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How can Community & Homestead Nutrition Gardens in Madhya Pradesh, India become more climate-resilient?

SECURING NUTRITION, ENHANCING RESILIENCE (SENU) - INDIA
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INTRODUCTION AND OBJECTIVES OF THE STUDY

Approximately two billion people around the world are reported to be chronically malnourished, concentrated mainly in sub-Saharan Africa and Asia. The effects of this are particularly devastating for the first thousand days of the lives of children, and on a macro level, this also has adverse impacts on national economies. Climate change constitutes a major threat to food and nutrition security, with its impacts already being felt in many countries, including India.

The Indo-German project 'Securing Nutrition, Enhancing Resilience (SENU) – India' implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) aims to improve the nutrition situation of nutritionally insecure people, particularly women of child-bearing age (15-49 years) and young children (6-23 months) in four districts of Madhya Pradesh and two districts of Maharashtra through an integrated approach linking participatory learning and action trainings on nutrition and hygiene practices, with nutrition-sensitive micro planning and Community Nutrition Gardens (CNG) as well as Homestead Nutrition Gardens (HNG) to ensure year-round availability of diverse and nutritious food at village level.

In the Sheopur and Chhatarpur districts of Madhya Pradesh, 20 pilot CNGs were established in 2019 and 2020. During the pilot phase, SENU collaborated with women self-help groups (SHGs) which were created for this purpose. From 2021 to 2025, a total of 350 CNGs are to be established in four districts of Madhya Pradesh: 140 CNGs each in Barwani and Khandwa districts and 35 CNGs each in Sheopur and Chhatarpur, including the 20 pilot CNGs.

Focusing on the target districts in Madhya Pradesh, i.e., Barwani, Chhatarpur, Khandwa and Sheopur, the objective of the study was to identify measures to make CNGs and HNGs more climate-resilient and assess to what extent these measures were already being pursued by the project. Specific questions to be addressed were:

- Which of the current interventions in the SENU project are already climate-adaptive, i.e., resilience enhancing with respect to climate change impacts?
- Which should be modified/complemented to be (more) climate-adaptive?

This study was part of a multi-country study of the Global Programme "Food and Nutrition Security, Enhanced Resilience" which focused on Burkina Faso, Malawi, Madagascar and India. In India, the study comprised a review of scientific literature and technical (project) documents and seven interviews conducted with implementation and scaling partners.

CLIMATE CHANGE RISKS AND IMPACTS IN THE PROJECT DISTRICTS, MADHYA PRADESH

The impacts of climate change are already apparent in the project intervention area in Madhya Pradesh and are likely to become more severe in the future. Increasing temperatures are expected to lead to higher frequency and intensity of extreme events, including both drought spells and high-intensity rainfall, with potentially severe implications for the productivity of HNGs and CNGs [1].

Current climate observations and projections for Madhya Pradesh suggest a gradual increase in temperatures across all seasons and an increase in rainfall variability, with the frequency and intensity of droughts and heavy rainfall likely to increase[2]. Figure 1 shows that the temperature increase is projected to be relatively uniform across Madhya Pradesh.

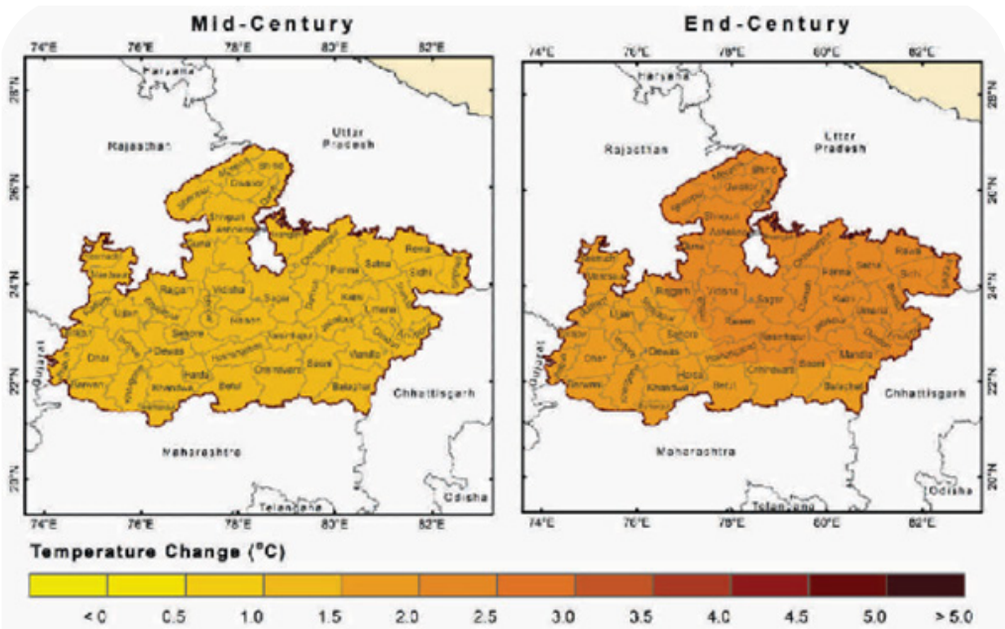

Figure 1: Projected change in annual maximum temperature in Madhya Pradesh state, relative to the baseline (Note: Baseline = 1981-2010, Mid-Century = 2021-2050, End-Century = 2071-2100)

