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Nutri garden for nutritional security and diversity among rural farm families-Namakkal District

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Abstract
Nutritional problems such as anaemia, malnutrition, stunting, wasting are prevalent among women and children. Nutri- garden promotes dietary diversification in rural household through easy availability of fresh vegetables and fruits on a daily basis, thereby, can play an important role in achieving nutritional security at household or community level. The objective of the study was to increase the availability of vegetables in rural household and to improve the knowledge of rural farm women regarding layout, technological and nutritional aspect of nutri-garden. Nutri-Gardens positively impact the family nutrition. In conclusion, Nutri-Gardens offer a holistic approach to improving nutrition in rural India, empowering women, raising their socio-economic status, and promoting nutrition education and community participation. The collaboration among various stakeholders is essential to disseminate information effectively and ensure the success and sustainability of Nutri-Gardens as a cost-effective and sustainable approach to mitigate malnutrition in the rural households. Farm families were introduced to the concept of organically growing nutrition garden through on campus training programs on balanced diet and importance of micro-nutrients. The nutritional composition of Recommended Dietary Allowance (RDA) was computed using Nutritive Value of Indian Foods and compared the same with the nutrients intake. The percentage adequacy determined revealed that there was an increase in per cent of quantity of nutrients intake like proteins (21.82%), fibre (13.83%), vitamin A (23.87%), vitamin C (15%), Iron (14.29) and Calcium (18.34%). After introduction of nutrition garden, the consumption of fresh vegetables increased in the daily diet which contributed towards the upliftment of the nutritional status of the farm families.

Keywords: Front line demonstration, Layout, Nutri-garden, Diversity, Nutrition security

Introduction

Nutritional security is a critical concern, particularly in the rural areas where a significant portion of the population is engaged in agriculture. In this connection, women farmers who are important stakeholders in agriculture, can address the challenges of both agricultural development and malnutrition reduction. However, agricultural policies focus on increasing farm production and farmers' income and often overlook the importance of addressing nutritional issues. The majority of farmers in India are small and marginal farmers, and simply increasing overall farm production and income may not adequately address the nutritional needs of the rural population. Hence, at the policy level, achieving inclusive growth in agriculture is important for strengthening the linkages between agriculture and nutrition. Addressal of nutritional security requires a multifaceted approach that goes beyond agricultural production. One potential solution is the implementation of Nutri-Gardens scheme, which can contribute to improving the availability and accessibility of nutritious foods at the household level. The Nutri-Gardens comprise the cultivation of a diverse range of vegetables, fruits, and herbs in home gardens or plots. The Nutri-Gardens make the women farmers aware about the quantity of vegetables to be used in daily diet (Kumari *et al*. 2019) [2]. The benefits that can emerge from Nutri-Gardening practices include better health and nutrition, additional income, employment, food security within the household and enhancement in community social life. The increased consumption of fruits and vegetables is one of the simplest and healthier ways of enhancing the nutritional status of population. Food security and nutritional diversity is one of the key areas that a developing country should address. With varying local opportunities and challenges, the kitchen garden forms a panacea that can address food insecurity and bring in self reliance, sovereignty and dignity.

Materials and Methods

The study was conducted in two villages (Naraikinaru and Mettupatty) of Namakkal District with the objective to determine the impact of nutri-garden on food security in terms of increase in vegetable consumption. One hundred respondents 50 nutri-gardeners and 50 non- nutri gardeners were randomly selected from the participating farmers of KVK's Nutri-Garden demonstration for KVK front line demonstration programme on nutrition security. Data was collected by face-to-face interview with the help of interview schedule. Most of the respondents were middle-aged having small farm size and primary level education. Both the groups had average family size ranging between 5-6 members and annual income between Rs 35000 to 50000. The average vegetable consumption increased in the nutri-gardeners in all three seasons- rabi 122%, kharif 151.85% and zaid 180%. Per day consumption of vegetables was found to be 81.01 percent higher in nutri-gardeners 272.84 g/day than the subjects not having nutri-garden 150.73 g/day. The calorie intake per day from vegetables was also recorded to be 126.55 percent higher in subjects having nutri-garden 110.15 kcal/day than those who did not. Major constraints with nutri-garden as faced by the respondents

