

# Tropical Home Gardens:

Biodiverse, Climate-resilient and  
Nutrition-sensitive Forms of Agriculture

A Compilation of Abstracts




INITIATIVE ON  
Fruit and Vegetables  
for Sustainable  
Healthy Diets

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INITIATIVE ON  
Climate Resilience



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## About CGIAR, FRESH and ClimBeR

CGIAR is a global research partnership for a food-secure future dedicated to transforming food, land, and water systems in a climate crisis. The CGIAR Research Initiative on Fruit and Vegetables for Sustainable Healthy Diets (FRESH) aims to use an end-to-end approach to increase fruit and vegetable intake and in turn improve diet quality, nutrition and health outcomes while also improving livelihoods, empowering women and youth and mitigating negative environmental impacts. While the CGIAR Initiative on Climate Resilience (ClimBeR) is one of the Research Initiatives in its new research portfolio that will deliver science and innovation to transform food, land, and water systems in a climate crisis. ClimBeR aims to transform the climate adaptation capacity of food, land, and water systems in the Philippines and five other countries, ultimately increasing the resilience of smallholder production systems to withstand severe climate change effects like drought, flooding, and high temperatures.

For more information, please visit <https://www.cgiar.org/>



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# Preface

Scholarly definitions of home gardens and homesteads commonly describe them as traditional operational farm unit located near household dwellings. These spaces typically comprise of fruits, vegetables, and sometimes livestock for household consumption and as a source of income. Homesteads may also be defined as an agroforestry system that maintains the ecological functions of forests while providing socioeconomic needs of households.

These spaces are located around homes in rural areas especially in the tropical south. They typically include a wide range of crops, trees and vegetables (annuals, short and long-term perennials) and small livestock.

These tropical home gardens are a traditional practice in most of Asia and large parts of the African continent. This land use system contributes significantly to household and local food systems. Dietary diversity is achieved in households that grow home gardens. This higher diversity translates into better uptake of micro nutrients. If small animals are included then better protein uptake is also ensured. There are also economic benefits as well. Food acquisition expenses are significantly slashed in households growing their own food (supplements).

Additionally, these gardens often have medicinal plants, recognized for human and animal health care, which are valuable natural resources that need to be conserved. Home gardens also play a role in climate mitigation and adaptation efforts. They can serve as an important adaptation pathway for households. Home gardens in rural areas and along forests can help enhance forest cover and help with carbon sequestration.

Traditional tropical home gardens should be acknowledged by policy makers, planners, and development managers for their economical, ecological, and social benefits. This compilation aims to highlight the significance of these land use systems to encourage their recognition, valuation, and promotion. By presenting this initial set of abstracts from published literature, this document seeks to draw attention towards underappreciated local initiatives and their potential contributions to sustainable development.

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**Danny Hunter**

**Maria Shiela Santos Anunciado**

**Norcelita Reyes Sacdalan**



# Introduction

This compilation contains 67 abstracts of publications on tropical home gardens mostly in Asia.

Desk research was conducted from December 2024- January 2025.

Online databases used for this literature review include but are not limited to:

- <https://www.cgiar.org/research/cgiar-portfolio>
- <https://www.cgiar.org/initiative/climate-resilience>
- <https://scholar.google.com>
- <https://www.frontiersin.org/journals>
- <https://link.springer.com/search>
- <https://journals.sagepub.com>

These databases were searched for keywords relevant to home garden, homesteads in Asia, particularly Bangladesh, Cambodia, Nepal, Indonesia, Vietnam, Philippines, India.

The first set of terms used were “home gardens”, “homesteads”, “home gardening”, “community gardens”, and “urban gardens”. These terms represented home gardening definitions, structures, interventions and its contribution for increased food production at the household level.

The second set of terms searched include multifunctional roles of home gardens. The keywords were “nutrition”, “genetic biodiversity conservation”, “climate change adaptation”, “microclimate regulation”, “food security”, “sustainable forms of food production”, “women empowerment”, “humanitarian food aid”, “cultural significance” and “health and well-being”.

Upon addition of “traditional home gardens” as keywords, several countries were found notable for availability of research studies and unique practices. Refining the search to capture relevant literature in Asia, the following keywords were added to the first set of terms: “Bangladesh”, “Cambodia”, “Nepal”, “Indonesia”, “Vietnam”, “Philippines”, “India”, “Sri Lanka”.

This document presents key findings and recommendations on traditional home gardening practices and programs to serve as guidance in designing interventions. This also offers guidance on crafting policy using home gardens as a strategy to promote nutrition, education, agriculture, and land use planning.

# Abstracts:

## Selection of Publications on Tropical Home Gardens





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**Home gardens can be more important than other urban green infrastructure for mental well-being during COVID-19 pandemics**

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# 1

## Why garden? – Attitudes and the perceived health benefits of home gardening (2021)

Chalmin-Pui, Lauriane & Griffiths, Alistair & Roe, Jenny & Heaton, T. & Cameron, Ross. (2021). Why garden? – Attitudes and the perceived health benefits of home gardening. *Cities*. 112. 103118. 10.1016/j.cities.2021.103118.

Domestic (home) gardens provide opportunities for psychological and physical health benefits, yet these environments have received less attention in terms of their therapeutic value compared to other urban green spaces. This is despite their ubiquity and the popularity of gardening as a pastime. This research explored why residents engaged with gardening and the extent to which they recognised any health benefits from the activity. A questionnaire was distributed electronically within the UK, with 5,766 gardeners and 249 non-gardeners responding. Data were collated on factors including garden typology, frequency of gardening and individual perceptions of health and well-being. Significant associations were found between improvements in well-being, perceived stress and physical activity and more frequent gardening. Gardening on a frequent basis i.e. at least 2–3 times a week, corresponded with greatest perceived health benefits. Improving health, however, was not the prime motivator to garden, but rather the direct pleasure gardening brought to the participants. There was evidence that satisfaction with one's front garden and the time spent in it increased as the proportion of vegetation was enhanced. The data supports the notion that domestic gardens should be given greater prominence in urban planning debates, due to the role they play in providing health benefits.

## 2

### Development of home garden model for year round production and consumption for improving resource-poor household food security in Bangladesh (2016)

Ferdous, Z., Datta, A., Anal, A. K., Anwar, M., & Khan, A. S. M. M. R. (2016). Development of home garden model for year round production and consumption for improving resource-poor household food security in Bangladesh. *NJAS: Wageningen Journal of Life Sciences*, 78(1), 103–110. <https://doi.org/10.1016/j.njas.2016.05.006>

The government of Bangladesh has long been striving to increase food security and to reduce poverty and malnutrition. In this regard, home gardens can play an important role in providing enhanced food supply and increased diversity of food to some extent. Studies on niche/ecosystem based homestead gardening were carried out at Lahirirhat Farming Systems Research and Development site, Rangpur under the On-Farm Research Division of Bangladesh Agricultural Research Institute during 2008–2009, resulting in the development of a year round production model, known as the Rangpur (Syedpur) model, for Tista Meander Floodplain agro-ecological region of Bangladesh. The objective of the study was to utilize the homestead resources in scientific ways for producing fresh vegetables and fruits over space and time and to enhance the nutritional supplies for the family throughout the year. A total of 12 households were selected from landless (no cultivable land), marginal (0.2–0.6 ha) and small (0.61–1.0 ha) farmer groups and seven production niches were intervened for round the year production following the Rangpur model. The niches were open sunny place, roof top, trellis, fence, boundary, marshy land and partially shady place. After the intervention, the highest amount of vegetables was produced by the small farmer groups (511 kg/year) followed by marginal (499 kg/year) and landless (422 kg/year) farmers. The yearly vegetable requirements of farmers were largely met by the homestead garden with a supply between 55 and 79 kg/head/year compared with the bench mark level of 21–30 kg/head/year before the intervention. The highest total income (BDT 5030/year) and net income (BDT 4290/year) were obtained from homestead at small farmers followed by marginal and landless farmers. From this study it is evident that the target farmers were able to fulfill their daily requirement of vegetables in most parts of the year by following the Rangpur model. This suggests an increase in food security and a reduction in malnutrition of farm families in the target households of Rangpur region in Bangladesh. The upscaling of the production model based on niche/ecosystem in different poverty stricken regions of Bangladesh is recommended to achieve food security and malnutrition reduction.



### 3

## Home gardens for improved food security and livelihoods (2020)

Galhena Dissanayake, D.H., & Maredia, K.M. (Eds.). (2020). *Home Gardens for Improved Food Security and Livelihoods* (1st ed.). Routledge. <https://doi.org/10.4324/9781315471778>

Home Gardens for Improved Food Security and Livelihoods demonstrates how home gardens hold particular significance for resource-poor and marginalized communities in developing countries, and how they offer a versatile strategy toward building local and more resilient food systems.

With food and nutritional security being a major global challenge, there is an urgent need to find innovative ways to increase food production and diversify food sources while increasing income-generating opportunities for communities faced with hunger and poverty. This book shows that when implemented properly, home gardens can become just such an innovative solution, as well as an integral part of sustainable food security programs. It provides a conceptual overview of social, economic, environmental and nutritional issues related to home gardening in diverse contexts, including gender issues and biodiversity conservation, and presents case studies from Africa, Asia and Latin America highlighting home gardening experiences and initiatives. The volume concludes with a synthesis of key lessons learned and ways forward for further enhancing home gardens for sustainable food security and development.

This book will be a useful read for students and scholars working on local food systems, food security, sustainable development and more broadly development strategy.

## Diversity and distribution of traditional home gardens along different disturbances in a dry tropical region, India (2021)

Patel SK, Sharma A, Singh R, Tiwari AK and Singh GS (2022) Diversity and Distribution of Traditional Home Gardens Along Different Disturbances in a Dry Tropical Region, India. *Front. For. Glob. Change* 5:822320. doi: 10.3389/ffgc.2022.822320

Home gardening is an indigenous practice of cultivation that has effectively adapted to local ecological conditions over generations. This study examined the effects of disturbance and garden size on biodiversity to develop a better understanding of vegetation cover and its role in livelihood and provision of forest management in the Vindhyan highlands. Data were collected from 60 gardens which were classified into large ( $> 650 \text{ m}^2$ ), medium ( $400\text{--}650 \text{ m}^2$ ), and small ( $< 400 \text{ m}^2$ ), based on size and disturbance gradients viz., high, medium, and low. A total of 133 species from 50 families were recorded, in which trees (47.4%) were dominant followed by shrubs (18%) and herbs (16.5%). With respect to disturbance, the highest number of tree species (39) were found at low disturbance (LD) followed by 33 species in medium disturbance (MD) and 32 species in high disturbance (HD). The total mean richness of species was greater at LD ( $20.3 \pm 2.3$ ) and lowest at HD ( $18.5 \pm 2.2$ ). Tree density was significantly ( $P \leq 0.05$ ) higher at LD ( $293.75 \pm 16.1$  individual  $\text{ha}^{-1}$ ) as compared to MD ( $221 \pm 11.5$  individual  $\text{ha}^{-1}$ ) and HD ( $210 \pm 10.3$  individual  $\text{ha}^{-1}$ ). However, the results for shrubs and herbs density were considerably different, where shrubs density was highest at HD ( $70 \pm 6.9$  individual per  $1,000 \text{ m}^2$ ) and lowest at LD ( $62.5 \pm 5.8$  individual per  $1,000 \text{ m}^2$ ), while the maximum density of herbs was recorded at MD ( $466.25 \pm 29.8$  individual per  $100 \text{ m}^2$ ) and minimum at LD ( $370 \pm 21.4$  individual per  $100 \text{ m}^2$ ). The summed dominance ratio indicated frequent use of garden plants in bio-fencing, vegetables, ornamental, and ethnomedicine. Diversity ( $P < 0.01$ ) and species richness ( $P < 0.05$ ) showed a significant positive correlation with garden size. The Principal Component Analysis (PCA) showed that the first component (PC1) accounted for 28.6% of variance, whereas the second explained 21.9% of variance in both disturbance and garden size with a cumulative variance of 50.5%. These components depicted the positive association with HD (14.34), SDiv (13.91), TCD (12.47), and HDiv (12.09). We concluded that the diversity of home gardens changed with disturbance, which crucially served as a refuge for native tree species in a degraded landscape. This pattern highlighted the importance of home gardens for plant biodiversity conservation and local livelihood, which must be a viable option for regeneration of deforested dry tropics, while also reducing the burden on dry tropical forest regions.



