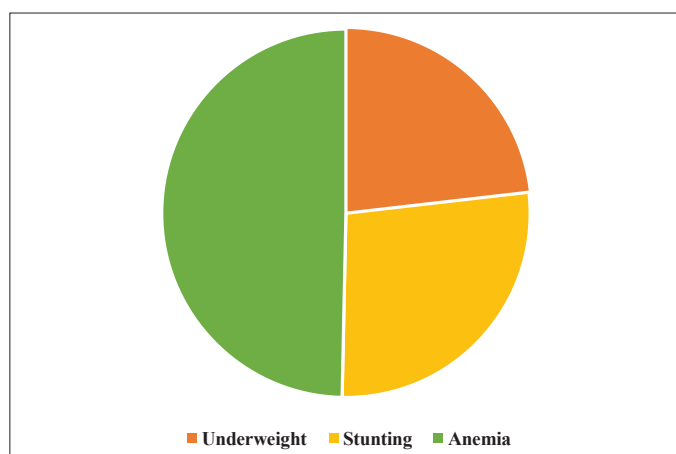


Nutri-Garden as an Extension Model for Enhancing Household Nutritional Security in Malda District

Malda district is presently facing a complex nutrition challenge marked by the co-existence of undernutrition and rising lifestyle-related diseases. High levels of anemia, child stunting and underweight persists among women and young children, while overweight, diabetes and hypertension are increasingly observed among adult women. Although calorie intake may be adequate in many households, poor dietary diversity and limited intake of nutrient-rich foods contribute to hidden hunger. Field-level assessments by ICAR-CISH KVK indicated inadequate diversity in household diets, particularly among women. In response, structured nutri-garden models were promoted to enhance year-round availability of vegetables, fruits, legumes and herbs within homesteads. The circular and rectangular models, supported by season-wise crop planning, align with ICMR-NIN dietary guidelines and offer a practical, affordable and locally adaptable strategy to improve diet quality and strengthen household nutritional security in Malda district.

Keywords: Dietary diversity, Hidden hunger, MDD-W, ICMR-NIN, Nutri-garden, Nutritional security

ACCORDING to the District Nutrition Profile of Malda (2020), malnutrition remains a major public health challenge affecting both women and young children. Nearly 70–75% of women (15–49 years) and children under five are reported to be anemic, indicating widespread micronutrient deficiencies, particularly iron deficiency. In addition, around 41% of children are stunted and 35% are underweight, reflecting chronic undernutrition, poor dietary diversity, recurrent infections and inadequate infant and young child feeding practices. Such nutritional deprivation during the critical first 1,000 days of life adversely affects growth, immunity, cognitive development and long-term productivity.



Nutrition status of Malda district
(District Nutrition Profile of Malda, 2020)

At the same time, Malda is witnessing a nutrition transition, with rising levels of overweight, obesity, diabetes and hypertension among women. This co-existence of undernutrition and overnutrition clearly reflects the double burden of malnutrition in the district. While calorie intake may be sufficient for many households, diet quality remains poor, characterised by low consumption of fruits, vegetables, pulses and other micronutrient-rich foods. Addressing this dual challenge requires both nutrition-specific interventions and nutrition-sensitive approaches that promote dietary diversity, women's empowerment and sustainable local food systems.

Understanding local dietary patterns in Malda: Field observations and household-level interactions carried out by ICAR-CISH KVK in Malda district indicated limited dietary diversity among many families. A 24-hour dietary recall survey was conducted among 60 households selected using simple random sampling, which revealed that meals were largely cereal-based, with comparatively lower inclusion of fruits, green leafy vegetables, milk, eggs and other nutrient-rich foods. Dietary diversity was assessed using standard indicators by grouping foods into broad categories. The mean Dietary Diversity Score (DDS) was 3.4 ± 1.2 , indicating low diversity. Only 28% of households consumed fruits, while 22% consumed milk or milk products and 18% included eggs in their daily diet. Among women of reproductive age, 76% exhibited low dietary diversity, consuming fewer than five food groups per day.

Despite access to staple foods, diets remained

imbalanced and deficient in protective foods. Women particularly consumed limited food groups, mainly cereals and pulses, increasing the risk of micronutrient deficiencies, especially iron and essential vitamins. The National Family Health Survey (NFHS-5, 2019–21), reports a high prevalence of anemia in West Bengal. Similar concerns of 'hidden hunger' have been emphasised by the Food and Agriculture Organization and the World Health Organization, linking poor dietary diversity with micronutrient deficiencies. Previous studies have demonstrated that home or nutri-gardens improve dietary diversity and nutritional outcomes by increasing access to micronutrient-rich foods. Recent evidence also shows that nutri-garden interventions enhance vegetable consumption and reduce micronutrient deficiencies and anemia.

This situation reflects the presence of 'hidden hunger,' where energy needs may be met but diet quality remains poor. At the same time, increasing cases of overweight and lifestyle-related diseases suggest an ongoing nutrition transition marked by imbalanced food habits. In this context, promoting household nutri-gardens emerges as a practical and sustainable nutrition-sensitive approach to diversify diets, increase intake of micronutrient-rich foods and strengthen long-term nutritional security.