were lack of irrigation facilities and damage of garden by animals. It was concluded from the present study that nutri-garden indeed has a positive impact in ensuring the food security among rural population and should be popularized. Training was imparted and preand post- evaluation was done for evaluating the change in knowledge of farm women regarding various aspects of nutri- garden. Questionnaire was used for pre - and postevaluation. Questions were divided into three sections: Importance of nutri-garden; Land preparation and layout; Knowledge about appropriate sowing methods. In the second phase of the programme, vegetable seeds were distributed in *Zaid*, *Kharif* and *Rabi* season. Impact of established nutri- garden in rural household was assessed by calculating the per cent change in the check and demonstration yield during Zaid, *Kharif* and *Rabi* season as well as BCR (benefit to cost ratio) for demonstration and check yield during the three seasons.

$$\text{Demonstration Yield} = \frac{\text{Total production of particular crop}}{\text{Total area}}$$

$$\text{Per cent change in the yield} = \frac{\text{Demonstration yield - Check yield x 100}}{\text{Check yield}}$$

$$\text{Net return} = \text{Gross return - Gross cost}$$

$$\text{BCR (benefit to cost ratio)} = \frac{\text{Net Return}}{\text{Gross cost}}$$

(Nutrient available in selected vegetable was calculated using Longvah *et al*. (2017) [3]. Nutrient availability per vegetable was calculated as:

$$\text{Availability of nutrients per veg} = \frac{(\text{Nutrient availability in particular vegetable crop per 100 gms}) \times 100}{\text{Total production of particular vegetable [in gms]}}$$

$$\text{Nutrient availability per person} = \frac{\text{Availability of nutrients per veg.}}{\text{Total beneficiaries } (i.e.\ 115)}$$