Water vulnerability maps show that vulnerability in the project intervention districts is currently assessed to be 'high' (Sheopur, Chhatarpur and Khandwa) and 'very high' (Barwani). By mid-century, water vulnerability in Sheopur district is projected to increase to a 'very high' level, while the vulnerability levels of the remaining intervention districts remain within their current category[1,2] (Figure 2).

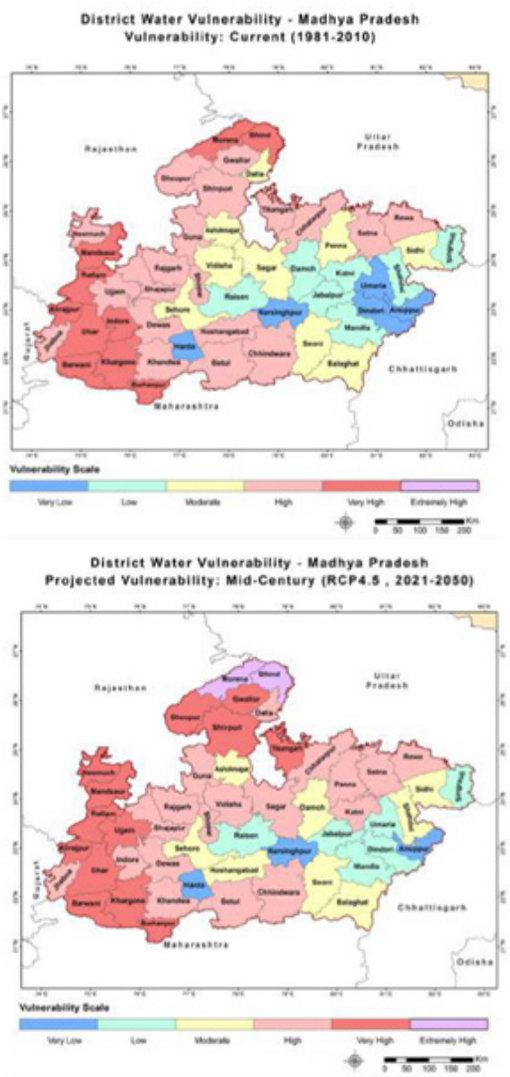

Figure 2: District water vulnerability maps for Madhya Pradesh state, current vs. mid-century

CLIMATE ADAPTIVE MEASURES

The technical design of CNGs is based on the following four principles:

- **Land usage optimisation:** ensure that the available space is utilised most efficiently.
- **Soil fertility optimisation:** ensure that the productive capacity of the land is enhanced and sustained over time.
- **Water usage optimisation:** conserve rainwater and in-situ moisture to irrigate the garden and maintain a conducive moisture regime for plant growth.
- **Crop mix optimisation:** select crops judiciously according to the project objective of ensuring the year-round availability of diverse foods of high nutritive value.

In the following table, the above-stated technical entry points are briefly outlined, and additional resilience enhancing options that could be integrated into the nutrition garden design and management are presented.

