garden, and recent awareness of the importance of nutri-gardens, or poshan vatika, was initiated by the Union Ministry of Women and Child Development and the Ministry of Ayush, Government of India. Under their joint effort, nutri-gardens have been established in approximately 4.37 lakh Anganwadi Centers. Nutri-gardens provide simple and inexpensive access to fruits, vegetables, medicinal plants, and herbs, ensuring that women and children receive fresh produce daily (Suneetha *et al.*, 2021) [11]. Nutri-garden

produce is a good source of micronutrients, especially in poor households. Rural areas have ample space, and establishing a kitchen garden is far simpler, as farm families are involved in agriculture. Several benefits of establishing a nutri-garden have been observed in surveys and literature, such as increasing the availability of nutrient-rich vegetables throughout the year, obtaining fresh and pesticide residue-free produce, supplementing income in rural areas with extra produce, and using biodegradable household waste as manure to reduce environmental pollution. Nutri-garden empowers women in rural areas to contribute economically to the cost of purchasing vegetables, which is reduced by at least Rs. 1000/- per month for a family of 4 to 5 members (Jindal and Dhaliwal, 2017) [4].

Nutri-kitchen gardens have been found to play a significant role in improving food security for resource-poor rural households in developing countries (Singh *et al.*, 2018 [10]; Rana *et al.*, 2021 [8]). The establishment of nutri-gardens can play a massive role in tackling the problem of micronutrient deficiencies in rural settings. In this research, efforts were made to establish nutri-gardens in rural settings in the Faridabad district and to evaluate their impact on dietary diversity and micronutrient intake.

Methods

Hundred nutri-gardens were established in *Chirsi, Tajupur, Bhopani, Nacholi, and Badarpur said* village in the Faridabad district. Data was collected from 100 households, each with and without establishing nutri-gardens. Data was collected on total vegetable production in kilograms, the number of family members by age, and the per capita availability of vegetables was calculated. Dietary diversity score, food variety score, the contribution of vegetable intake in recommended dietary allowances of micronutrients, benefit-to-cost ratio of developed kitchen gardens were calculated. Data were analyzed statistically using SPSS software.

Horizontal, vertical, and square plots were prepared under the close supervision of KVK, the scientists' team. Vegetable seed packets for summer and winter vegetables were procured separately from the Department of Vegetable Science, CCS HAU, Hisar. The seed packets of summer vegetables were distributed in March 2022, whereas the seed packets of winter vegetables were distributed in November 2022. The total land area covered under 100 nutri gardens was approximately 10473 square meters. Technical inputs on plantation, irrigation, and nutrient management were given by the KVK scientists' team. The main vegetables grown during the summer season were bitter gourd, pumpkin, bottle gourd, ridge gourd, cucumber,

beetroot, mint, coriander and marua leaves, guar beans and ladyfinger whereas the main vegetables grown under the winter season were carrot, spinach, fenugreek, radish, turnip, tomato, mustard leaves, drumsticks and cabbage. Data on total vegetable intake and varied vegetable products in their diets were collected using a food frequency questionnaire and a 24 h recall method. Vegetable contribution (%) for per day intake of minerals and vitamins of interest was calculated using the Indian Food Composition Table (2017) and the recommended dietary allowances (RDA) published by the Indian Council of Medical Research (ICMR) in 2020. Food variety score was calculated by counting the total no. of food items consumed by the family in a day, whereas the dietary diversity score was calculated by counting the number of food groups consumed in a day.

Pre- and post-training exposure-response were collected on various aspects such as: how many products can be prepared using vegetables with different cooking methods; how to preserve maximum nutrients during processing and cooking; how to manage surplus production using food processing and food preservation techniques. Pre- and post-training exposure response was collected on a 20-question proforma developed by the research team. Each question was given 1 point, and the sum represented as pre- and post-knowledge scores. A comparison was made between the groups with and without establishing nutri-gardens on various aspects.