Nutri-gardens have gained prominence as a valuable source of nutrition at household level. Integrating trainingon nutri-garden practices can significantly contribute to better performance and well-being of individuals. This holistic approach not only addresses nutritional needs but also brings change in the attitude of the people and helps the family to carry out the work more efficiently and effectively through improved knowledge and skill. Pre- evaluation, then training followed by post-evaluation is assessment tools that helps in evaluating the learning outcomes, knowledge gaps, and behaviour changes of trainees before and after the training. Before training was imparted to farm women, only 8% women had knowledge that nutri-garden can help in women empowerment; only 16% had knowledge that home grown vegetables are free from harmful pesticides and insecticides; whereas only 19% had knowledge that vegetables grown in nutri-garden are free from artificial colours. After training, knowledge of the farm women was enhanced that can be evidenced from the fact that more than 90% of the women had gained knowledge on various aspects of importance of nutri- garden. Knowledge of the farm women was evaluated about nutri- garden land preparation and layout through preevaluation questionnaire. None of the women had knowledge that the preferred shape for nutri-garden should be square or rectangle; neither had they any idea regarding vermicompost preparation method and its beneficial impact on the farmer's field. Only 7% had idea that vermicompost should be used in nutri- garden and 16% of farm women knows that Nutri- garden area should have availability of sunlight throughout the day. Improvement in the knowledge of farm women was noticed post training as nearly 80% of the women had knowledge on all aspects of nutri- garden land preparation and layout. Through training, farm women gained knowledge about appropriate sowing method of vegetables. 25% of the women had knowledge on all aspects of nutri-garden land preparation and layout. Through training, farm women gained knowledge about appropriate sowing method of vegetables. 25% of the farm women had low level of knowledge about appropriate sowing method of vegetables before training. After training with KVK, majority of respondents (>82%) got knowledge that radish, spinach, bittergourd like vegetables are grown by seed sowing method whereas seeds of transplanted crops like tomato, chilli, brinjal should be sown in nursery beds one month in advance and after one month of sowing, seedlings are removed from nursery and transplanted in the nutri-garden beds. Training program enhances the awareness of farm women regarding various nutritional aspects and economic benefits of nutri-garden. Farm women understanding the nutritional benefits of the crops they grow, increases the likely of these fresh and nutrient-rich foods to be incorporated in their family's daily meals. This can lead to improved dietary practices and overall better health outcomes. Average per capita availability of nutrients from vegetables grown in *zaid*, *kharif* and *rabi* season are presented in Table 6. One of the primary objectives to develop nutrismart village having nutri-garden is to ensure nutritionally adequate diet at the household level. By comparing the NFHS-4 data with NFHS-5 data regarding nutritional status of the children under 5 years, it can be seen that although stunting, wasting and underweight percentage decline from 2015-16 to 2019-21 but the percentage of occurrence of disease in the population is still high. Protein and micronutrient deficiency among children results in PEM. Establishment of nutri-garden under front line demonstration ensures approximately 221.25 gms, 384.38 gms and 347.06 gms of per capita availability of protein during *Zaid*, *Kharif* and *Rabi* season, respectively. Despite of multifactorial pathophysiology of anaemia, iron deficiency anaemia is most prevalent (Warner and Kamran, 2022). Ascorbic acid is reported to be a potent enhancer of iron absorption (Milman, 2020) [4]. Ascorbic acid facilitates iron absorption in small intestine. Increased per capita availability of iron and ascorbic acid was also seen with the establishment of nutri- garden ensuring approximately 212.17 mg, 333.93 mg and 149.88 mg of iron and 2934.76 mg, 6633.46 mg and 4577.17 mg of ascorbic acid per capita availability during *Zaid*, *kharif* and *rabi* season, respectively. According to the WHO, millions of children suffer from vitamin A deficiency in developing countries (Wiseman *et al.*, 2017) [6]. *β*-carotene is the precursor for vitamin A (Krinsky and Johnson, 2005). Food-based approaches and supplementation are the ways for combating vitamin A deficiency in the population. Sustainable food-based approaches through nutri-garden can be portrayed as effective method for combating vitamin A deficiency in long term. Per capita availability of beta carotene after establishment of nutri-garden under NARI project was approximately 179695.2 mcg, 294246.5 mcg and 134636.19 mcg during *Zaid*, *kharif* and *rabi* season, respectively. Both calcium and vitamin D deficiency is highly prevalent in India resulting in rickets in children; osteoporosis and

osteomalacia in adults. Per capita availability of calcium was also found to be enhanced among study population with the establishment of the nutri-garden.

Results and discussion

Nutri-garden was implemented throughout the year during *Rabi, Kharif* and *Zaid* season. Vegetables grown during Zaid season consist of green leafy vegetables (GLVs) such as Spinach and amaranthus and other vegetables such as brinjal, beans, bitter gourd, smooth gourd, pumpkin, ridge gourd, cucumber and lady's finger. Average per unit production with per cent change in the yield between demonstration unit and check unit of vegetables in *Zaid, Kharif* and *Rabi* season is presented in Table 1.

Table 1: Nutrition gardening in economic perspective (200 sq. meter area

S. N0	Crop	Production/plot(3x4)	Cost of cultivation	Total return	Net return	BCR
Rabi vegetables						
1.	Brinjal	19	220	380	160	1.72
2.	Reddish	32.5	350	860	510	2.45
3.	Tomato	43.8	320	657	337	2.05
4.	Cluster beans	26.2	320	524	204	1.63
5.	Okra	47.6	360	1428	1068	3.96
6.	Bitter gourd	30	450	1160	710	2.57
7.	Amaranthus	32	230	640	410	2.78
8.	Chilies	12.5	630	1635	1005	2.59
9.	Lab-lab	25	230	750	520	3.26
Karif vegetables						
10.	Ridge gourd	15.2	250	456	206	1.82
11.	Snake gourd	18.6	320	558	238	1.74
12.	Palk	16	260	480	220	1.84
13.	Tomato	18.7	230	467	237	2
14.	Brinjal	18.2	230	546	316	2.3

