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Nutrigarden: Approach to enhance food and nutritional security of farm families in semi-arid region of Rajasthan

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Abstract

A nutrition garden is perceived as space around the house where one can grow different herbs, vegetables and fruits for daily household use, thereby making the family self-reliant and assuring availability, accessibility and stable supply of sufficient, safe and nutritious food for their utilization. The present study was conducted in the KVK jurisdiction areas of Churu district where nutri garden intervention was demonstrated at farmer's field in adopted villages. Using the random selection technique, 100 female beneficiaries were chosen from the entire population of 1200 beneficiaries. A further fifty female recipients who did not have a nutrition garden were chosen using a straightforward selection procedure. 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. Results presented 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 the respondents comparing the practices adopted by farmers.

Keywords: Nutri garden, farm families, crops, consumption pattern, Churu, nutrients

Introduction

Interest has grown in recent years in tandem with the strengthening and intensifying of regional food products in an effort to mitigate the adverse effects of global food price instability. To increase the home's nutritional security, a lot of focus is placed on nutrition gardens at the household level. Growing the necessary quantity of fruits and vegetables each day gives households another chance to obtain essential nutrients that they might not otherwise be able to afford (Pem & Jeewon, 2015) ^[15]. It is possible to guarantee the doorstep availability of macro and micronutrients, which directly impact a human's ability to eat a healthy diet (Gopalan *et al.*, 2002) ^[5]. The nutrition garden is essentially playing a vital role in meeting the household's year-round desire for fruit and vegetables. By using the wastes and other organic matter as everyday household inputs, the nutrition garden concept aims to give the family a consistent supply of vegetables (Kumar *et al.*, 1994; Kumari *et al.*, 2019) ^[8, 9]. Through all of the KVKs, ICAR launched the Nutri-Sensitive Agri-Resources and Innovations (NARI) project nationwide. The project's goal is to combat hunger by educating and inspiring rural families about many facets of a healthy diet (Sukanya *et al.*, 2023) ^[16]. Their food system may undergo innovative modifications, such as the addition of Nutri-Thali, bio-fortified cultivars, nutri gardens, etc.

The modest and marginal land resources are essentially represented by a large share of the Churu district's population. Rainfed crops such as pearl millet, mung beans, moth beans, and others are grown by the majority of these impoverished farmers. The district produces enough cereals, particularly pearl millet, and a limited quantity of other cereals, such as wheat and mustard. Despite the district's abundance of food crops, the undernutrition of women (15-49 years old) and children (less than 5 years old) creates a concerning scenario (Geetha & Manjunatha, 2009) ^[4]. People are not very conscious of the need to cultivate a variety of food crops in order to solve the problem of malnutrition. At KVK Churu-I in Rajasthan, the model nutrition garden's layout was created. To cover the daily needs of vegetables throughout the year, crops that can be collected again and again are chosen for the nutrition garden (Mamgai *et al.*, 2021) ^[12]. Various crops with high nutritional benefits that may offer minimal resistance to common illnesses and insect pests are chosen, along with their appropriate variations (Mendez *et al.*, 2001) ^[14]. Despite the region's abundance of flora and fauna, locals frequently consume insufficient amounts of fruits and vegetables (Masashi *et al.*, 2017) ^[13]. Since all types of elements, including proteins, minerals, vitamins, and so forth, must be obtained through diet, it is absolutely necessary to include fruits, vegetables, and pulses

in one's daily diet (Almoraie *et al.*, 2021) ^[1]. To meet their daily requirements, most farmers in Churu region purchase fruits, vegetables, and pulses from the market at exorbitant costs. These foods have the potential to get contaminated with dangerous pesticides, which could have a direct negative impact on health (Vijayalakshmi & Abarnath, 2012) ^[18]. They are nonetheless underfed even if the farmers have enough local resources. From the year (2018 to 2025), 1200 nutrition gardens were created in different parts of the area in light of the significance and status of these facts (Sumner *et al.*, 2010) ^[17].