	MEASURE	MAIN FUNCTION
SOIL FERTILITY OPTIMISATION	Green Manure	• Increased soil organic matter, leading to increased water infiltration and water holding capacity • Physical protection of the soil against erosion
	Compost/Vermicompost	• Increased soil organic matter • High-quality organic fertilization
	Microbial fertilizers	• Enhanced water and nutrient uptake by plants, leading to greater resilience against heat and drought
WATER USAGE OPTIMISATION	Conservation ponds	• Collection of runoff water on sloping land for irrigation purposes • Possibly integration of aquaculture for dietary diversity (and income)
	Drip irrigation	• Most water-efficient technique of irrigating vegetables and fruit trees
	Retention ditches	• Water harvesting technique benefiting adjacent crops and adding to groundwater recharge
	Roof-top water collection	• Water harvesting technique for irrigation purposes
	Groundwater recharge	• Artificial replenishment of groundwater resources to support plant growth
	Wastewater recycling	• Use of grey water (e.g., from kitchens) for irrigation purposes
CROP MIX OPTIMISATION	Agroforestry	• Productive purposes (fruits and tree-based vegetables) • Moderation of the micro-climate • Soil stabilisation • Protection against wind and stray animals (live fences) • Attraction of beneficial insects
	Tweaking crop mix towards drought tolerance	• Enhanced climate resilience through the selection of drought tolerant and sturdy (underutilised) local vegetable and tree species of high nutritive value
CROP MANAGEMENT OPTIMISATION	Integrated pest management	• Control of pests and diseases (likely to proliferate with climate change) aligned with principles of organic production
	(Adjusted) timing of operations	• Adjustment of field operations to increasingly delayed onset of the monsoon for optimum use of available rainfall • Optimisation of harvesting times for enhanced shelf-life of fresh produce
	Seed treatment	• Enhanced germination and resistance against early-season diseases
	Companion planting	• Promote crop growth under increasingly disadvantageous growing conditions with climate change
POST-HARVEST MANAGEMENT OPTIMISATION	Precooling/cold storage	• Reduce post-harvest losses of highly perishable fruits and vegetables
	Preservation	• Ensure year-round availability of fruits and vegetables through drying, pickling and other preservation techniques
	Extending shelf-life without cooling	• Enhance shelf-life of fresh produce through respective crop selection and, potentially, through innovative technologies, such as ethylene degradation

CNG IMPLEMENTATION CHALLENGES AND OPPORTUNITIES

The implementation of CNGs and HNGs can be aided by several schemes and programmes by the Government of Madhya Pradesh. While the climate adaptive measures outlined above are technically relatively straightforward, their proper implementation poses a number of challenges but also offers opportunities.

- **Sourcing of seeds:** The (non-)availability of seeds of drought and disease tolerant local vegetable varieties of high nutritive value poses the greatest challenge to the nutrition garden concept (both with respect to CNGs and HNGs). The collection, maintenance, and preservation of local species require specific knowledge and skills. In this regard, the community- led approach implemented by Bharatiya Agro- Industries Foundation (BAIF, https://baif.org.in) for the identification and conservation of indigenous crop cultivars may serve as an example. BAIF, headquartered in Pune, Maharashtra, is a development research foundation that works with tribal communities for developing livelihood opportunities and nutritional security in Maharashtra and beyond. This is done through community-level "seed saver" groups. Initiated by BAIF, this work

is supported by the Rajiv Gandhi Science and Technology Commission (RGSTC) and the Tribal Development Department of the Government of Maharashtra[3].

- **Sourcing of organic materials:** Soil organic matter accumulation is a key strategy for making nutrition gardens more climate resilient. This requires the availability of sufficient quantities of organic material, which may be a challenge, especially for CNGs. Internal sourcing will require a clear governance structure of CNGs.

- **Capacity development:** Climate adaptive measures available with respect to soil, water and crop management do not require significant capital investment, but they are knowledge-intensive and require significant capacity development. To ensure sustainability beyond the life of the project, training activities need to be institutionalised with state- or district-level partners to avoid unintended effects and frustration, which may lead to the target group losing interest and discontinuing these valuable practices. Frustration may easily be caused by failing technical devices (such as clogged drip irrigation systems); hence, respective technical training has to encompass questions of regular technical maintenance (e.g., cleaning of filters) and simple trouble shooting. For CNGs, clear internal rules are required to govern the sharing of inputs and outputs.

  Capacity needs to be developed within women SHGs to set up a transparent internal governance structure, and this kind of capacity development needs to be institutionalised with local partners as well.

- While the primary goal of CNGs is to ensure the year-round availability of nutritious fruits and vegetables for SHG members, the **integration of commercial components is strongly recommended**. Several commercial opportunities were identified, such as the sale of seed packages, preserved or processed products, or vermicompost. However, care needs to be taken that the original idea of enhancing the nutritional status of women and infants is not hijacked by efforts to maximise profits.

CONCLUSION AND RECOMMENDATIONS

From the analysis conducted, and based on the existing CNG upscaling strategy, the following conclusions and recommendations are deduced for the SENU project.

- Resilience enhancing measures are related to soil management, water management, crop mix (integration of trees), crop management, and post-harvest management.

- **Agronomic measures** could be applied to enhance climate resilience further, such as

  i) the use of seed treatment and microbial fertilizers,
  ii) companion planting principles,
  iii) the establishment of water retention ditches and
  iv) the crop mix can be further tweaked towards drought tolerance as well as high nutritive value.

- With respect to **post-harvest management**, the economic viability of appropriate-scale electric cooling equipment for CNGs should be explored. Low-cost evaporative cooling options should otherwise be promoted for both CNGs and HNGs.

- The **preservation of fruits and vegetables** should become an integral part of the CNG concept to facilitate the year-round availability of produce. At the same time, this would offer an income enhancing opportunity for CNGs.

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