Role of nutri-garden in addressing micronutrient deficiencies: A well-designed nutri-garden serves as a practical and sustainable household-level approach to improving dietary diversity and reducing micronutrient deficiencies. By cultivating a range of seasonal vegetables, perennial crops, fruits and herbs within the homestead, families gain year-round access to fresh, safe and nutrient-rich foods. This diversity increases the number of food groups consumed at the household level and enhances the likelihood of meeting minimum dietary diversity standards for women and children.

Nutri-gardens are especially valuable for rural households, where limited market access and financial constraints often restrict the regular consumption of protective foods such as green leafy vegetables and fruits. By producing these foods at home, families reduce their dependence on market purchases and shield themselves from price fluctuations, while simultaneously improving diet quality. Regular intake of green leafy vegetables, vitamin A-rich produce, fruits, pulses and herbs improve the consumption of key micronutrients such as iron, calcium, folate, vitamin C and β -carotene, nutrients essential for preventing anemia, strengthening immunity and supporting child growth and development.

Beyond nutrition, nutri-gardens promote self-reliance, food and nutritional security and greater involvement of women in household food production. When thoughtfully planned in alignment with ICMR–NIN dietary guidelines, nutri-gardens can help to transform cereal-dominated diets into more balanced, diversified and micronutrient-rich eating patterns at the household level.

Nutri-garden models for household nutritional security: Nutri-gardens can be developed using two simple and adaptable models depending on available household space, both designed to ensure year-round availability of diverse, nutrient-rich foods. The circular model ($\approx 65 \text{ m}^2$ or 700 sq. ft) is ideal for small homesteads. In this layout,

taller fruit crops such as drumstick, papaya, banana or guava are placed at the outer corners to avoid shading, while protective border crops like onion, marigold and maize act as natural pest repellents and wind barriers. The circular area is divided into seven outer plots for major seasonal crops including cruciferous vegetables, cucurbits, solanaceous crops and legumes, with trellises used for climbers to optimise vertical space. The middle ring accommodates green leafy vegetables and seasonal root crops, while the inner circle is reserved for medicinal and culinary herbs. A central compost pit enables recycling of kitchen waste, making the system sustainable and self-reliant.



Rectangular Nutri Garden Layout (Pre-establishment stage)



Rectangular layout (after crop establishment)

The rectangular model ($100\text{--}200 \text{ m}^2$) is suitable for households with larger backyards. The space is divided into organised beds that allow systematic crop rotation and seasonal planning. Fruit trees are planted along the boundaries and internal plots are allocated for leafy vegetables, other vegetables, roots and tubers, legumes and climbers. This arrangement ensures continuous harvest across seasons while maintaining soil health and reducing pest incidence. With greater area and flexibility, the rectangular model supports higher crop diversity and productivity, aligning well with ICMR–NIN dietary recommendations. Both models enhance household dietary diversity, improve micronutrient intake and contribute to long-term nutritional and food security.

Season-wise crop planning for year-round nutrition: Season-wise crop guidance for the nutri-garden, as presented in Table 1 below, highlights major crop categories and their key nutritional contributions, enabling systematic year-round planning aligned with household dietary requirements. This structured crop planning framework can be effectively adopted in both the circular and rectangular nutri-garden models. By reducing seasonal nutrient gaps and ensuring continuous availability of



Circular Nutri Garden Layout (Pre-establishment stage)



Circular layout (after crop establishment)

Table 1. Seasonal Crops in nutri-garden

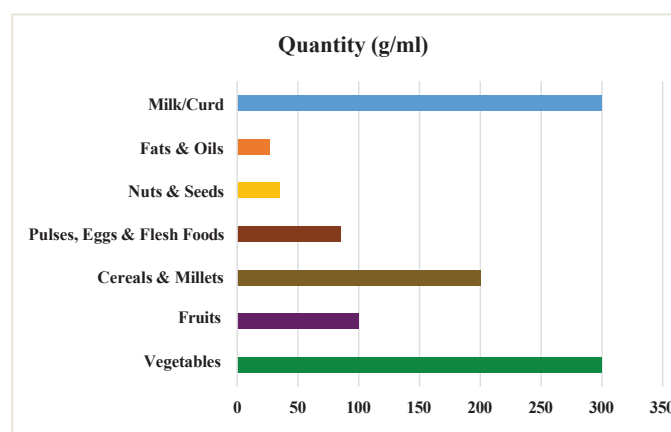
Season	Time period	Crop category	Crops included	Key nutritional contribution
Kharif	June to October	Green Leafy Vegetables	Amaranthus (green & red), Colocasia leaves, Tender pumpkin leaves	Iron, β -carotene, folate, dietary fibre
		Vegetables	Okra, Tomato, Brinjal, Chilli, Cucurbits	Vitamin C, potassium, antioxidants
		Legumes	Cowpea, Cluster beans, Yard long beans	Plant protein, iron, fibre
		Roots & Tubers	Colocasia, Tapioca, Elephant foot yam, Sweet potato	Energy (carbohydrates), β -carotene, potassium
Rabi	October to March	Green Leafy Vegetables	Spinach, Methi, Mustard, Bathua, Green sorrel, Radish leaves, Beet greens, Garden cress	Iron, calcium, folate (B9), β -carotene
		Vegetables	Tomato, Brinjal, Chilli, Capsicum, Cruciferous vegetables	Vitamin C, antioxidants
		Legumes	Peas, Broad beans, French beans	Protein, iron, fibre
		Roots & Tubers	Potato, Beetroot, Radish, Carrot, Jicama, Onion, Garlic	Carbohydrates, β -carotene, vitamin C
Zaid	March to June	Green Leafy Vegetables	Amaranthus (green & red)	Iron, β -carotene
		Vegetables	Okra, Brinjal, Chilli, Cucurbits	Vitamin C, potassium
		Legumes	Cowpea, Cluster beans	Protein, fibre
		Roots & Tubers	Colocasia	Energy, minerals