## 5

# Building sustainable, resilient, and nutritionally enhanced local food systems through home gardens in developing countries (2023)

Maredia, K. M., Dissanayake, D. H. G., Freed, R., Madan, S., Mikunthan, G., Attorp, A., Patidar, N., Blanco-Metzler, H., Meka, R.R. and Gonsalves, J.F. (2023). Building sustainable, resilient, and nutritionally enhanced local food systems through home gardens in developing countries. *Development in Practice*, 33(7), 852–859. <https://doi.org/10.1080/09614524.2023.2218068>

Home gardens have been a part of local and global food systems since humans first began domesticating crops and have endured the test of time. They are commonly referred to as kitchen gardens, backyard gardens, garden patches, and garden beds and often have a local or cultural context. Home gardens vary from location to location in terms of organization, structure, size, and composition and are generally influenced by household resources and attributes, socioeconomic aspects, and cultural factors. International organizations and national, regional, and local governments, non-governmental organizations, and grassroots groups have been adopting and utilizing home gardening to reduce hunger and food insecurity and mitigate food risks from various crises and disasters. Drawing on case studies from various regions of the world, this article highlights experiences with home gardening through case studies and their impacts on targeted communities in various areas of the world. The case studies show that low resource use, adaptability to diverse conditions and situations, and resilience are key factors contributing to the widespread adoption of home gardens. Furthermore, they have been a particularly useful development strategy in crisis and post-crisis situations and in improving marginalized and vulnerable communities' food and nutritional security. This review article summarizes the important contributions of home gardening projects from various countries and identifies major constraints and opportunities. It concludes with recommendations to policy-makers, researchers, development practitioners and other relevant stakeholders to address those challenges.

## Long-term impacts of home gardening on dietary diversity and household food security in low-income countries: a systematic review (2024)

Okoye Chinelo U, Jonathan KO, Oluwatoyin EO, Bamidele JA, Caleb KO. Long-Term Impacts of Home Gardening on Dietary Diversity and Household Food Security in Low-Income Countries: A Systematic Review. *SciBase Human Nutrition Food Sci.* 2024; 1(2): 1006.

**Background:** Food security is a critical global issue, worsened by climate change, economic instability, and unequal resource distribution, particularly in low- and middle-income countries (LMICs). Dietary diversity is a key indicator of food security, directly affecting nutritional quality and health. Home gardening has been identified as a potential strategy to improve dietary diversity and food security by providing nutrient-rich foods and reducing reliance on external food sources. This systematic review aims to assess the long-term impacts of home gardening on dietary diversity and food security, particularly in LMICs.

**Methodology:** The review utilized a systematic search strategy across PubMed, Google Scholar, and Web of Science, using keywords related to home gardening, dietary diversity, and food security. Inclusion criteria focused on studies examining the long-term impacts of home gardening in LMICs, with outcomes measured over at least one year. Data extraction involved collecting details on study design, population characteristics, location, intervention specifics, and outcomes. The synthesis was conducted narratively, identifying patterns and trends, and included a critical appraisal of the evidence.

**Discussion:** The review found that home gardening significantly improves dietary diversity and food security in LMICs. Studies indicated that home gardening promotes the consumption of nutrient-rich foods, reduces dependency on fluctuating food markets, and enhances resilience to economic and environmental shocks. Key factors influencing the sustainability of these benefits include socioeconomic status, climate conditions, and education. However, the review also identified gaps in long-term research and methodological limitations, such as the lack of diverse study populations and consideration of external contextual factors. **Conclusion:** Home gardening is a viable strategy for improving dietary diversity and food security in LMICs. However, the long-term sustainability of these benefits depends on supportive policies, education, and resources. Future research should address the identified methodological limitations to better estimate the long-term effects of home gardening.

## What is good about Sri Lankan homegardens with regards to food security? A synthesis of the current scientific knowledge of a multifunctional land-use system (2018)

Mattsson, Eskil; Ostwald, Madelene; and Nissanka, S.. (2018). What is good about Sri Lankan homegardens with regards to food security? A synthesis of the current scientific knowledge of a multifunctional land-use system. *Agroforestry Systems*. 92. 10.1007/s10457-017-0093-6.

Recently, there has been growing interest in agroforestry systems due to their great potential to mitigate threats to household food and nutrition security from soaring food prices but also as carbon sinks. In Sri Lanka, smallholder farms such as homegardens constitute a majority of Sri Lanka's total annual crop and timber production. Despite Sri Lankan homegardens being considered desirable and sustainable land-use systems, their role in food and nutrition security is not yet entirely understood. By synthesising scientific articles and grey literature we sought the link between food security and homegardens by quantifying their products or services and ascertaining whether food security characteristics are assessed as direct or indirect impacts. The results show that 27 % of 92 identified articles directly quantified aspects that are relevant to food security. Another 51 % of the articles quantified indirect aspects that have relevance for food security, including climate, soil, ecosystem services, structural and floristic diversity and economic aspects. Twenty-two percent of the articles were categorised as being qualitative or conceptual and contained no direct assessments or quantification of food security. The presence of significant merits from homegardens includes providing food security throughout the year at low-cost while sustaining numerous ecosystem services. This benefits particularly the poor farmers. However, many studies are descriptive and only provide location-specific information on single research focuses such as plant species, yield and management. There are few comparisons with crop land, forests or other production systems, and there is even less empirical evidence and quantification of the food security and other benefits. Seven areas where more scientific focus would be beneficial are identified. Homegardens are strong in national policies and to reach a greater level of efficiency within these activities our findings suggest more emphasis on a higher degree of inclusiveness of relevant stakeholders and long-term engagements with context specific guidance.

## 8

## Home and community gardens in Southeast Asia: potential and opportunities for contributing to nutrition-sensitive food systems (2013)

Weinberger, K. Home and community gardens in Southeast Asia: potential and opportunities for contributing to nutrition-sensitive food systems. *Food Sec.* 5, 847–856 (2013).  
<https://doi.org/10.1007/s12571-013-0299-z>

Southeast Asia is home to both severe over- and under-nutrition. Continued pressures on environmental sustainability and rapid urbanization are also of growing concern in the region. This paper focuses on home and community gardens and is based on examples from various parts of the world. The paper addresses how their risks and benefits may be assessed within a framework of nutrition-sensitive food systems and in the context of sustainable development. Entry points for policy makers in the Southeast Asian region, who wish to support home and community gardens, are identified and the paper concludes with a set of recommendations.

## 9

## Home gardens: a promising approach to enhance household food security and wellbeing (2013)

Galhena, D.H., Freed, R. & Maredia, K.M. Home gardens: a promising approach to enhance household food security and wellbeing. *Agric & Food Secur* 2, 8 (2013).  
<https://doi.org/10.1186/2048-7010-2-8>

With the global population expected to reach over 9 billion by 2050, there is a continuous need to increase food production and buffer stocks. In this scenario, countries around the world, especially developing countries where the pervasiveness of hunger and food scarcity is more acute, are resorting to various counter strategies to meet the growing demand and to avert food insecurity and famine. Over the recent years there has been growing interest to strengthen and intensify local food production in order to mitigate the adverse effect of global food shocks and food price volatilities. Consequently, there is much attention towards home gardens as a strategy to enhance household food security and nutrition. Home gardens are an integral part of local food systems and the agricultural landscape of developing countries all over the world and have endured the test of time.

Through a rigorous literature review, this paper first examines definitions and characteristics of home gardens and then provides a global review of their social, economic, and environmental contributions to communities in various socio-economic contexts. Many of the compositions on home gardens share research and experiences of developing countries in Africa, Asia, and Latin America. These studies recognize positive impacts of home gardens towards addressing food insecurity and malnutrition as well as providing additional benefits such as income and livelihood opportunities for resource-poor families and delivering a number of ecosystem services. However, only a handful of case studies were found on post-crisis settings. While providing a general overview of some of these studies, this review investigates the home garden experiences of post-conflict Sri Lanka, where home gardening has been practiced for centuries. While emphasizing multiple benefits, we also highlight constraints to home garden food production. In conclusion, we emphasize the need for more research and empirical data to appraise the role of home gardens in crisis and post-crisis situations, as well as assessing their economic value and their impacts on food security, nutrition, economic growth, and gender issues.

## A review of research on homegardens in Sri Lanka: the status, importance and future perspective (2012)

Pushpakumara, D., Marambe, B., Silva, G., Weerahewa, J., & Punyawardena, B.V. (2012). A review of research on homegardens in Sri Lanka: the status, importance and future perspective. *Tropical Agriculturist*, 160, 55-125.

Homegardens in Sri Lanka are dynamic sustainable food production systems, and presumably the oldest land use activity, next to shifting cultivation. It is still one of the major forms of land use in the island that has continued to evolve through generations within the Sri Lankan landscape to suit the socio-economic, cultural and ecological needs. In most cases, transferred from one generation to the next, the gardens are maintained as a family property. This land use system has existed in Sri Lanka for centuries, and in 1995 accounted for 13.1% of the total land area of the country. However, it started receiving the national recognition only recently. This review summarizes the current status of knowledge on homegardens, their importance to the society and environment, and potential for improving them. In this endeavor, about 90 published documentary evidences were reviewed. As revealed the homegarden research in Sri Lanka dates back to 1973 and during the past four decades, the research focus was mainly on providing system description on localized homegarden systems. It was further attempted in this review to highlight the significance of the homegarden land use system and its dominant contribution in maintaining agricultural and environmental sustainability of the country. In this context, the importance of classification of homegardens, present status of homegarden agroforestry in terms of area under homegardens and their distribution, contributions of homegardens to timber and fuelwood production, food and nutritional security of householders, biodiversity conservation, and in managing landscape sustainably through environmental services, are discussed in detail. Further, the critical gaps in available information and way forward in homegarden research are identified.

## A process evaluation of a home garden (2024)

Ritter, T., Mockshell, J., Garrett, J. et al. (2024). A process evaluation of a home garden intervention. *Agriculture & Food Security* 13, 44. <https://doi.org/10.1186/s40066-024-00499-9>

### Introduction

Most reviews of nutrition-sensitive programs assess the evidence base for nutrition outcomes without considering how programs were delivered. Process evaluations can fill this void by exploring how or why impacts were or were not achieved. This mid-term process evaluation examines a home garden intervention implemented in a large-scale, livelihoods improvement program in Odisha, India. The objectives are to understand whether the intervention was operating as planned (fidelity), investigate potential pathways to achieve greater impact, and provide insights to help design future home garden programs.

### Methodology

Data collection and analysis for this theory-driven process evaluation are based on a program impact pathway that shows the flow of inputs, processes, outputs, outcomes, and impacts. Quantitative and qualitative data from focus group discussions, semi-structured interviews, and a Process Net-Mapping exercise with beneficiaries, frontline workers, and program management staff.

### Results

Despite a mismatch between the design and implementation (low fidelity), the process evaluation identified positive outputs, outcomes, and impacts on home garden production, consumption, income, health and nutritional outcomes, and women's empowerment. Flexibility led to greater positive outcomes on nutrition, the adoption of sustainable agricultural practices and easy-to-understand nutrition models, and the likelihood of the intervention being sustained after the program ends.

**Homestead food production model contributes to improved household food security and nutrition status of young children and women in poor populations: lessons learned from scaling-up programs in Asia (Bangladesh, Cambodia, Nepal and Philippines) (2000)**

Talukder, Aminuzamman & Haselow, Nancy & Osei, Akoto & Villate, E. & Quinn, Victoria & Dhunge, S. & Uddin, A. & Reario, D. & SokHoing, L. & Kroeun, H.. (2000). Homestead food production model contributes to improved household food security and nutrition status of young children and women in poor populations. Field Actions Science Reports.

Micronutrient malnutrition is a serious public health problem among women and children in Bangladesh, Cambodia, Nepal and the Philippines. Helen Keller International has been implementing homestead food production (HFP) programs (coupled with nutrition education) in these countries to increase and ensure year-round availability and intake of micronutrient-rich foods in poor households, particularly among women and children. Between 2003 and 2007, the HFP program was implemented among ~30,000 households in these four countries. Data collected from representative samples taken for evaluations of HFP programs in these countries illustrated the benefit of the program for households. Data were collected through interviews with households in villages that had the HFP program and from control households in non-HFP program villages. Blood samples collected from ~1000 children aged 6-59 months and ~1200 non-pregnant women before and after program implementation were analyzed for hemoglobin. The review showed that the HFP program significantly improved dietary diversification. The combined data from all four countries showed improved animal food consumption among program households, with liver consumption increasing from 24% at baseline to 46% at endline and the median number of eggs consumed by families per week increasing from 2 to 5. The sale of HFP products also improved household income. Anemia prevalence among children in program households decreased in all the countries; however, the decrease was only significant in Bangladesh and the Philippines. Although anemia prevalence also decreased among control households in three countries, the magnitude of change was higher in program households compared with control households.

## Improving food and nutrition security through homestead gardening in rural, urban and peri-urban areas in Bangladesh (2001)

Talukder, Aminuzamman & Pee, Saskia & Taher, Abu & Hall, Andrew & Moench-Pfanner, Regina & Bloem, Martin. (2001). Improving food and nutrition security through homestead gardening in rural, urban and periurban areas in Bangladesh.