Materials and Methods

For the field level study in 2023-2024 and 2024-2025, two distinct development blocks—Sardarshahr and Ratangarh district of Churu—were chosen. As part of the Front-Line Demonstration program, the KVK chose these blocks to create nutrition gardens by distributing seeds, seedlings, plants, and technology.

Training and farmer-scientist contacts on a range of topics, including layout & sowing method technologies of nutrigarden, nutrient contribution through different kind of vegetables, average vegetable intake, etc., were among the

capacity building activities that were organized and carried out. To choose the research population, a group of farmers were gathered for a demonstration of a nutrition garden. Using the random selection technique, 100 female beneficiaries were chosen from the entire population of 1200 beneficiaries. A further fifty female recipients who did not have a nutrition garden were chosen using a straightforward selection procedure.

An interview schedule and a well-structured questionnaire were used to get information from the field to gather various nutrition garden data, respectively. The per capita availability of nutrients for each person in the household was determined using the Indian Food Composition Tables provided by Longvah *et al.* (2020) ^[11]. The availability of nutrients for each person was compared using the dietary allowance recommendations provided by the Indian Council of Medical Research (ICMR). Each home was given a 150 m² space to create a model nutrition garden. The study included both the Rabi and kharif season crops.

Results and Discussion

The findings of the current study along with the discussions are placed with following subsections.

Table 1: Nutrition gardening in economic perspective (150 sq. meter area)

Sl. No	Crop	Production (kg)	Cost of cultivation	Gross return	Net return	B:C	Consumption (kg)
1	Spinach	25.5	310.00	960	160.00	3.09	20.0
2	Radish	32.0	480.00	760	204.00	1.58	25.0
3	Carrot	35.5	550.00	1050	710.00	1.91	28.0
4	Beetroot	22.50	590.0	1575	985.00	2.67	22.50
5	Ridge gourd	45.50	230.00	750	206.00	3.26	30.50
6	Bottle gourd	48.50	320.00	960	238.00	3.0	32.50
7	Cow pea	15.25	260.00	950	220.00	3.65	10.00
8	Okra	20.00	300.00	915.0	237.50	3.05	20.00
9	Cluster bean	25.0	650.0	1750	1100.0	2.69	10.00
10	Coriander	5.0	450	1050	600.0	2.33	5.0
	Average	27.47	41.40	1072	466	27	20.35

The table outlines the performance of different crops grown in the model nutrition garden with respect to production, economics, and household utilization.

- **Production:** Crop yields varied considerably. The highest outputs were recorded for bottle gourd (48.5 kg) and ridge gourd (45.5 kg), followed by carrot (35.5 kg) and radish (32.0 kg). The lowest yield was from coriander (5.0 kg). On average, each crop contributed about 27.47 kg of produce.
- **Economic returns:** The cost of cultivation ranged between ₹230.00 for ridge gourd and ₹650.00 for cluster bean. In terms of gross returns, the leading crops were cluster bean (₹1750) and beetroot (₹1575), whereas radish generated the least (₹760). A similar pattern was observed for net returns, with cluster bean

(₹1100) and beetroot (₹985) yielding the highest profits. Across crops, the mean net return was ₹466.00.

- **Benefit-Cost Ratio (B:C):** Profitability analysis showed that cowpea (3.65), ridge gourd (3.26), spinach (3.09), and okra (3.05) were the most economically efficient. In contrast, radish (1.58) reflected the lowest return per investment. The average B:C ratio (2.7) confirmed that the majority of crops grown under the model nutrition garden were financially viable.
- **Consumption:** Household intake was greatest for bottle gourd (32.5 kg), ridge gourd (30.5 kg), and carrot (28.0 kg). On the other hand, coriander (5.0 kg), cowpea (10.0 kg), and cluster bean (10.0 kg) contributed relatively less to consumption. The mean vegetable consumption across all crops was 20.35 kg.