Results of the study clearly shows more than five per cent increased yield in demonstration unit in comparison to farmer's field for majority of vegetables grown during zaid season. During kharif season, green leafy vegetables (GLVs) such as amaranthus and coriander and other vegetables such as bitter gourd, radish, lady's finger, smooth gourd, pumpkin, brinjal, tomato and green chilli were produced in the nutri-garden. During kharif period, increased yield was seen in demonstration unit in comparison to farmer's field for all vegetables. For vegetables such as amaranthus, radish, bitter gourd, coriander and green chilli, 12-22 per cent increased yield was seen in demonstration unit in comparison to check unit. Vegetables such as spinach, peas, cauliflower, radish, carrot, pumpkin, tomato and chillies were produced in rabi season. Higher crop yield was seen in demonstration unit for majority of vegetables. Benefit to cost ratio (BCR) ranges between 0.05 to 1.06 for demonstration unit and between 0.08 to 0.28 for check unit *i.e.* farmer's field during Zaid season. BCR ratio for demonstration yield was higher for vegetables such as spinach, brinjal, beans, bitter gourd, pumpkin, ridge gourd, cucumber and lady's finger in comparison to check yield. Benefit to cost ratio (BCR) for *kharif* crop ranges between 0.05 to 2.58 for demonstration unit and between 0.03 to 1.18 for check unit. In comparison to check yield, BCR ratio for demonstration yield was higher for all vegetables except for the radish during kharif season. Huge difference was seen in the crop yield between demonstration unit and check unit for majority of vegetables during *rabi* season. Benefit to cost ratio (BCR) ranges from 0.01 for radish to 2.18 for tomatoes in demonstration unit. BCR ratio for check unit lies between 0.01-1.92. In comparison to check yield, BCR ratio for demonstration yield was higher for all vegetables except for the radish during rabi season. Higher crop yield during the three seasons in demonstration unit in comparison to check unit for majority of vegetables can be attributed to use of vermicompost in proper amount (Islam *et al.,* 2021) [1], regular monitoring of demonstration unit by nutrition and agriculture scientist and timely spray of the insecticides and pesticides as per the need. Vermicompost enhances the nutrient content of the soil resulting in higher growth and productivity in the demo unit of the farmer's field.

A recommended quantity for balanced diet has been proposed by the National Nutrition Council of India which is fixed at 300 grams on the basis of per day per head. Leafy vegetables were the major produces from the nutrition gardens and maximum quantity consumed by the beneficiary household for the upliftment in the nutritional status. The production from the gardens were recorded on an average 418.3 kg of vegetables by the households having the nutrition garden and 165kg of vegetables by household having no nutrition garden. The households basically consume the self produces with a remarkable nutritional support and alongside opens an income opportunity of approximately Rs. 7500. It was also noted that there was an increasing record of consumption rate of vegetables in before and after intervention of the nutrition gardens i.e., 246kg and 375 kg respectively.

Table 2: Comparative analysis intervention of model nutrition garden and traditional kitchen garden

Parameters	Average yield (kg/200sqm)	Market value (Rs)	Average consumption(kg)
Traditional (Before intervention)	165	3300	246
Model nutrition garden (After intervention)	418	7172	373
Percent change	153	117	52.4

It was also noted that there was an increasing record of consumption rate of vegetables in before and after intervention of the nutrition gardens i.e., 246kg and 375 kg respectively.