Home gardening has been shown to be an important way to improve the intake of vitamin A-rich foods, particularly for poor households and in countries where plant foods are the main source of vitamin A. The pilot program was initiated to identify ways to improve the existing homestead gardening practices. Following the development of a community-based model, the program was scaled up by forming partnerships with local non government organizations. By implementing the program through NGOs, households continued to receive technical support for homestead gardening and the program could continue to expand without input and resources from HKI. From 1993 to the present the program has been expanded and to date has worked with more than 50 NGO and GO partners and reaches more than 800,000 households. Regular monitoring has demonstrated that the program successfully increases the production and consumption of vitamin A rich foods in the target households in both rural and urban areas. Recent findings from the national vitamin A survey have reconfirmed that children residing in households without a homestead garden are at greater risk of being night blind than are children residing in households without a homestead garden (Kiess et al). Working in collaboration with partner NGOs and the GO, the cost of this gardening approach was significantly decreased from the cost of the pilot project from US\$39 per garden to less than US\$ 8 per garden.

## Impacts of a home garden intervention in Bangladesh after one, three and six years (2022)

Baliki, G., Schreinemachers, P., Brück, T. et al. Impacts of a home garden intervention in Bangladesh after one, three and six years. *Agric & Food Secur* 11, 48 (2022).  
<https://doi.org/10.1186/s40066-022-00388-z>

**Background:** Training women in home gardening and nutrition has been shown to increase household production and consumption of nutritious food and contribute to women's empowerment, but evidence is limited to short-term effects. Here, we investigate whether home garden support leads to long-term improvements in household nutrition and women's empowerment. To do this we use four waves of household-level survey data collected over a 7-year period (2013–2019) from an intervention (n = 395) and a control (n = 224) group in four rural districts of Bangladesh. We estimate the intent-to-treat effect using a difference-in-difference estimator.

**Results:** We find an immediate increase in the quantity of vegetables harvested from home gardens (+ 29.6 kg/year; p = 0.01) and this effect is sustained in years three (+ 42.3 kg; p < 0.01) and six (+ 37.0 kg; p < 0.01). The nutrient yield from the gardens also remained positive and significant, but the effect declined due to changes in the composition of vegetables. The effect on per capita vegetable intake, significant in years one and three, turned not significant in year six. Effects on nutrition knowledge, food preparation practices, and women's empowerment all remained significant in year six.

**Conclusions:** Home garden interventions in Bangladesh create sustained impact on a range of social, economic and nutritional outcomes. Refresher training after 5 or 6 years may help to maintain the full range of impacts observed.

## Impact of home garden interventions in East Africa: results of three randomized controlled trials (2021)

Lutz Deppenbusch, Pepijn Schreinemachers, Ralph Roothaert, Sylvia Namazzi, Charles Onyango, Sophia Bongole, James Mutebi (2021). Impact of home garden interventions in East Africa: Results of three randomized controlled trials, *Food Policy*, Volume 104, 2021, 102140, ISSN 0306-9192, doi.org/10.1016/j.foodpol.2021.102140.

Sub-Saharan Africa has the lowest per capita consumption of vegetables of all regions in the world. As low vegetable consumption is associated with poor human health, there is need for effective policies and interventions to increase it. Home garden interventions have proven effective in several countries in Asia, but evidence from large trials is scant in Africa. Using data from a home garden promotion project in Kenya, Tanzania and Uganda, this study tests the hypothesis that home garden interventions, offered to rural households with women 14–35 years of age and/or with children under five years of age, increase household production and consumption of vegetables. Three randomized controlled trials collected pre- and post-intervention data (2 years apart) for 1,255 intervention and control households. We report intent-to-treat effects and the treatment effect on the treated and analyze distributional effects using quantile regression. For Tanzania, the results show a 20% increase in households producing vegetables and an additional two months of vegetable harvesting, but no such significant effects were found for Kenya and Uganda. We find no significant effects on diets. Lack of impact may be explained from the fact that many participating households were already producing vegetables (reducing the scope for impact) and a low participation rate of selected households in training events. These results stand in contrast to the positive impacts of home garden interventions in Asia. The results suggest a need to better understand barriers to home garden interventions in the three countries and a need for more careful design, local adaptation and targeting.

## Impact and distributional effects of a home garden and nutrition intervention in Cambodia (2022)

Deppenbusch, L., Schreinemachers, P., Brown, S. et al. Impact and distributional effects of a home garden and nutrition intervention in Cambodia. *Food Sec.* 14, 865–881 (2022).  
<https://doi.org/10.1007/s12571-021-01235-y>

Home garden interventions combining training in agriculture and nutrition have the potential to increase vegetable production and consumption in lower-income countries, but there remains a need for better evidence for impact. This study contributes to filling this gap by evaluating the impact and distributional effects of a home garden intervention in Cambodia. We used a cluster randomized controlled trial with before and after data for a sample of 500 rural households with children under five and women 16–49 years old. Impact was estimated using analysis of covariance (ANCOVA) and conditional quantile regressions with non-parametric bounds. The results show that the intervention significantly increased the adoption of nearly all promoted gardening methods. More households (+ 35%;  $p < 0.01$ ) produced vegetables, and the production period was extended by five months on average. One-month recall data show an increase in vegetables harvested (+ 25 kg;  $p < 0.01$ ) and consumed (+ 10 kg;  $p < 0.01$ ) from the garden. Quantile regressions confirm these findings and show that nearly all households benefitted, but households that were already doing better at baseline tended to benefit more. Seven-day recall data show an increase in the quantity of vegetables consumed (+ 61 g/day/capita;  $p < 0.01$ ) and an increased quantity of vitamin A, folate, iron, and zinc contained in these vegetables. Women contributed more to the garden work than men and their time spent in the garden increased by 29 min/day on average. These results add further evidence that integrated home garden interventions can contribute to nutrition outcomes and that almost all participants can benefit.

## A review of the effectiveness of agriculture interventions in improving nutrition outcomes (2004)

Berti PR, Krasevec J, FitzGerald S. A review of the effectiveness of agriculture interventions in improving nutrition outcomes. *Public Health Nutr.* 2004 Aug;7(5):599-609. doi: 10.1079/PHN2003595. PMID: 15251050.

**Objectives:** To review the impact of agriculture interventions on nutritional status in participating households, and to analyse the characteristics of interventions that improved nutrition outcomes.

**Design:** We identified and reviewed reports describing 30 agriculture interventions that measured impact on nutritional status. The interventions reviewed included home gardening, livestock, mixed garden and livestock, cash cropping, and irrigation. We examined the reports for the scientific quality of the research design and treatment of the data. We also assessed whether the projects invested in five types of 'capital' (physical, natural, financial, human and social) as defined in the Sustainable Livelihoods Framework, a conceptual map of major factors that affect people's livelihoods.

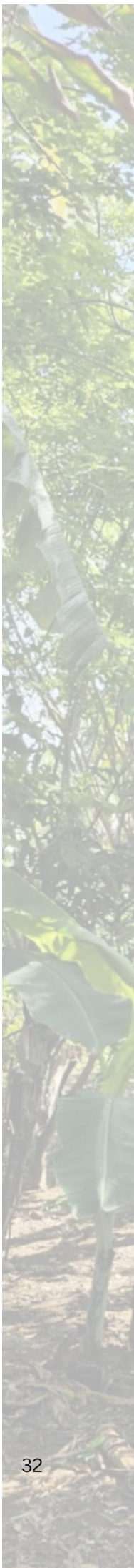
**Results:** Most agriculture interventions increased food production, but did not necessarily improve nutrition or health within participating households. Nutrition was improved in 11 of 13 home gardening interventions, and in 11 of 17 other types of intervention. Of the 19 interventions that had a positive effect on nutrition, 14 of them invested in four or five types of capital in addition to the agriculture intervention. Of the nine interventions that had a negative or no effect on nutrition, only one invested in four or five types of capital.

**Conclusions:** Those agriculture interventions that invested broadly in different types of capital were more likely to improve nutrition outcomes. Those projects which invested in human capital (especially nutrition education and consideration of gender issues), and other types of capital, had a greater likelihood of effecting positive nutritional change, but such investment is neither sufficient nor always necessary to effect change.

## Why home gardens fail in enhancing food security and dietary diversity (2022)

Du Toit MJ, Rendón O, Cologna V, Cilliers SS and Dallimer M (2022). Why Home Gardens Fail in Enhancing Food Security and Dietary Diversity. *Front. Ecol. Evol.* 10:804523. doi: 10.3389/fevo.2022.804523

Visions of sustainable cities mostly conjure up well tended home and community gardens, where owners and residents plant fruits and vegetables that supply some of their livelihood needs. Indeed, home gardens can contribute to household food security but often fail to do so. Moreover, gardens can provide several additional ecosystem services and impact entire communities. This paper seeks to answer why these gardens often do not provide adequate services to make a substantial contribution to food security and identifies possible solutions. We undertook a case study in South Africa in a low-income former township area. The area is characterized by poverty, high levels of unemployment and food insecurity. We interviewed 140 respondents with home gardens to determine what role their own garden plays in household food security. Only 10% of households were found to be completely food secure. Of the rest, 39% experienced hunger that affected everyone in the household and 51% were at risk of hunger. Despite the fact that 72% of the respondents planted vegetables or fruits, the gardens did not contribute substantially to food security. The respondents mostly bought their food, with subsequent food shortages when they did not have enough money. The dietary diversity and consumption of vitamin A-rich fruits and vegetables were very low. The most important constraints inhibiting urban agriculture in the study area were cultural practices, such as the presence of large, bare, open spaces, or “lebala,” the focus of home gardeners on ornamental species and lawns; and a reliance on purchasing of foods.



## Factors influencing the sustainability of homestead vegetable production intervention in Rufiji, Tanzania: A cross-sectional mixed methods study (2022)

Mlalama KN, Matemu A, Kosia E, Canavan CR, Bellows AL, Blakstad M, et al. (2022) Factors influencing the sustainability of homestead vegetable production intervention in Rufiji, Tanzania: A cross-sectional mixed methods study. *PLOS Glob Public Health* 2(9): e0000531. <https://doi.org/10.1371/journal.pgph.0000531>

There is growing evidence that home vegetable gardening interventions improve food security and nutrition outcomes at the family level. Sustainability of many of these community interventions remain a challenge. This study assessed factors influencing the sustainability of homestead vegetable production intervention in Rufiji district, Tanzania, one year after the cessation of external support. This was a community based cross-sectional study using both quantitative and qualitative data collection methods. A total of 247 randomly selected women from households who participated in the homestead vegetable intervention were interviewed using a structured questionnaire. The study held four focus group discussions with women from households that participated in the intervention, and four In-Depth interviews with two extension workers, one community health worker, and one agriculture district officer. Multiple logistic regression for quantitative data and thematic analysis for qualitative data was conducted. About 20.24% (50/247) of households sustained homestead vegetable production for one year after the intervention phased out. Shortage of seeds (adjusted odds ratio = 0.65: CI = 0.46–0.93, p-value 0.018) and either manure or fertilizers (adjusted odds ratio = 1.62: CI = 1.04–2.46, p-value 0.031) were significant factors influencing the sustainability of homesteads vegetable production. In the Focus Group discussions (FGDs) and In-Depth Interview (IDIs), all participating women and extension workers reported high cost of water, destruction from free-grazing animals, agriculture pests and diseases, poor soil fertility, shortage of seeds, and lack of capital affected homestead vegetable production sustainability. Existing individual, community, and system challenges influence the sustainability of external-funded agriculture and nutrition interventions. The study findings underscore the importance of community authorities, scientists, and policymakers in having a well-thought sustainability plan in all promising external-funded interventions.

## Building on traditional gardening to improve household food security (1998)

Marsh, R.R. (1998). Building on traditional gardening to improve household food security. *Food, nutrition and agriculture*, 4-14.

Family food production systems are found in most regions of most countries worldwide. Traditional tropical gardens have a great diversity of crops, are well adapted to local microclimates and require a minimum of purchased inputs. Field crops provide the bulk of energy needed by the household, while the garden supplements the diet with vitamin-rich vegetables and fruits, energy-rich vegetable staples, animal sources of protein and herbs and condiments. The many potential benefits of home gardening have led to numerous gardening projects sponsored by non-governmental organizations, governments and United Nations agencies. Nevertheless, promotion of gardening as a nutrition or community development strategy is controversial. Many believe that disappointing results of gardening projects stem from a failure to understand the existing garden system in the context of changing household objectives. If improved gardens could build upon the characteristics and objectives of traditional gardens, many problems could be avoided. Home gardening contributes to household food security and nutrition by providing direct access to diverse foods that can be harvested, prepared and fed to family members, often on a daily basis. Even very poor and landless people can practice gardening since it may be done with virtually no economic resources. Homestead production is also an important source of supplementary income for poor rural and urban households around the world. The garden may become the principal source of household food and income during periods of stress. Experiences of gardening projects around the world illustrate the importance of building on indigenous knowledge; reducing biophysical, agronomic and economic constraints; integrating nutrition education and social marketing in gardening projects; promoting the economic benefits of gardening; understanding the roles of women and children; and working towards an integrated food security strategy.