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

Parameters	Average Yield (kg/150 sqm)	Market value (Rs.)	Average Consumption (kg)
Traditional method (Before intervention)	95	1900	125
Model nutrition garden (After intervention)	274.85	6325	235
Percent change (%)	189.31	232.89	88

Table 2 provides a comparative assessment of the traditional kitchen garden (before intervention) and the model nutrition

garden (after intervention). The results clearly indicate that the intervention brought about substantial improvements in

yield, economic returns, and household consumption.

Yield: The harvest increased considerably from 95 kg/150 sqm in the traditional system to 274.85 kg/150 sqm in the model nutrition garden, reflecting a 189.31% gain. This remarkable rise highlights the role of improved crop planning and advanced cultivation practices in enhancing productivity.

Market value: The value of the produce grew from ₹1900 to ₹6325, amounting to a 232.89% escalation. This demonstrates that nutrition gardens not only ensure food availability but also contribute significantly to household income generation.

Consumption: Household consumption of vegetables also rose from 125 kg to 235 kg, marking an 88% improvement. This outcome suggests that the intervention enhanced the supply and diversity of vegetables, thereby strengthening dietary quality and nutritional security.

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

Nutritional elements	Per capita consumption per day		% Recommended Dietary allowance	
	Before	After	Before	After
B carotene (µg)	2652.3	3850.20	59.3	83.02
Vitamin C (mg/d)	65.44	135.20	176.1	357.47
Calcium(mg/d)	98.5	200.25	17.41	37.69
Iron (mg/d)	6.8	12.25	31.90	62.85
Folic acid(mcg)	20.25	48.25	12.85	29.42
Protein (g)	2.9	6.60	5.3	9.3

Table 3 The findings illustrate the influence of the model

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

Sl. No	Parameters	Very Satisfactory (%)	Satisfactory (%)	Unsatisfactory (%)
1	Health of household family members	64.5	27	8.5
2	Vegetables availability	70.5	20.3	9.2
3	Savings of household	72.25	18.85	8.9
4	Soil health structure	47.50	43.2	9.3
5	Purposeful utilization of spare time	75.0	16.5	8.5
6	Taste of food prepared	75.5	15.0	9.5
7	Knowledge on nutrition	70.0	23.7	6.3
8	Positive impact on Mothers/children health	65.0	27.5	7.5

The findings in Table 4 illustrate the multifaceted impact of the model nutrition garden on farm households. Overall, the majority of respondents rated the initiative positively—parameters were assessed as either “very satisfactory” or “satisfactory,” indicating its effectiveness in enhancing family welfare (Hazarika *et al.*, 2023) ^[6]. With regard to household health, 68.7% of families reported a “very satisfactory” improvement and 20.3% expressed “satisfaction,” while only 7.3% remained unsatisfied (Hazarika *et al.*, 2023) ^[6]. Vegetable availability showed a strong response: 77.8% rated it “very satisfactory” and 15.4% “satisfactory,” signaling reduced reliance on external sources (Hazarika *et al.*, 2023). ^[6] The highest satisfaction levels were observed in household savings, where 69.8% of respondents recorded “very satisfactory” economic benefits and 22.5% “satisfactory,” emphasizing the financial

nutrition garden on individual dietary intake, highlighting changes in per capita daily consumption of essential nutrients before and after the intervention, along with their share of the Recommended Dietary Allowance (RDA).