Results and Discussion

Results of effect of nutri-garden (summer vegetables) on dietary diversity scores, food variety scores, micronutrient intake and knowledge score of women have been presented in Table-1 and data indicated that assuming an average saving price of Rs. 30 per kg for purchasing vegetables, approximately Rs.4168 were saved by each family on vegetable expenditure. Due to increased vegetable production, food variety score and dietary diversity score were increased from 22.56 to 28.06 and 5.80 to 9.30, respectively, in their daily diets. Per person, the availability of vegetables increased from 25.34 g to 240 g, with the total production of 205.6 kg/day. It was observed that increased per capita availability of vegetables has contributed 42.8, 58.5, 63.7, and 75.4 percent of the recommended daily dietary allowances of calcium, iron, β -carotene, and vitamin-C, respectively. Results of the present study are close to earlier findings revealed by Nandal and Vashisth (2009) [6], Singh *et al.* (2018) [10] and Rana *et al.* (2021) [8], Borthakur *et al.* (2021) [1], who had shown the increased micronutrient intake in the daily diets of family members.

Table 1: Effect of nutri-garden (summer vegetables) on dietary diversity, micronutrient intake, and knowledge score of women

Assessed Parameters	Without intervention	Nutri-garden intervention	Percent increase
Food variety score	22.56 \pm 2.6	28.06 \pm 3.2	24.38
Dietary diversity score	5.80 \pm 1.3	9.30 \pm 1.5	60.34
Vegetable production (Kg)	18.20 \pm 0.6	205.6 \pm 1.5	1029
Per capita availability of vegetables (grams)	25.34 \pm 1.2	240 \pm 12	847
Knowledge score of diversified vegetable products (20 points)	5.80 \pm 0.8	17.31 \pm 1.2	198
Knowledge score of nutrient preservation (20 points)	6.40 \pm 0.7	16.23 \pm 1.5	153
Knowledge score of post-harvest management (20 points)	6.80 \pm 0.8	15.82 \pm 1.2	132
Vegetables contribution (%) in per day micronutrient intake			
Calcium	24.2	42.8	76.85
Iron	13.6	58.5	330
Beta-carotene	20.4	63.7	212
Vitamin-C	19.4	75.4	288

Post knowledge score on diversified summer vegetable products, nutrient preservation during processing and cooking of vegetables, and post-harvest management of surplus vegetables was increased from 5.80 to 17.31, 6.40 to 16.23, and 6.80 to 15.82 points, respectively, on a scale of 20 points after training exposure.

Results of economic analysis of summer vegetables grown in established nutri-gardens have been presented in Table 2, and data indicated that the per day average production of

vegetables among 100 households having no established nutri-gardens was only 18.20 kg, whereas, it was 205.6 kg among the households having established nutri-gardens. Results indicated that by assuming 30 rupees per kg, an average selling price of summer vegetables, a household can save up to 4168 rupees. The benefit-to-cost ratio was 2.08 among households having established nutri-gardens, which was 1.73 among the households having no established nutri-gardens.

Table 2: Economic analysis of nutri-garden (Summer vegetables)-2022

Technology option	Average vegetable production/day (kg)	Economics			
		Gross cost (Rs.)	Gross return (Rs.)	Net return (Rs.)	BC ratio
Without intervention	18.20	200	546	346	1.73
Nutri-garden intervention	205.6	2000	6168	4168	2.08

Average selling price assumed: Rs. 30/kg of vegetable

Results of effect of nutri-garden (winter vegetables) on dietary diversity scores, food variety scores, micronutrient intake and knowledge score of women have been presented in Table-3 and data indicated that assuming an average selling price of Rs.20 per kg, Rs.2400 was saved by each family on vegetable expenditure during the winter season and due to increased vegetable production, food variety and dietary diversity scores increased from 17.35 to 28.36 and 5.10 to 9.40, respectively, in their daily diets. Per person availability of vegetables was increased from 30.60 to 258.0 g with the total production of 250.25 kg/day among rural households with established nutri gardens. It was observed that increased per capita availability of vegetables has

contributed 54.5, 60.5, 65.5 and 54.5 percent of per day recommended dietary allowances of calcium, iron, β -carotene and vitamin-C, respectively. In a previous study, it was observed that there was an improvement in the availability of vegetables for consumption at both household and individual level. The average per capita availability of vegetables increased from 172 to 278 gm/day due to kitchen gardening intervention. Per capita availability of nutrients/day increased by 0.93 per cent for protein, 30.35 per cent for iron, 32.61 per cent for calcium, 36.32 per cent for beta-carotene, 144 per cent for vitamin C and 15.49 per cent for folic acid RDA (Singh *et al.*, 2018) ^[10].