## Homegardens of Andaman and Nicobar, India (2007)

Pandey, C. B., Rai, R. B., Singh, L., & Singh, A. K. (2007). Homegardens of Andaman and Nicobar, India. *Agricultural Systems*, 92(1–3), 1–22. <https://doi.org/10.1016/j.agsy.2006.01.009>

The study reports the influence of biophysical and socio-cultural factors on composition, diversity and distribution of plant species in the homegardens of the Andaman and Nicobar archipelago of India. The study also examines component interactions and productivity of the system. Four hundred and thirty homegardens were surveyed from six islands, four from Andaman (South Andaman, North Andaman, Middle Andaman and Little Andaman) and two from Nicobar district (Car Nicobar and Nancowry). In Nicobar, an aboriginal tribe, the Nicobari, predominates. The Nicobaries are Christians. However, people from different parts of the Indian subcontinent were rehabilitated in the Andamans in the mid twentieth century. A mixed culture prevails in South Andaman, but in the other Andaman islands either Bengali or Tamil culture predominates. Biophysically, South Andaman is hilly whereas Nicobar is flat. The other islands lie in between the two extremes. All are similar climatically. Twelve to thirty-four plant species were encountered in the homegardens that were planted, cared for and harvested. These plants categorized as palm, fruit, spice and forest trees, formed a three-storey structure in Andaman and a two-storey structure in Nicobar's homegardens. The floristic similarity between the homegardens of the Andamans was 82–92%. However, it was only 12–18% between the homegardens of Andaman and Nicobar. Compared to Nicobar, species richness was greater in the homegardens of the Andamans. However, diversity was higher and evenness lower in the homegardens of Nicobar. All plant species in the homegardens of Nicobar are spontaneous in regeneration. For the Andamans, the proportion of spice trees was higher in the homegardens of South Andaman, mango and citrus in North Andaman, and pineapple and vegetables in Little Andaman. High plant diversity in these homegardens serves subsistence needs and provides income to most of the households as well. Net income in the homegardens of Andaman was 6.9 times higher compared to that in the homegardens of Nicobar.

## Dynamics of homegarden structure and function in Kerala, India (2006)

Peyre, AA & Guidal, A. & Wiersum, K. & Bongers, Frans. (2006). Dynamics of Homegarden Structure and Function in Kerala, India. *Agroforestry Systems*. 66. 101-115. 10.1007/s10457-005-2919-x.

Homegardens in Kerala have long been important multi-purpose agroforestry systems that combine ecological and socioeconomical sustainability. However, traditional homegardens are subject to different conversion processes linked to socioeconomic changes. These dynamics were studied in a survey of 30 homegardens. On the basis of a cluster analysis of tree/shrub species density and subsequent further grouping using homegarden size as additional characteristic, six homegarden types were differentiated. These were assessed regarding structural, functional, management and dynamics characteristics. Four development stages of homegardens were found along a gradient from traditional to modern homegardens. Fifty percent of the homegardens still displayed traditional features, whereas 33% incorporated modern practices. The process of modernisation includes a decrease of the tree/shrub diversity, a gradual concentration on a limited number of cash-crop species, an increase of ornamental plants, a gradual homogenization of homegarden structure and an increased use of external inputs. One homegarden was characterised as an adapted traditional homegarden combining multispecies composition and intensive management practices using internal inputs with commercial production. In comparison to modern homegardens, this homegarden type offers an example of an alternative development path in adapting homegardens to changing socioeconomic conditions. The study of structural and functional dynamics of homegardens offers the opportunity to understand the trends in socio-economic sustainability and how these relate to ecological sustainability.

## Harvesting resilience: Tribal home-gardens as socio-ecological solutions for climate change adaptation and sustainable development in a protected area (2024)

Mallick, Manisha, Pramod K Singh, Rajiv Pandey. 2024. Harvesting resilience: Tribal home-gardens as socio-ecological solutions for climate change adaptation and sustainable development in a protected area  
<https://doi.org/10.1016/j.jclepro.2024.141174>

This study delves into the socio-ecological system (SES) of tribal home-gardens within India's Similipal Biosphere Reserve (SBR), unveiling their vital role in fostering biodiversity, resilience, and sustainability. Grounded in an SES framework, our research elucidates the deep interconnectivity between tribal communities and their home-gardens, woven into the tapestry of broader environmental and social dynamics. These gardens, rich in crops, forest species, and livestock, serve as dynamic reservoirs of indigenous and local knowledge (ILK), crucial for bolstering local economies and enhancing climate resilience. We analysed 36 focus group discussions across 36 villages and identified 15 indigenous nature-based practices that significantly contribute to 9 Sustainable Development Goals (SDGs) and 22 Sustainable Development Targets (SDTs). Indigenous home-gardening practices underpin climate change adaptation strategies and highlight the importance of integrating biodiversity and socio-economic objectives. Our findings underscore the criticality of diversification in enhancing resilience within indigenous SES, showcasing the balance between human adaptability and ecological symbiosis. The tribal home-gardens, driven by indigenous stewardship, provide essential ecosystem services and are instrumental in ecosystem protection, conservation, and restoration. Additionally, they play a pivotal role in enabling climate change adaptation, fostering gender empowerment, and upholding cultural significance, all sustained by dynamic feedback loops with their natural environment. This paper advocates for the greater recognition and integration of such indigenous-led NbS and ILK in global climate initiatives, emphasising their indispensability in enhancing climate resilience and promoting sustainable development within similar SES.

## 24 Connectivity of local wisdom in homegarden management in Rural Kupang City (2024)

Abdurrahman, Mustafa; Suek, Johanna; Malle, Imanuel; Sipayung, Roni Haposan. (2024). Connectivity of Local Wisdom in Homegarden Management in Rural Kupang City. Eternal Scientific Publications ISSN: 2583 – 5238 / Volume 3 Issue 1 January 2024 / Pg. No: 368-375 Doi: 10.56472/25835238/IRJEMS-V3I1P143

Homegarden management is considered the oldest land use activity. It is a transformation from shifting cultivation to a more intensive land management system due to the pressure of population growth and reduced fertile land. This study answers the research question about what local wisdom underlies yard management in rural Kupang City. The location was chosen deliberately, while the respondents were randomly selected, involving 120 households. Data analysis descriptively and quantitatively. The results of the analysis show that local wisdom in the yard is related to management from social, ecological, economic, and aesthetic aspects while remaining oriented towards environmentally friendly management. The role of the yard from an ecological aspect is to provide a diversity of plant types, namely five types of food, 16 horticultural plants and six types of biopharmaceutical plants, 20 fruit trees, more than 15 types of forestry plants, 16 types of ornamental fish business plants and five types of domesticated livestock. Various types of plants act as soil cover, reduce erosion, and increase groundwater storage, in addition to their contribution to the family economy and socially absorb labor throughout the year.

Norka M. Fortuny-Fernández, David García-Callejas, Anne Damon, Pablo Martínez-Zurimendi, Natalia Y. Labrín-Sotomayor, Yuri J. Peña-Ramírez (2024). Factors driving tree community structure in traditional home gardens in the Mayan forest, *Urban Forestry & Urban Greening*, Volume 99, 2024, 128466, ISSN 1618-8667, <https://doi.org/10.1016/j.ufug.2024.128466>.

### Introduction

'Peasant populations in tropical areas use Traditional Home Gardens (THG) as a key resource for their homes. THG supports significant plant biodiversity, most directly related to asset production, including locally rare species related to food, fuelwood, cultural, ornamental, shade, and wind barriers. Previous studies have considered factors driving tree diversity in THG; however, few have evaluated the biological, environmental, and management factors that shape tree diversity. Our objective in the present study was to identify the drivers of the tree community in THG across a precipitation gradient, evaluating biological, environmental and management factors.

### Methods

We visited forty-eight THG distributed across the precipitation gradient spanning around 300 km The tropical Mayan Forest in the Yucatan Peninsula, Mexico., where tree inventory and identification were obtained from specimens with a diameter at breast height > 5 cm. Interviews were conducted with owners about the history of THG. Metadata were captured and analyzed for 19 putative determinants of tree population structure. Differences in tree diversity by individual THG and region were determined statistically. Modeled interaction networks were determined based on a co-occurrence matrix.

### Results

THG tree abundances are mainly explained by the relative abundance of not deliberately established individuals, the organic carbon content in the soil, and surrounding forest integrity. Management history of THG by peasants, including factors such as irrigation, TGH area, and fertilization, showed smaller but significant differences. Tree distribution is at a lower degree influenced by the precipitation gradient in the Yucatan Peninsula, which shows different abundances even for species established by THG owners.

### Conclusions

Our results suggest that biological and environmental factors may shape tree abundance and distribution over anthropic activities in THG. We identified rare, region-specific, and indicator species by region and modeled interaction networks that show coincidences with the empirical knowledge of THG owners.

## Ethno-medicinal plants of tribal people: A case study in Pakyong subdivision of East Sikkim, India (2023)

Suman Tamang, Ankit Singh, Rainer W. Bussmann, Vandana Shukla, M.C. Nautiyal. (2023). Ethno-medicinal plants of tribal people: A case study in Pakyong subdivision of East Sikkim, India, *Acta Ecologica Sinica*, Volume 43, Issue 1, 2023, Pages 34-46, ISSN 1872-2032, <https://doi.org/10.1016/j.chnaes.2021.08.013>.

### Background

Tribal people of India still use ancient traditional health care practices, using available plants in their surroundings. Traditional knowledge of medicine is vanishing due to urbanization and outmigration thus its urgent need to preserve this valuable knowledge.

### Methods

This recent study was carried out in Pakyong subdivision of East Sikkim during 2016-17, and information was collected interviewing 71 informants of the Lepcha, Bhotia, and Nepali tribes.

### Results

Present study documenting 60 useful plant species belonging to 38 families, used for local health care needs including ten veterinary useful species. Herbaceous plants were used in high proportion (32 species, 54%) followed by trees (20, 33%), shrubs (20, 8%) and climbers (3, 5%). Leaves were the most frequently used plant parts and decoction was the common drug formulation among the inhabitants. The Informant consensus factor (ICF) ranged between 0.88 and 0.97, and fidelity levels in the study region were varied from 11.53% to 100%.

### Conclusion

Documentation of local plant uses by tribal people will be helpful in sustainable use of indigenous practices of medicinal plants, and further information may be used for pharmacological investigation and novel phytoconstituents isolation.

## The role of traditional knowledge and food biodiversity to transform modern food systems (2022)

Kennedy, Gina; Wang, Zeyuan ; Maundu, Patrick; Hunter, Danny (2022). The role of traditional knowledge and food biodiversity to transform modern food systems, Trends in Food Science & Technology, Volume 130, 2022, Pages 32-41, ISSN 0924-2244 <https://doi.org/10.1016/j.tifs.2022.09.011>.

### Abstract

#### Background

The current way our food systems operate does not result in healthy and nutritious diets for all, nor are we producing food in a manner that the planet can sustain. Food biodiversity, or the range of animal and plant species used for food is one solution to improve the health of both people and the planet.

#### Scope/approach

Case studies were used to illustrate current initiatives and programs aimed to bring greater food biodiversity into our food systems. Case studies were developed by subject matter experts and reviewed for demonstrated and potential impact on four food system outcomes: healthy diets and nutrition, agro-ecological resilience, livelihoods and income and socio-cultural wellbeing.

#### Key findings/conclusion

The six case study examples demonstrate that there are multiple approaches that confer benefits across a range of food system outcomes. The case studies demonstrate contributions to the body of knowledge on food composition, dietary diversification, strategies to prioritize crops that regenerate soil and purify water, require few inputs or can grow in harsh conditions, as well as provide increased income to communities and rebuild cultural knowledge. Some approaches were initiated by government and others at community level; they all demonstrate ways to achieve greater integration of food biodiversity into food systems. This collection of case studies illustrates a fraction of what is currently being done to support biodiverse food production and consumption. The evidence base for how to bring greater food biodiversity back into our food systems should be improved and should not be an isolated occurrence, but rather a continuous process.

## Traditional homegardens and ethnomedicinal plants: Insights from the Indian Sub-Himalayan region (2022)

Manish Roy, Biplov Ch. Sarkar, Gopal Shukla, Vineeta, Manoj Kanti Debnath, Arun Jyoti Nath, Jahangeer A Bhat, Sumit Chakravarty (2022). Traditional homegardens and ethnomedicinal plants: Insights from the Indian Sub-Himalayan region, *Trees, Forests and People*, Volume 8, 2022, <https://doi.org/10.1016/j.fpp.2022.100236>.