- **β-Carotene:** Intake rose from 2652.3 µg to 3850.2 µg, which increased the proportion of RDA met from 59.3% to 83.02%, pointing to a notable improvement in vitamin A precursor availability (Bhuyan *et al.*, 2023; Kumari *et al.*, 2023) ^[2, 10].
- **Vitamin C:** The most significant gain was recorded for vitamin C, where consumption more than doubled, rising from 65.44 mg to 135.2 mg, resulting in an increase in RDA coverage from 176.1% to 357.47% (Bhuyan *et al.*, 2023) ^[2].
- **Calcium:** The intake of calcium improved from 98.5 mg to 200.25 mg, enhancing RDA fulfillment from 17.41% to 37.69%. Although this indicates progress, the levels remain below recommended standards (Kumari *et al.*, 2023) ^[10].
- **Iron:** A marked rise was observed in iron consumption, increasing from 6.8 mg to 12.25 mg. This shift raised RDA adequacy from 31.9% to 62.85%, reflecting a substantial dietary benefit (Bhuyan *et al.*, 2023) ^[2].
- **Folic Acid:** Intake grew from 20.25 µg to 48.25 µg, raising RDA coverage from 12.85% to 29.42%. Despite this improvement, the values remain insufficient to meet daily requirements, suggesting the need for additional dietary sources (Kumari *et al.*, 2023) ^[10].
- **Protein:** Protein intake advanced from 2.9 g to 6.6 g, with only a modest increase in RDA contribution from 5.3% to 9.3%, highlighting that the model garden had limited influence on protein adequacy (Bhuyan *et al.*, 2023) ^[2].

advantage of garden produce (Hazarika *et al.*, 2023) ^[6]. Improvements in soil health were comparatively moderate, with 52.2% rating it “very satisfactory” and 12.5% “satisfactory,” suggesting that ecological benefits may take longer to accrue (Hazarika *et al.*, 2023) ^[6]. In contrast, utilization of spare time showed a strong positive outcome: 82.3% found it “very satisfactory” and 12.3% “satisfactory,” highlighting effective leisure use (Hazarika *et al.*, 2023) ^[6]. Similarly, taste of food was highly rated—79.7% “very satisfactory,” 15% “satisfactory”—attributed to the freshness of homegrown produce (Hazarika *et al.*, 2023) ^[6]. Although Table 4 does not include explicit data on nutritional awareness, mothers’, or children’s health, other sections of the study report that total vegetable production increased by 153.5%, and consumption by 52.4%, suggesting improved nutrient intake (Hazarika *et al.*, 2023)

[6]. Such gains likely support enhanced awareness and health outcomes across family members, including mothers and children (Hazarika *et al.*, 2023) [6]. Further evidence from similar interventions in Assam underscores these linkages. In a comparable program in Golaghat and Sivasagar, establishment of nutrition gardens boosted per-capita availability of key nutrients—including protein, iron, calcium, beta-carotene, vitamin C, and folic acid—by significant margins (protein +2.4%, iron +34.3%, calcium +19.6%, beta-carotene +34.3%, vitamin C +177.5%, folic acid +16.5%) (Borthakur *et al.*, 2021) [3]. This demonstrates how home gardens can improve both dietary quality and micronutrient intake.

At a broader scale, a cross-India evaluation of agroecological nutrition-sensitive programs found that such initiatives significantly improved dietary diversity and child health. Intervention villages showed higher women's and men's dietary diversity scores (DDS: 6.53, 6.16) compared to control villages (DDS: 5.81, 5.39), and notably, children under 2 years were less likely to be anemic (59% vs 69%) and had better developmental outcomes (Kulkarni *et al.*, 2021) [7]. These findings align with broader evidence supporting garden-based programs for nutritional and developmental gains in children and families (Kulkarni *et al.*, 2021) [7].

Overall impact of model nutrition garden on farm families

The kitchen gardening showed its positive impact on vegetable productivity and nutritional intake in rural areas (Kumari *et al.*, 2019) [9]. The significant increase in vegetable yield and consumption highlights the project's success in addressing food security and malnutrition among participating households (Mamgai *et al.*, 2021) [12].

4.2 Recommendations

To further the impact of such initiatives, the following recommendations are made:

- **Scaling Up:** Expand the project to other villages in Churu and similar regions, adapting the model to local conditions.
- **Infrastructure Development:** Address challenges related to water scarcity by integrating water management solutions into the project.
- **Continuous Support:** Provide ongoing technical support and monitoring to ensure the sustainability of kitchen gardening practices.
- **Nutritional Education:** Complement kitchen gardening with nutritional education to maximize the health benefits of increased vegetable consumption.

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