Table 3: Change in nutritional status of individual through intervention of model nutrition garden

Nutritional elements	Percapita consumption per day		%Recommended Dietary allowance		Difference (%)
	Before	After	Before	After	
Vitamin C(mg/d)	70.44	142.99	176.1	357.47	+181.37
Calcium(mg/d)	104.5	226019	17.41	37.69	+20.28
Iron(mg/d)	6.7	13.20	31.90	62.85	+30.5
Folic acid(mg/d)	25.70	58.85	12.85	29.42	+16.57
Protein(g)	3.2	5.60	5.3	9.3	+4

Table 3 of the study revealed that there was availability of nutrition on after establishment of gardens by the beneficiaries. There was significant increase of nutrients per day were recorded after intervention of the model nutrition gardens also clarifies that 29.42% folic acid, 62.85% iron, 37.69% calcium, 83.02% beta-carotene, 357.47% vitamin C and 9.3% proteins were additionally available to recommended dietary allowances of therespondents comparing the practices adopted by farmers. Overall impact of model nutrition garden on farm families.

The questionnaire results were placed in the Table 4 which were collected from the households of the study. The proper utilization of space and time along with good health and savings were recorded in the present study. Respondents also commented very satisfactory responses on the taste of produces they made.

Table 4: Overall impact of model nutrition garden on farm families

S. No	Parameters	Very satisfactory (%)	Satisfactory (%)	Un satisfactory (%)
1	Health of Family	68.7	20.3	7.3
2	Variety food availability	77.8	15.4	3.5
3	Savings	69.8	22.5	4.2
4	Soil health	52.2	12.5	6.9
5	Utilization of spare time	82.3	12.3	3.4
6	Taste of food prepared	79.7	15	2.6

Conclusion

Nutri-garden is highly beneficial in achieving nutritional security at household level by increasing the vegetable intake. Training on nutri-gardens offers a multifaceted approach to enhancing the performance of farm women and integrating training programs along with the establishment of nutri-garden in farm families can lead to healthier environment by increasing production and intake with use of appropriate technical know-how. An increase in yield of the crops was seen in demonstration unit in comparison to farmers field. This enhances the nutrient availability among rural families. Knowledge of the rural household was also enhanced through various training programmes conducted during the study. The major constraints faced by the farm women in management of nutri-garden were inadequate water supply in some areas and high input cost involved in purchasing low cost quality seed. Nutri gardens are seen to be important not only as a source of vegetables but also to access herbs that are useful in medicinal values. In more recent times their significance is seen to be growing in the context of the efforts to combat micro nutrient deficiencies. These deficiencies are widely prevalent in areas where the normal diet of the population has low diversity and particularly where they are dependent on a single staple food such as cereal based diets or monotype cropping system is in practice. In the present perspective, nutrition garden is a prerequisite to upliftment of rural household livelihood through the implementation of model nutrition garden.

References

1. Islam R, Solaiman AHM, Kabir MH, Arefin SA, Azad MOK, Siddiqee MH. *et al*. Evaluation of lettuce growth, yield and economic viability grown vertically on unutilized building wall in Dhaka City. Frontiers in Sustainable Cities, 2021.
2. Kumari P, Mustaf M, SPS Somvanshi, C Singh, P Kumar. Nutri-Garden for sustainable food security and nutritional diversity in Hamirpur district of Bundelkhand Region (UP). Indian Journal of Extension Education, 2019.
3. Longvah T, Anantan I, Bhaskarachary K, Venkaiah K, Longvah T. Indian food composition tables. Hyderabad: National Institute of Nutrition, Indian Council of Medical Research, 2017.
4. Milman NT. A review of nutrients and compounds, which promote or inhibit intestinal iron absorption: Making a platform for dietary measures that can reduce iron uptake in patients with genetic haemochromatosis. J. Nutr. Metab, 2020. doi, NIN, ICMR-2018. Plate for the day, National Institute of Nutrition, Hyderabad, India.
5. Singh V, Yadav KS. Tripathi AK. Kitchen gardening: A promising approach towards improving utritional security in rural households. International Journal of Microbiology Research.
6. Wiseman EM, Bar-El Dadon S, Reifen R. The vicious cycle of vitamin a deficiency: A review. Critical Reviews in Food Science and Nutrition,2017:57(17):3703-3714.