Homegardens are a traditional human-made microenvironment, socioeconomically connected to people's long-term survival. In India's sub-Himalayan region, studies have been conducted on many aspects of homegardening systems. However, little has been studied on ethnomedicinal plants from this region's traditional homegardens. The current study focuses on the diversity and population status of ethnomedicinal plants in homegardens and their folk therapeutic uses. The present work was conducted in West Bengal's Jalpaiguri District, part of the Terai zone. A purposive, multi-stage random sampling method was used to select 100 homegardens. Sixty-seven ethnomedicinal plant species representing 44 families and 60 genera including 22 trees, eight shrubs, 34 herbs, and three climber species were documented. The documented ethnomedicinal plants species were used as folk therapies to treat 39 diseases including some serious ailments like cancer. The most commonly employed plant part for therapeutic purposes were leaves (22 species) followed by fruits (seven species), whole plant (five species), rhizome (three species), tuber and young bud (two species). The use-value for the documented ethnomedicinal species varied from 0.56 (*Ocimum sanctum*) to 0.012 (*Lannea coromandelica*) while, the fidelity values ranged from 92.17% (*O. sanctum*) to 3.43% (*Streblus asper*). The value of cultural importance ranged from 0.384 (*Ocimum sanctum*) to 0.009 (*Corchorus capsularis* and *Nyctanthes arbor-tristis*). The above quantification of the ethnomedicinal plant species signifies the prominence of a species in cultural and folk therapeutic terms, i.e. higher the values, higher is the traditional importance of the species. The present documentation indicates rich traditional knowledge on medico-botanical aspects of the study area as diverse ethnomedicinal plant species were actively harboured and maintained in the homestead by the inhabitants for their primary health care and well-being that usually were supplemented prior to modern health care system. Diverse ethnomedicinal plant species being maintained in the homestead is significant in conservation of these species that too in a human-dominated landscape when these plant species are threatened for existence due to habitat destruction and commercial exploitation in their natural habitats.

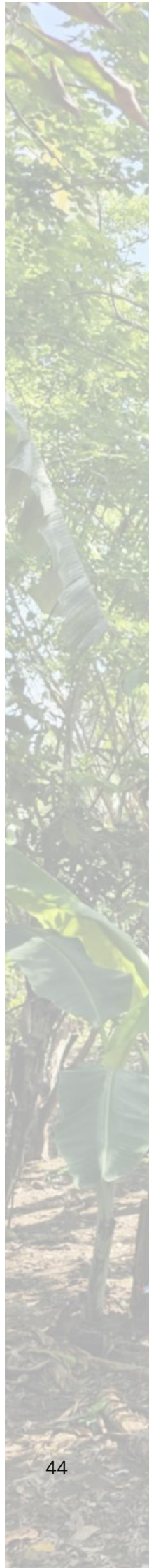
## Characteristics and functions of traditional homegardens: a review (2009)

Huai, Huyin & Hamilton, Alan. (2009). Characteristics and functions of traditional homegardens: A review. *Frontiers of Biology in China*. 4. 151-157. 10.1007/s11515-008-0103-1.

Traditional agroecosystems play an important role in the conservation of biodiversity and in sustainable development. As a typical type of traditional agroecosystem, traditional homegardens have been receiving increasing attention from scientists, especially ethnobotanists. They are considered as germplasm banks for many crops and other economic plants. They are also a key site for domestication of wild plants. Current ethnobotanical studies on homegardens focus on their structures, floristic composition, and contributions to their owners. Traditional homegardens often show complicated structures, diverse floristic compositions, multiple functions, low input (including labor and money), and ecological and socioeconomic sustainability. The characteristics and functions of traditional homegardens are closely related to many factors, such as their geographic location and the cultural backgrounds and socioeconomic conditions of their owners. Many researches on homegardens are conducted in the tropics. There are few studies on the dynamics of traditional homegardens, especially those located in temperate, arid and semi-arid zones. The dynamics of homegardens and the factors affecting these processes will be a fruitful field for future research.

Karyono (2000). Traditional homegarden and its transforming Trend. *Bionatura*, 2, 218427.  
<https://jurnal.unpad.ac.id/bionatura/article/view/5598>

Homegarden is a productive traditional landuse system surrounding the house which is usually planted by a mixture of annual and perennial crops. Homegarden plays important role in fulfilling various daily needs of the household. It is a dynamic system which can change from time to time following the changes of biophysical and social to fulfill the needs of the owner. The changes of structure and function of Homegarden are commonly related to the improvement program, i.e. intensification and commercialization. However, in the improvement program too often high productivity has been set only as a sole goal, while the long-term of sustainability has been neglected leading the destructive changes in the functioning of Homegarden system. Therefore, improvement program should not be weighted solely on its economic potential, but should also be considered on its socio-cultural and natural conservation function.



## Quantitatively characterizing the floristics and structure of a traditional homegarden in a village landscape, Sri Lanka (2019)

Martin, Meredith & Geiger, Klaus & Singhakumara, Balangoda & Ashton, Mark. (2019). Quantitatively characterizing the floristics and structure of a traditional homegarden in a village landscape, Sri Lanka. *Agroforestry Systems*. 93. 10.1007/s10457-018-0254-2.

Our study examined the species composition and vegetative structure of traditional homegardens within the context of the surrounding land use mosaic typical of village lands in the southwest region of Sri Lanka. We conducted interviews and spatially mapped the land uses of a single traditional village comprising over thirty households. After mapping the different land uses for each household we selected ten households and conducted a census of the vegetation of their land use areas. Land use categories included homegarden, patio, rubber, tea plantation, and secondary forest and scrub. Land holdings varied in size between 0.18 and 1.34 hectares and comprised 39% tea land, 27% homegarden, 12% patio, 17% secondary forest and scrub land, and 4% rubber plantation. We identified a total of 268 plant species on the ten properties in a total of 216 genera and 84 families across all growth habits combined (trees, shrubs, herbs and climbers). Our results show three times the plant species richness in homegardens than for any similar research on tree gardens elsewhere, but a large proportion are exotic and almost all have some kind of utilitarian purpose. The top three tree species are palms in homegardens which represent over two-thirds of the stem density and half the basal area. The conservation activities within tree gardens emphasizes the crucial—but perhaps undervalued—role local livelihoods and land management activities play in retaining tree species diversity comparable but dramatically differing in taxa as compared to the original rain forest.

## Ethnobotanical knowledge and agrobiodiversity in subsistence farming: Case study of home gardens in Phong My commune, central Vietnam (2011)

Vlkova, Martina & Polesny, Zbynek & Verner, Vladimir & Banout, Jan & Dvorak, Marek & Havlik, Jaroslav & Lojka, Bohdan & Ehl, Petr & Perry, Jitka. (2011). Ethnobotanical knowledge and agrobiodiversity in subsistence farming: Case study of home gardens in Phong My commune, central Vietnam. *Genetic Resources and Crop Evolution*. 58. 629-644. 10.1007/s10722-010-9603-3.

Ethnobotanical survey was conducted in 101 randomly selected home gardens of Phong My commune, central Vietnam, situated in the buffer-zone of Natural Reserve. Data were collected through semi-structured questionnaires and direct observation. Sixty-seven species belonging to 35 families were identified to be used for various purposes. For each species the botanical and vernacular names, plant parts used and main purposes of use are given. The major use categories reported for plant species were food (86%), medicine (32%) and firewood (32%), however, seventy-seven percent of all inventoried plants have multiple uses. The species *Artocarpus heterophyllus* Lam., *Citrus grandis* Osbeck, *Citrus reticulata* Blanco, *Ipomoea batatas* (L.) Lam. and *Musa* spp. were identified as the main sources of plant foods consumed within the households. Statistical analyses indicated by Shannon-Wiener and Margalef indices have shown that local species diversity and richness is affected by home garden size. On the contrary, no relationship between diversity and home garden age was found. On the basis of a cluster analysis of plant species diversity, five home garden types were differentiated. In comparison to previously reported studies on tropical home gardens, the diversity in Phong My is lower, probably due to market-oriented strategy. Nevertheless, based on the results achieved, we can conclude that useful plants cultivated in local home gardens provide valuable foods complementing daily diet and subsequently contributing to socioeconomic status of the households.

## Do homegardens act as agent of agrobiodiversity conservation: a case study of homegardens of diverse socio-ecological zones in the Brahmaputra Valley, Assam? (2024)

Sharma R, Mina U, Devi A and Kumar BM (2024) Do homegardens act as agent of agrobiodiversity conservation: a case study of homegardens of diverse socio-ecological zones in the Brahmaputra Valley, Assam. *Front. Sustain. Food Syst.* 8:1366499. doi:10.3389/fsufs.2024.1366499

Homegardens are one of the oldest agroforestry systems reported around the world. These agroforestry systems are often reported as harbingers of plant biodiversity conservation. However, a comprehensive understanding of these systems from the perspective of species level agrobiodiversity conservation is often missing.

**Methodology:** This study first visualizes the comprehensive role of homegardens in species level agrobiodiversity conservation and then assesses any variation in agrobiodiversity along diverse Socio-ecological Zones (SEZs) in the study site. The prominent SEZs identified in the study site were Protected Area (PA), Riverine (RI), Rural Market (RM), and Tea Estate (TE). Eight ethnic/linguistic groups were also identified at the study site. Agrobiodiversity inventorying of 192 homegardens from 16 villages was done.

**Results:** The results of the study highlight that homegardens in the study site have high species level agrobiodiversity concentration (101 total tree species reported, 39.58% of homegardens (HGs) had more than 10 varieties of vegetables, 68% had at least one variety of bamboo, 76% had at least one banana variety, 20.83% had pond). A total of 64% of HGs had livestock and around 85% had poultry. Moreover, this agrobiodiversity distribution also varied along different SEZs. The livestock diversity indices ranged from 0.49 (TE) to 1.04 (PA). The average plant diversity among homegarden was found to be in the range of 1.09 (PA) to 1.48 (TE) for Shannon, 0.45 (PA) to 0.66 (TE) for Simpson, 0.31 (PA) to 0.71 (TE) for Pileou evenness and 2.39 (PA) to 2.76 (RM) for Margalef. The plant composition reflected the dominance of the food species i.e. an average of 37% in each SEZ. Sorenson similarity index among different SEZs for plant and livestock was found to be highest between the HGs of the PA and RM (0.82). Among the ethnic/linguistic groups, the highest mean number of plant species (51) was found among the Mishing tribe. Also, high similarity index (0.78) was found in plant and livestock composition among the Mishing and the Bodo tribes.

**Discussion:** The findings imply that HGs exemplify diversified and integrated systems, showcasing their potential to play a crucial role in the development of sustainable food systems.

## Home gardens: neglected hotspots of agro-biodiversity and cultural diversity (2010)

Galluzzi, Gea & Eyzaguirre, P. & Negri, Valeria. (2010). Home Gardens: Neglected Hotspots of Agro-Biodiversity and Cultural Diversity. *Biodiversity and Conservation*. 19. 3635-3654. 10.1007/s10531-010-9919-5.

Over the last two decades, the importance of conserving genetic resources has received increasing attention. In this context the role of home gardens as repositories of biological diversity has been acknowledged but still a comprehensive, interdisciplinary investigation of their agro-biodiversity is lacking. Home gardens, whether found in rural or urban areas, are characterized by a structural complexity and multifunctionality which enables the provision of different benefits to ecosystems and people. Studies carried out in various countries demonstrate that high levels of inter- and intra-specific plant genetic diversity, especially in terms of traditional crop varieties and landraces, are preserved in home gardens. Families engage in food production for subsistence or small-scale marketing and the variety of crops and wild plants provides nutritional benefits. At the same time, home gardens are important social and cultural spaces where knowledge related to agricultural practices is transmitted and through which households may improve their income and livelihoods. The present article summarizes available literature on the biological and cultural significance of agro-biodiversity in home gardens. It discusses future constraints and opportunities in home garden research, in the prospect of defining and promoting their role in conservation of agricultural biodiversity and cultural heritage.