Table 3: Effect of nutri-garden (winter vegetables) on dietary diversity, micronutrient intake, and knowledge score of women

Assessed Parameters	Without intervention	Kitchen gardening intervention	Percent increase
Food variety score	17.35 \pm 3.5	28.36 \pm 2.7	63.45
Dietary diversity score	5.10 \pm 1.1	9.40 \pm 1.9	84.31
Vegetables production (Kg)	30.00 \pm 1.2	220.00 \pm 1.1	633.0
Per capita availability of vegetables (grams)	30.60 \pm 8.4	258.0 \pm 13.6	744.0
Knowledge score of diversified vegetable products (20 points)	6.10 \pm 1.2	14.50 \pm 1.3	163.6
Knowledge score of nutrient preservation (20 points)	5.50 \pm 1.1	15.40 \pm 1.5	180.0
Knowledge score of post-harvest management (20 points)	7.20 \pm 1.5	16.10 \pm 1.6	126.7
Vegetables contribution (%) in per day micronutrient intake			
Calcium (mg)	30.3	54.5	79.86
Iron (mg)	18.6	60.5	225.6
Beta-carotene (μ g)	26.5	65.5	147.2
Vitamin- C	18.6	54.5	193.0

Post knowledge score on diversified winter vegetable products, nutrient preservation during processing and cooking of vegetables, and post-harvest management of surplus vegetables was increased from 6.10 to 14.50, 5.50 to 15.40, and 7.20 to 16.10 points, respectively on a scale of 20 points after trainings exposure. The results of the present study are in close agreement with the earlier findings of Rani *et al.* (2023) ^[9] and Rana *et al.* (2021) ^[8].

Results of economic analysis of winter vegetables grown in

established kitchen gardens have been presented in Table-4 and data indicated that the per day average production of vegetables among farmers' households having ordinary kitchen gardening was 30.00 kg whereas it was 220.00 kg among farmers' households having established nutri-garden. The benefit to cost ratio was 4.3 among households having established nutri-garden which was 2.00 among the farmers' households having ordinary unorganized kitchen gardening.

Table 4: Economic analysis of kitchen gardening (Winter vegetables)-2021

Technology option	Average vegetable production (kg)	Economics			
		Gross cost (Rs.)	Gross return (Rs.)	Net return (Rs.)	BC ratio
Without intervention	30.00	150	600	450	2.0
Kitchen Gardening intervention	220.00	2000	4400	2400	4.3

Average selling price assumed: Rs. 20/kg of vegetable

Conclusion

The per capita availability of vegetables increased from 25.34 gram to 240.0 gram with a total production of 205.6 kg during the summer season and 30.60 gram to 258 gram with a total production of 220.0 kg in the winter season. The increased per capita availability of vegetables has contributed 42.8 to 75.4 per cent of recommended dietary allowances of calcium, iron, vitamin-C and β -carotene. Besides having fresh, chemical free and all-time available vegetables, they earned additional income through the sale of surplus vegetables while there was an indirect income by savings achieved for not buying the same products from the market as well as better trade was developed when produce was exchanged with others in the neighborhood. Establishing nutri-garden provided an aesthetic and therapeutic exercise that helps in relieving stress. Efforts should be made through government agencies to provide seeds of biofortified varieties of fruits and vegetables to the farmers and also the biofortified varieties of cereals and legume and oil seeds grains to achieve maximum nutrients with their existing eating habits. It may be concluded that Nutri- garden served the purpose of nutrition-sensitive agriculture and resource innovations. It may be considered one of the strongest pillars to increase dietary diversity and achieve household food security.

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