diverse food groups, the nutri-garden model strengthens household food security and builds long-term nutritional resilience.

Perennials, fruits & herbs for continuous nutrient supply: Perennial leafy plants, fruits and herbs in the nutri-garden ensure continuous nutrient availability throughout the year without seasonal gaps. As highlighted in Table 2, these crops are rich sources of iron, calcium, vitamin C, β -carotene, antioxidants and dietary fibre, thereby supporting micronutrient adequacy and overall family health.

Daily nutritional contribution of selected nutri-garden crops: As presented in Table 3, the recommended daily intake of green leafy vegetables, other vegetables, roots, tubers and fruits as per ICMR–NIN guidelines can be effectively met through a well-planned nutri-garden. Regular consumption of these food groups supplies essential micronutrients and helps prevent deficiencies, thereby supporting balanced

nutrition and improved family health.



Recommended daily intake of food groups (g/ml) based on ICMR–NIN guidelines (2020)

Table 2. Perennial crops in nutri-garden

Category	Crops included	Key nutritional benefits
Leafy & medicinal Plants	Malabar spinach, Drumstick, Gogu leaves, Ponnaganni, Agathi leaves	Iron, calcium, β -carotene, antioxidants
Fruits	Banana, Lemon, Papaya, Guava, Ber, Amla, Pomegranate, Custard apple	Vitamin C, potassium, fibre, β -carotene
Herbs	Curry leaves, Mint, Lemongrass, Ajwain leaves, Betel leaves	Micronutrients, digestive benefits, antioxidants

Table 3. Recommended daily intake and nutritional contribution of nutri-garden food groups

Food group	Recommended intake/day (g)	Key nutrients
Green leafy vegetables (GLVs)	150 g	Iron, calcium, vitamin A (β -carotene), folate (B9), dietary fibre
Other vegetables	100 g	Vitamin C, B6, folate (B9), potassium, magnesium, dietary fibre
Roots and tubers	100 g	Carbohydrates (energy), β -carotene, potassium, dietary fibre
Fruits	150 g	Vitamin C, potassium, β -carotene, dietary fibre

(Based on ICMR–NIN Dietary Guidelines, 2020)

The ICMR–NIN dietary guidelines recommend a balanced plate with half comprising vegetables and fruits, adequate pulses and protein sources, inclusion of milk and milk products and moderate cereal intake; however, diets in Malda remain largely cereal-dominant with limited diversity. A well-planned nutri-garden offers a practical household-level solution by ensuring regular availability of 300-350 g of vegetables and 100-150 g of fruits/person/day, helping bridge the gap between recommended and actual intake. Inclusion of legumes enhances plant-based protein intake, while combining iron-rich leafy vegetables with vitamin C-rich fruits improve iron absorption. Beyond improving daily diet quality, nutri-gardens support maternal nutrition, better complementary feeding for young children and reduced risks of stunting and anemia during the critical first 1,000 days. They also reduce market dependence, improve affordability of nutrient-dense foods and strengthen women's participation in household food decision-making, thereby promoting long-term food and nutritional security.

SUMMARY

Low dietary diversity and cereal-dominated food

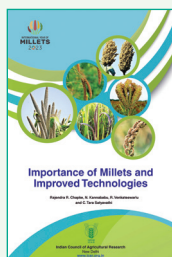
patterns in Malda contribute significantly to hidden hunger and the double burden of malnutrition, particularly among women and children. In this context, nutri-gardens offer a practical and sustainable nutrition-sensitive extension model by ensuring year-round availability of diverse, locally grown, micronutrient-rich foods at the household level. By reducing dependence on market purchases, improving access to protective foods and enhancing diet quality, they directly address micronutrient deficiencies in a cost-effective and scalable manner. Their adaptability to different household conditions and suitability for KVK-led interventions make them a viable strategy for strengthening household nutritional security and promoting long-term health and resilience in rural communities.

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