## Kandyan home gardens: a time-tested good practice from Sri Lanka for conserving tropical fruit tree diversity (2016)

Pushpakumara, D.K.N.G.; Heenkenda, H.M.S.; Marambe, B.; Ranil, R.H.G.; Punyawardena, B.V.R.; Weerahewa, J.; Silva, G.L.L.P.; Hunter, D.; Rizvi, J. (2016) Kandyan home gardens: a time-tested good practice from Sri Lanka for conserving tropical fruit tree diversity. In: Sthapit, B. (et al. (eds.)) Tropical fruit tree diversity: good practices for in situ and on-farm conservation. Abingdon, Oxon (UK): Routledge, p. 112-126. ISBN: 978-1-138-78128-3

### Conclusion and way forward

Sri Lankan HGs in Kandy and adjacent districts, such as Badulla, Kegalle, Kurunegala, Matale, Nuwara Eliya and Rathnapura, are defined and popularly known as Kandyan home gardens (KHGs) or Kandyan forest gardens. KHGs represent a scattered but important human-made land use system that increases the tree cover of this area of Sri Lanka. Out of 196 fruit species recorded in Sri Lanka, more than half of the species are recorded from 17 per cent of the area of the above districts. The KHGs, therefore, are an important land use system for Sri Lanka in terms of the percentage of land area occupied, conservation of fruit crop species and their genetic diversity, and provision of other environmental services, while helping to generate income and food and nutrition security of households. This study shows that KHGs represent a land use system that, over time and space, in most instances maintains and in some instances enhances and creates crop genetic diversity; hence they can be regarded as a good practice for maintaining diversity (GPD). Year-round production of a wide range of products required by householders, new business ventures through value addition, provision of many ecosystem services and easing pressure on natural forests have been identified as key elements of KHGs.

Having said that, relatively little attention has been paid to assessing the ecosystem services and dynamics of KHGs under the influence of rural transformation to commercialization, land degradation and the impact of fragmentation of KHGs on social, cultural and ecological sustainability. Hence, a community-based long-term, multidisciplinary and participatory research programme is needed to understand the dynamics of conservation and use of species and genetic diversity of fruits. On-farm assessment of genetic diversity using temporal quantitative data against the changing social dimensions in society brings inferences at the level of individual KHGs as well as the level of the landscape on the ecosystem services of KHGs.

L.N. Trinh, J.W. Watson, N.N. Hue, N.N. De, N.V. Minh, P. Chu, B.R. Sthapit, P.B. Eyzaguirre (2003). Agrobiodiversity conservation and development in Vietnamese home gardens, *Agriculture, Ecosystems & Environment*, Volume 97, Issues 1–3, 2003, Pages 317–344, ISSN 0167-8809, [https://doi.org/10.1016/S0167-8809\(02\)00228-1](https://doi.org/10.1016/S0167-8809(02)00228-1).

The cultural, ecological, and commercial forces that influence Vietnamese home gardens are explored in this 3-year International Plant Genetic Resources Institute (IPGRI) study. Home gardens located in four different ecosystems within Vietnam were surveyed to determine species composition, area, structure, commercialization, household socio-economic status, and gender division in decision-making. Four key species were chosen for in depth ethnobotanical and genetic diversity studies; preliminary results from participatory appraisal workshops are reported including farmer varietal preferences, descriptors, and a seasonal calendar. Cultural importance of home gardens and their species in Vietnam is also discussed. The study concludes that richness and stability of home gardens make them important sites for in situ conservation within ecozones, and great scope exists for the utilization of this information to improve nutritional and income-generating development projects.

## Home gardens management of key species in Nepal: a way to maximize the use of useful diversity for the well-being of poor farmers (2009)

Gautam R, Sthapit B, Subedi A, Poudel D, Shrestha P, Eyzaguirre P. Home gardens management of key species in Nepal: a way to maximize the use of useful diversity for the well-being of poor farmers. *Plant Genetic Resources*. 2009;7(2):142-153. doi:10.1017/S1479262108110930

The purpose of this study is to identify key home garden species in order to address basic research questions aimed at understanding farmers' home gardens management practices. The study was conducted in two contrasting Hill and Tarai sites in Nepal with households (HHs) ranging from 355 to 634. Unlike larger production systems, home gardens harbour many species in small areas often with a few crop varieties and species that are not well represented in larger fields. Given the number of species and their small population sizes, species and genetic diversity are best studied by identifying representative key species characterizing the complex productive niches within farms. Although species diversity within community is large (172–342), 24 key species were identified for the study. There is no fixed size of a home garden. The log of home garden size and species richness was positively correlated ( $r = 0.42$ ,  $P < 0.001$ ). Species richness was significantly higher in vegetable followed by fodder, fruits and spices. This paper also explores the diversity in home gardens to identify the composition and characteristics of the key species and how they are managed, used and conserved. Most of the farmers save the seeds of these home garden species for their own use, but many also exchange and buy and sell seed in local weekly market. Farmers' practices for selecting seed vary according to the reproductive biology of the key home garden species. Home gardens provide the HH with fresh and diverse supply of nutritious food, which improves their self-sufficiency, while conserving diversity on-farm. Despite this, they are neglected in research and development by policy makers and researchers.

## Vegetable cultivation as a solution to the problem of poverty in Indonesia (2024)

Sabrina, R., & Nurhayati. (2024). Vegetable Cultivation as A Solution to The Problem of Poverty in Indonesia. *Revista De Gestão Social E Ambiental*, 18(8), e06258.  
<https://doi.org/10.24857/rgsa.v18n8-046>

**Objective:** The increasing number of poor people in urban areas always creates new problems in society. So there is a need for solutions from various fields, both in the economic, social, environmental, and climate change fields. This research found one way that planting vegetables in the yard is considered a solution to the problem of poverty.

**Theoretical framework:** This research found a plan for planting vegetables in the yard to be a guide for those who are interested in carrying it out. By planting vegetables in the yard of the house, it is considered that the problem of poverty in the city can be slightly resolved.

**Method:** This study uses a qualitative method. 83 research informants were low-income residents of the slum area of Medan City, and literature data about strategies for overcoming poverty through gardening in the yard of the house further strengthened this data collection.

**Results and conclusion:** The results of this study found that planting vegetables in the yard can contribute to overcoming problems of income, purchasing power, nutrition, health, environmental sanitation, and climate change. Implications of the research: So research on vegetable cultivation is considered one of the strategies for overcoming the problems of malnutrition and poverty.

**Originality/value:** This research will be a lesson on how to independently carry out a planting system in your own yard.

**Assessment of the diverse roles of home gardens and their sustainable management for livelihood improvement in West Java, Indonesia (2019)**

Park, J. H., Woo, S. Y., Kwak, M. J., Lee, J. K., Leti, S., & Soni, T. (2019). Assessment of the Diverse Roles of Home Gardens and Their Sustainable Management for Livelihood Improvement in West Java, Indonesia. *Forests*, 10(11), 970. <https://doi.org/10.3390/f10110970>

Home garden is a traditional agroforestry system, which is an ecologically and socio-economically sustainable land use system in West Java, Indonesia. It plays a fundamental role in providing subsistence food and income to local people through a multi-strata structure. Despite the importance of the home garden, which is strongly linked with quality of living, there is still a lack of quantitative data and information. Therefore, we quantified the economic and ecological characteristics of home gardens in the present study to evaluate their diverse roles. In addition, general strategies that are applicable to home gardens in West Java were developed for sustainable management. The results of this study indicated that: (1) large landholding size showed a significantly higher Net Present Value (NPV) than small landholding size when the home gardens were dominated by fruit tree species, (2) species richness, species diversity, and carbon stock did not differ significantly among the different types and sizes of home gardens in West Java, and (3) multi-layered and diverse species composition is considerable for sustainable management of home gardens in terms of income generation and against urbanization and commercialization in West Java, Indonesia. Further studies should be considered for developing a standardized and generalized model that is able to evaluate and quantify the various ecosystem values that are generally acceptable and applicable in rural areas.

Mulia, R.; Le, T.T.; Tran, N.D.; Simelton, E. (2022). Policy Support for Home Gardens in Vietnam Can Link to Sustainable Development Goals. *Agriculture* 2022, 12, 253. <https://doi.org/10.3390/agriculture12020253>

Despite research evidence on the diverse benefits of home gardens and their potential contributions to multiple sustainable development goals (SDGs), the role of policy towards supporting these contributions remains unclear in developing countries like Vietnam. In this study, we found that 25 out of Vietnam's 86 key rural development and agricultural policies enacted over the last decade (2010–2021) set specific targets for home gardens. The targets, however, focus strongly on income generation with indicators stipulating e.g., 50–80% of total income from home gardens should be generated by the main product. The policies set no specific target for other potential roles of home gardens beyond the economy of rural households and can exacerbate the widespread transformation of home gardens in Vietnam into farming practices with low crop diversity. The latter potentially limits contributions of home gardens to two (SDG 1, 10) of at least 11 (SDG 1–3, 5, 6, 8, 10–13, 15) of Vietnam's 17 SDGs. To narrow the gap between research and policy in home garden contributions to Vietnam's SDGs, we need to better mainstream integrated home garden systems and their diverse benefits, enrich policy targets beyond the income generation, and strengthen coordination among state departments for policy implementation.

## Contribution of home gardens to sustainable development: perspectives from a supported opinion essay (2022)

Santos, M.; Moreira, H.; Cabral, J.A.; Gabriel, R.; Teixeira, A.; Bastos, R.; Aires, A. Contribution of Home Gardens to Sustainable Development: Perspectives from A Supported Opinion Essay. *Int. J. Environ. Res. Public Health* 2022, 19, 13715. <https://doi.org/10.3390/ijerph192013715>

Home gardening has a long history that started when humans became sedentary, being traditionally considered an accessible source of food and medicinal plants to treat common illnesses. With trends towards urbanization and industrialization, particularly in the post-World War II period, the importance of home gardens as important spaces for growing food and medicinal plants reduced and they began to be increasingly seen as decorative and leisure spaces. However, the growing awareness of the negative impacts of agricultural intensification and urbanization for human health, food quality, ecosystem resilience, and biodiversity conservation motivated the emergence of new approaches concerning home gardens. Societies began to question the potential of nearby green infrastructures to human wellbeing, food provisioning, and the conservation of traditional varieties, as well as providers of important services, such as ecological corridors for wild species and carbon sinks. In this context, and to foster adaptive and resilient social-ecological systems, our supported viewpoint intends to be more than an exhaustive set of perceptions, but a reflection of ideas about the important contribution of home gardens to sustainable development. We envision these humble spaces strengthening social and ecological components, by providing a set of diversified and intermingled goods and services for an increasingly urban population.

## Vegetable gardens and their impact on the attainment of the Millennium Development Goals, biological agriculture and horticulture (2012)

J. D.H. Keatinge , M. L. Chadha , J. d'A. Hughes , W. J. Easdown , R. J. Holmer , A. Tenkouano , R. Y. Yang , R. Mavlyanova , S. Neave , V. Afari-Sefa , G. Luther , M. Ravishankar , C. Ojiewo , M. Belarmino, A. Ebert , J. F. Wang & L. J. Lin (2012) Vegetable gardens and their impact on the attainment of the Millennium Development Goals, *Biological Agriculture & Horticulture: An International Journal for Sustainable Production Systems*, 28:2, 71-85, DOI:10.1080/01448765.2012.681344

The attainment of the Millennium Development Goals is at severe risk, owing to rising malnutrition and high child stunting and mortality rates, greater poverty, a large increase in the incidence of noncommunicable diseases, and lack of progress in women's empowerment. Here, the role of vegetable home, school, community, and disaster recovery gardens as a pro-poor and pro-environment intervention in the developing world is reviewed. This includes the contribution of vegetable gardens in improving food and nutritional security, generating additional income, providing employment, contributing to better health, and helping to empower disadvantaged groups in society. The implications of global research in the tropics and subtropics over the last 20-30 years are assessed over a wide geographic and linguistic range. The effectiveness and sustainability of such interventions are considered in the light of their contribution to the attainment of the Millennium Development Goals. Suggestions for potential new directions for research are made, and a call for better integration of effort in research and development between the agriculture, nutrition, and health sectors is presented as a key issue if rapid development progress is to be made and sustained.

## A review on the advantages of home garden for Khmer people in rural areas of Cambodia (2023)

Chivon, Roeurnand Serey Mardy.(2023). A Review on the Advantages of Home Garden for Khmer People in Rural Areas of Cambodia. *International Journal of Sustainable Applied Sciences (IJSAS)* Vol.1, No.6, 2023: 777-782.  
<https://10.0.233.242/ijssas.v1i6.921>

Homesteading, also known as home gardens, is a long-standing food production practice worldwide. It involves cultivating vegetables around the home, with some families growing multiple varieties without proper management. The aim of this study is to express how important of home garden is for individual Khmer families and livelihood in Rural areas of Cambodia. Home gardens therefore feature species that are complementary to one another and are characterized by cheap capital input and basic technology. They can improve the variety of foods in a home, provide fresh vegetables, save money by not buying vegetables, and increase income by selling extra vegetables to neighbors and friends. This income can be used to pay for other foods, school fees, and other expenses. Gardening also helps families exercise and stay fit, diversifying their diet, and reducing daily expenses. It also provides livelihood opportunities for resource poor families and delivers various ecosystem services. In conclusion, working in the garden encourages family exercise and fitness, raising the diet's level of diversity even more, lower daily costs, such as providing resource-poor families with a means of subsistence.

## Home Garden; an approach for household food security and uplifting the status of rural women: A Case Study of Saptari, Nepal (2021)

Bhandari, S., Yadav, P.K., & Rijal, S. (2021). Home Garden; an Approach for Household Food Security and Uplifting the Status of Rural Women: A Case Study of Saptari, Nepal. *Turkish Journal of Agriculture - Food Science and Technology*.

Food security is one of the major global challenges of the twenty-first century. World population is expected to increase by one-third, between 2009 and 2050, and in Asia, crop yield is estimated to decline by 5 to 30% from 2050 onwards compared to 1990. It is high time to seek alternatives that can increase production utilizing existing resources ensuring food security. A home garden can be a viable and sustainable alternative in this regard; nevertheless, it is often neglected. Thus, this study aims to understand the role of the home garden in maintaining household food security and enhancing rural women's status in Nepal. Two villages of Bishnupur rural municipality, namely, Bajitpur and Musharniya were selected as study sites. 78.6% of households in Bajitpur and 68.4% households in Musharniya were found to have a home garden where crops and livestock were organized in an integrated way. The home garden was found to maintain household food security, ensure food availability for most of the seasons, access of household members to food, its utilization, and stability in production. Furthermore, 66.67% and 58.33% of women sold surplus home garden products in Bajitpur and Musharniya respectively. This signifies the role of home gardening activities in uplifting the social and economic status and, farming knowledge of rural women in both villages. However, there is a lack of extension facilities and subsidies for the home garden to encourage farmers. Therefore, different models of home gardens should be developed and disseminated, prioritizing the integration of the scientific farming system with traditional knowledge for sustainable adoption of the home garden in Nepal.

## Economic evaluation of a novel homestead food production program in rural Cambodia (2016)

Lakzadeh, P. (2016). Economic evaluation of a novel homestead food production program in rural Cambodia (T). University of British Columbia. Retrieved from <https://open.library.ubc.ca/collections/ubctheses/24/items/1.0300361>

**Background:** For over 20 years Helen Keller International has implemented homestead food production (HFP) programs in developing countries to improve the nutritional status of women and children, household food security and income. The HFP model encourages year-round food production through home gardens and animal husbandry. Although, HFP has been successful in increasing household food production, economic assessment of this program has been limited. In order for program implementers to allocate limited resources efficiently, there is a need for a rigorous economic assessment of HFP programs.

**Objective:** To (1) identify factors associated with household income in rural, Cambodia, (2) to systematically measure and monetize food production from gardens and fishponds, and explore the cost-effectiveness of HFP in Cambodia in a cost-benefit analysis (CBA), using data from a randomized control trial (RCT), (3) explore the sensitivity of the CBA results and alternative scenarios for program implementation.

**Methods:** Factors associated with household income, were examined using a generalized linear mixed model at a univariate and multivariate level. Food production was estimated from multiple longitudinal data sources. The program benefits (food production) were monetized using local village market values, while costs were determined through a micro-costing analysis. A CBA was carried out from the project perspective and the net monetary benefit in each study arm was estimated and compared to control households. Lastly, the sensitivity of the CBA results was tested in a one-way sensitivity and scenario analysis.

**Results:** Assessment of baseline household income revealed that in rural Cambodia fishponds and pigs were associated with income. Households in the HFP program produced more food, relative to the control. The results from CBA show that home gardens are a cost-effective HFP intervention. The results from the scenario analysis suggest that the addition of fishponds to gardens may also be cost-effective if implemented outside a RCT.

**Conclusion:** This study has developed tools to systematically measure and monetize food production from HFP, while finding that establishment of home gardens is a cost-effective use of resources.

## Smallholder tree growing in Philippine back yards: homegarden characteristics in different environmental settings (2008)

Snelder, D.J. (2008). Smallholder Tree Growing in Philippine Back Yards: Homegarden Characteristics in Different Environmental Settings. In: Snelder, D.J., Lasco, R.D. (eds) Smallholder Tree Growing for Rural Development and Environmental Services. Advances in Agroforestry, vol 5. Springer, Dordrecht. [https://doi.org/10.1007/978-1-4020-8261-0\\_2](https://doi.org/10.1007/978-1-4020-8261-0_2)

Although Asian homegardens have received fair scientific attention, the Philippine homegardens form an exception to this rule. The objective of this chapter is to explore the dynamics and diversity of 57 homegardens (size: 0.07–0.13 ha) in five villages in the Cagayan Valley. Of the 155 plant species in total (>312 if including ornamentals), 71 are tree species. When moving from forested uplands to densely populated lowlands, homegardens become more diverse, better structured and higher in plant density. Likewise, they show increasing differentiation towards tree crop mixtures with *Mangifera indica* (mango) and *Moringa oleifera* (horse raddish), non-tree crop mixtures with *Solanum melongena* (eggplant) and *Colocasia oltorius* (cocoyam) or *Ipomoea batatas* (sweet potato), and livestock for selling purposes. Farmers' most important reasons for having homegardens refer to household consumption. Yet, the selling of excess crops and livestock products is of increasing importance as income from farms decreases (due to smaller sizes and lower soil fertility) being eventually inadequate to meet households' cash needs. Garden products generate US\$281 ± 944 per hectare (median: US\$130) – or US\$73 ± 123 per homegarden (median: US\$27) – at minimal or no input costs. The annual gross income from gardens with livestock is higher, i.e., US\$115 ± 72 per household (median: US\$98). Yet, corn (major cash crop of farm fields) yields a much higher gross income, i.e., US\$676 ± 336 per hectare per year with inputs varying from US\$137 (without fertilizer) to US\$250 (with) per hectare per cropping cycle.

## The role and impacts of small-scale, homestead agro-forestry systems ("pekarangan") on household prosperity: an analysis of agro-ecological zones of Java, Indonesia (2012)

Munandara, A., Schultinkb, G., & Kaswantoa, R.L. (2012). The role and impacts of small-scale, homestead agro-forestry systems ("pekarangan") on household prosperity: an analysis of agro-ecological zones of Java, Indonesia. *International Journal of AgriScience*, 2, 896-914.

A survey of very small-scale homestead gardens in three Javanese provinces was conducted to analyze the potential beneficial effects on household's quality of life. Aspects included: (1) diet and nutrition, (2) income, (3) level of goods and material assets, (4) family status, (5) credit access, and (6) the role of women in managing production and marketing. The survey encompassed sites on West, Central and East Java, representing a range of agro-ecological zones, watersheds (6), elevations, socio-cultural conditions and development stages. The plot sizes evaluated ranged from < 120 m<sup>2</sup> with no other agricultural land (OAL) to 120-400 m<sup>2</sup> with < 1,000 m<sup>2</sup> OAL. The average household plot size was about 240 m<sup>2</sup> (with open space of at least 140 m<sup>2</sup>) and OAL of 500 m<sup>2</sup>. Around 5.7% of the sample villages were, by national standards, considered to be at an advanced development state, with 82.9% at a medium state, and with the rest least developed. On average, very small homestead plots reduced food expenses by 9.9%. Nutritional benefits are primarily in the form of vitamin A and C-providing 2.4% and 23.6% of recommended dietary allowance (RDA), respectively and only 1.9% of either carbohydrates or protein. As contribution to total household income, average homestead output provides about 11% of total farm income, about 80% of which was derived from animal products such as chicken, eggs, fish and meat. As expected, plot size and value of household assets appear closely correlated and increase based on access to other agricultural land. About 55% of the households feel that social status would decline if the household lost access to their homestead land.

The need for credit access is especially critical for the smallest lot owners. Women play the most important role in plot maintenance and plant-, animal-and fish production, and also manage family expenses for food, clothes, child health care and education. It appears that their role is less significant in managing family debt, and the purchase of agricultural inputs or other family expenditures. Overall, homestead gardens also perform an important social function. They help establish family and territorial identity, and facilitate neighborhood cohesion and beneficial communal interaction. It is suggested that agrarian reform programs that includes the distribution of land to landless people and small-scale homestead farms should be carried out in relation to the prevailing agro-ecological conditions and associated land carrying capacity and productivity ratings. Overall, such initiative should be within the framework of sustainable community development projects and well-defined regional economic development strategies. A minimum household plot size (e.g. 400 m<sup>2</sup>) should be defined to accommodate an acceptable, future standard of living. This may be accomplished uniquely at the individual household level based on household ownership of plots, or possibly in combination with larger-scale communal garden systems with shared titles, individual plots and with associated benefits of economies of scale by reducing costs of capital-, material-and mechanized inputs, and value chain development that includes post-harvest storage, processing, packaging and marketing.

Experience indicates that there is significant benefit in integrating diverse production system, such as food and cash crops, animal and fish production, especially in a closed-loop nutrient recycling system in combination with organic farming. Coupling agricultural with non-farm activities, including value-added enterprises, would provide for increased economic stability and potentially, and higher household revenues. In this approach, micro credit access assistance and the role of adaptive species selection, cooperative input acquisition, processing and marketing should be considered together with access to effective rural extension services. Research findings also show that some pekarangan owners have access to additional land cultivated to support household needs, and that this may be an important factor in land use intensification and the provision of sustainable income levels.

## Scientific basis of agroforestry homegardens in Matara District, Sri Lanka: Present status and improvement needs (2022)

Zoysa, M. (2022) Scientific Basis of Agroforestry Homegardens in Matara District, Sri Lanka: Present Status and Improvement Needs. *Open Journal of Forestry*, 12, 60-87. doi: [10.4236/ojf.2022.121004](https://doi.org/10.4236/ojf.2022.121004).

High diversity of species in agroforestry homegardens play main agro-ecological roles in complex and sustainable land use systems. Efforts are being made in valuing and protecting the age-old practices of agroforestry on scientific basis in homegardens. This study attempted to analyse the scientific basis of households' practices and to develop strategies for the promotion of sustainable agroforestry homegardens in Matara district of Sri Lanka. Selected households were interviewed measuring their concern using 5-point Likert scale, and analysed the qualitative data using non-parametric statistics. The study revealed that scientific basis of household practices in agroforestry homegardens are moderate in selection of appropriate trees and plants, and management of trees and plant health care. Households pay little concern on scientific basis in planning and site placement, land preparation and establishment of trees/crops, and implementing proper cultural practices. There is no significant correlation between scientific basis of practices in agroforestry in relation with size of homegardens, educational level of households, and across the category of their occupations. Resources to use scientific knowledge in practice, and opportunity to improve scientific skills have moderate correlation significantly while availability of scientific information and access to scientific knowledge have significant but low correlation as applying knowledge on scientific basis. The interest to acquire scientific knowledge, and sufficient time to improve scientific knowledge, and other reasons have no significant correlation with scientific basis of household practices. Carefully planned interventions including policy adjustments and effective extension programs for learning and experimenting together with supportive programs would enhance scientific basis of household practices for agroforestry in homegardens.

## Homegardens as a modern carbon storage: assessment of tree diversity and above-ground biomass of homegardens in Matale District, Sri Lanka (2022)

Lowe, Ayesha; Pradeepa, Silva and Pushpakumara, DKN (Gamini). (2022). Homegardens as a Modern Carbon Storage: Assessment of Tree Diversity and Above-Ground Biomass of Homegardens in Matale District, Sri Lanka. *Urban Forestry & Urban Greening*. 74. 127671. 10.1016/j.ufug.2022.127671.

Homegardens are principally known as integrated man-made ecosystems with annuals and perennials where trees play a significant role in storing atmospheric carbon in the vegetation as above-ground biomass (AGB). Being one of the agroforestry systems, homegardens could ease the pressure on natural forest cover in the process of carbon sequestration and carbon storage, while reducing the greenhouse gas accumulation (CO<sub>2</sub>) in the atmosphere. Thus, they could be described as a promising approach for mitigation of climatic changes. A study was conducted to assess the tree diversity and AGB carbon stock of homegardens in Matale district, Sri Lanka. A total of 122 homegardens ranging from urban dwellings up to natural eco-systems across 05 agro-ecological regions (AER) were surveyed, capturing a vast diversity. A total of 5,140 woody trees were recorded from 100 genera and 45 families, covering 16.67 ha of homegardens. Six and three tree species were identified as vulnerable and near threatened, respectively in terms of national-level conservation status. Shannon-Wiener index (SWI) of  $1.90 \pm 0.49$  ranging between 0.49 and 2.83 indicated compositional diversity of the tree species. The AGB was widely varying between 0.8-139.4 Mg C/ha (mean AGB of  $36.5 \pm 27.4$  Mg C/ha). AGB and SWI were higher in small-scale ( $38.8 \pm 29.7$  Mg C/ha and  $1.91 \pm 0.50$ , respectively) than in medium-scale homegardens ( $28.0 \pm 14.9$  Mg C/ha and  $1.86 \pm 0.50$ , respectively). Species richness and species density were higher in small scale (<0.2 ha) homegardens compared to medium scale (0.2-0.8 ha). A considerable variation of tree diversity and AGB was observed among the homegardens in different AERs. The variation of AGB was primarily governed by tree density (trees/ha) and species diversity. Focusing on that, optimizing the potential of homegardens in terms of storing atmospheric carbon as AGB in the study area can be considered as a timely strategy in mitigating impacts of climate change and assisting domestic food security.

## Quantification of carbon stock and tree diversity of homegardens in a dry zone area of Moneragala district, Sri Lanka (2015)

Mattsson, E., Ostwald, M., Ostwald, M., Nissanka, S.P., & Pushpakumara, D. (2015). Quantification of carbon stock and tree diversity of homegardens in a dry zone area of Moneragala district, Sri Lanka. *Agroforestry Systems*, 89, 435-445. [10.1007/s10457-014-9780-8](https://doi.org/10.1007/s10457-014-9780-8)

Homegarden agroforestry systems are suggested to hold a large potential for climate change mitigation and adaptation. This is due to their multifunctional role in providing income, food and ecosystem services while decreasing pressure on natural forests and hence saving and storing carbon. In this paper, above-ground biomass carbon and tree species diversity of trees was quantified in homegardens around two villages in the dry south-eastern part of Moneragala district of Sri Lanka. A total of 45 dry zone homegardens were sampled on size, diameter at breast height, tree height and species diversity. Using allometric equations, we find a mean above-ground biomass stock of 13 mega grams of carbon per hectare ( $\text{Mg C ha}^{-1}$ ) with a large range among homegardens ( $1\text{--}56 \text{ Mg C ha}^{-1}$ ,  $n = 45$ ) due to a variation of tree diversity and composition between individual homegardens. Mean above-ground carbon stock per unit area was higher in small homegardens ( $0.2 \text{ ha}$ ,  $26 \text{ Mg C ha}^{-1}$ ,  $n = 11$ ) and statistically different compared to medium ( $0.4\text{--}0.8 \text{ ha}$ ,  $9 \text{ Mg C ha}^{-1}$ ,  $n = 27$ ) and large ( $1.0\text{--}1.2 \text{ ha}$ ,  $8 \text{ Mg C ha}^{-1}$ ,  $n = 7$ ) homegardens. In total, 4,278 trees were sampled and 70 tree species identified and recorded. The Shannon Wiener index were used to evaluate diversity per homegarden and ranged from 0.76 to 3.01 with a mean value of  $2.05 \pm 0.07$  indicating a medium evenly distributed diversity of sampled tree species. The results show a vast heterogeneity in terms of carbon stock and tree diversity within the less studied dry zone homegardens; results that contribute to more knowledge of their expansion potential as well as climate mitigation and adaptation potential. The results are also useful for whether homegardens should be considered to be included as an activity to enhance natural forest cover within Sri Lanka's newly commenced UN-REDD National Programme.

## A Traditional Agroforestry Practice in Nepal (2008)

Pandey, Shiva. (2008). Home Garden: A Traditional Agroforestry Practice in Nepal.

More than 80% populations of the country are involved on agriculture based profession in Nepal. Nepalese farmers have cultivated trees on farm from time immemorial and these practices are dubbed as agroforestry. However, Farmers of Nepal have been practicing different agroforestry models in different geography and locality. Home garden is more popular agroforestry model compared to other practices and is common practice in all most locality in Nepal. This case study is prepared on the basis of primary information and secondary information. Components, practices, socio-economic benefits, species conservation and sustainability aspects were analyzed in this study. "Home garden is practiced as a mixture of crops (mostly vegetables, herbs, NTFPs), trees (fruit and or fodders trees), and provide diversify products to the cultivators. The study found 131 species of crops are maintained in home garden. It has played a crucial role in the improvement of the livelihoods of small scale farmers and disadvantaged families in the rural areas. Home garden has helped to conserve many species in a small areas with providing diversify needs to the farmers. This practice is important to fulfill nutrients, foods, fuel wood, fire wood and fodder. Besides, this practice provides place for species conservation and may helpful for better ecological functioning in mean time.

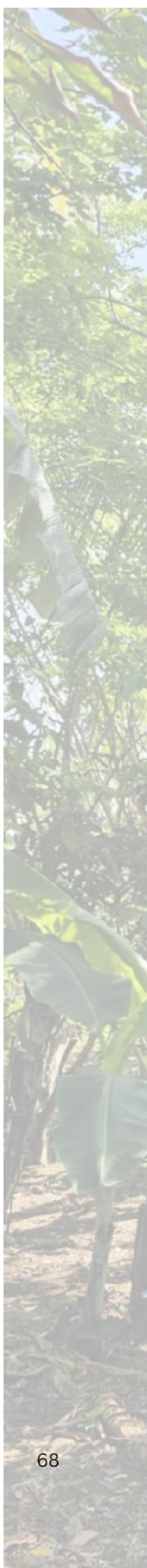
Shankarnarayan, K. A., Harsh, L. N., & Kathju, S. (1987). Agroforestry in the arid zones of India. *Agroforestry Systems*, 5(1), 69–88. doi:10.1007/bf00046414

The arid regions of India cover over 300,000 km<sup>2</sup> and are spread over six States, mostly in the northwestern parts of the country. In spite of the hostile environmental conditions, several indigenous agroforestry practices are being practised in this region. The Central Arid Zone Research Institute (CAZRI) has made considerable progress in improving these indigenous practices and also developing new land use technologies some of which involve agroforestry approaches. Notable among these include sand-dune stabilization, shelterbelt plantations, tree planting techniques in difficult land forms, silvopastoral and agrisilvicultural systems, introduction and improvement of fruit trees and other indigenous trees, etc. Some of these technologies are adopted on a large scale by farmers in the arid zone of India, and have attracted international attention in other arid parts of the world. This paper is a summary of the results of these agroforestry initiatives of CAZRI.

## Microclimate management by traditional farmers (1972)

Wilken, G. C. (1972). Microclimate Management by Traditional Farmers. *Geographical Review*, 62(4), 544. doi:10.2307/213267

Fluxes of energy, heat, and moisture that produce distinctive crop microclimates are controlled by surface shade, albedo, conductivity, and geometry. Traditional farmers use vegetation, tillage systems, mulches, and man-made structures to modify surface characteristics and thus the microclimates. Windbreaks and groundcovers protect plants from the mechanical forces of wind and rain or hail and inhibit dispersal of natural or modified microclimates. Although descriptive evidence of climate management by traditional farmers is abundant, quantitative data to evaluate the effectiveness and the extent of particular practices are scarce. Nevertheless, climate should be added to the list of environmental factors over which traditional farmers exercise significant control.



## Climate variability and adaptation of homegardens in South Asia: case studies from Sri Lanka, Bangladesh and India (2018)

Marambe, B., Weerahewa, J., Pushpakumara, G., Silva, P., Punyawardena, R., Premalal, S., Miah, M.G., Roy, J., & Jana, S.K. (2018). Climate variability and adaptation of Homegardens in South Asia: case studies from Sri Lanka, Bangladesh and India. *Sri Lanka Journal of Food and Agriculture*.

This study assessed the climate variability, vulnerability of Homegardens (HG), and elements that influence the adaptation decisions of homegardeners in selected regions in South Asia. Study sample comprised 148 HGs in three sites in Sri Lanka, 120 HGs in Bangladesh and 100 HGs in India. Variability in temperature and rainfall in the sites from 1961 to 2010, and changes in the onset of cultivating seasons during two decades (1991-2010) were analyzed. The socio-economic data of the homegardeners, agronomic data of HGs, diversity of trees and farm animals, and adaptation strategies used in HGs for perceived variability in climate during 1991-2010 were collected using a questionnaire survey. The annual rate of rise in night-time minimum temperature in the three Sri Lankan study sites (0.012 to 0.022 °C;  $R^2 = 0.251$  to 0.589;  $p < 0.05$ ) and in the Indian study site (0.041 °C;  $R^2 = 0.324$ ;  $p < 0.05$ ) more pronounced than the increase in day-time maximum temperature. The average annual day-time minimum and maximum temperatures in Bangladesh study site did not show a significant variation ( $p > 0.05$ ). The annual cumulative rainfall did not reveal any discernible trend in all study sites ( $p > 0.05$ ). From 1991-2010, 85 % of Maha seasons in Sri Lanka (September to February) have not been set on time ( $p < 0.05$ ), whereas in Bangladesh and Indian study sites, the onset of the majority of cultivating seasons was not delayed. The HGs in Sri Lankan sites were mainly crop-based while those from India and Bangladesh had a rich blend of crops and farm animals. The homegardeners have made changes to planting dates of annual crops, agronomic practices, technology used (new annual crop varieties and irrigation equipment) and soil and water conservation measures to adapt to climate variability. Probit analysis showed that the type of employment, age, education level of the household head, experience in farming, HG size (extent), presence of farm animals and tree density of the HGs have significantly influenced the decision of homegardeners to adopt any adaptation strategy. Homegardeners who perceived climate variability were more adaptable and adaptation strategies were location specific.

## Enhancing the resilience of food production systems for food and nutritional security under climate change in Nepal (2022)

Neupane N, Paudel S, Sapkota R, Joshi YP, Rijal Y and Chalise A (2022) Corrigendum: Enhancing the resilience of food production systems for food and nutritional security under climate change in Nepal. *Front. Sustain. Food Syst.* 6:1067707. doi: 10.3389/fsufs.2022.1067707

**Background:** Climate change in Nepal has posed a considerable challenge to agricultural productivity and has threatened food and nutritional security at multiple levels. This study aims to assess the impacts of climate change on national food production and food and nutritional security as well as document issue-based prioritized adaptation options for a resilient food production system.

**Methods** This study considers temperature, precipitation, and their anomalies as the key factors affecting food production in Nepal. Nationwide precipitation trends along with their association with the annual production of major cereal crops in Nepal were assessed using data from the last three decades (1990–2018). The annual productions of the major cereal crops were summed and normalized to calculate production index scores in the districts. Scores were plotted and visualized into maps using the R programming. In three ecological regions, the distribution of flood and extreme rainfall events and cases of malnutrition from 2005 to 2018 were plotted. The effects of climate change and highest priority adaptation options at the district level were documented through a review of national policies and literature studies and qualitative research based on Focus Group Discussions (FGDs)

**Results:** Between 1990 and 2018, the overall average production of major cereal crops in Nepal was increased by around 2,245 MT annually. In the district level index analysis, the highest production score was found for Jhapa and Morang while the lowest production score was found for Humla. Cases of malnutrition in some districts coincided with flood and heavy rainfall events, indicating that climate change and extreme climatic events have a role to play in food production and security. Growing drought-tolerant crops, changes in crop cycle, riverbed farming practices, and development of short-term strategies, such as contingency crop planning, changing plantation dates, plantation of short-duration varieties, and evacuation schemes. Similarly, long-term strategies, such as encouraging out-migration of population to safer locations, resettlement programs with transformative livelihood options, and sustainable agricultural practices were found to be key prioritized adaptation measures for a resilient food system.

**Conclusion:** In Nepal, climate change and the increasing frequency and magnitude of extreme climatic events adversely affect the food production system, which has become a serious threat to food and nutritional security. The implementation of evidence-based practices to build a resilient food system specific to climate-vulnerable hotspots at the district and local levels is the nation's current need.

## Are homegarden ecosystems resilient to climatic change? An analysis of adaptation strategies of homegardeners in Sri Lanka (2012)

Weerahewa, J., Pushpakumara, G., Silva, P., Daulagala, C., Punyawardena, R., Premalal, S., ... Marambe, B. (2012). Are homegarden ecosystems resilient to climatic change? An analysis of adaptation strategies of homegardeners in Sri Lanka. *APN Science Bulletin*, 2(1), 22–27.  
doi:10.30852/sb.2012.22

Homegarden ecosystems are considered to be resilient to climate change partly due to the use of efficient and effective adaptation strategies by the homegardeners. This study documents the strategies adopted by homegardeners in Sri Lanka and investigates the determinants of the choice of such strategies. Data gathered from household surveys conducted in three selected locations were analyzed to achieve the study objectives. About 52% of the homegardeners in all locations were found to be small-scale farmers (<0.5 ha) engaged in semisubsistence farming over a long period of time. The majority (85%) of them were educated up to the primary (elementary) level. Among the homegardeners, more than 63% in Keeriyagaswewa, 54% in Pethiyagoda and 90% in Siwalakulama have not made any significant changes to the plant, tree and animal composition of homegardens over the past 20 years. A number of adaptation strategies have been used by the homegardeners enabling them to maintain diversity in the homegarden ecosystem. Changes in planting dates (37%), agronomic practices (39%), use of soil and water conservation measures (41%) and technology (55%) such as the use of new varieties and irrigation equipment, were the most commonly-used adaptation strategies. A considerable variation in the type of adaptation strategies across the households was noted. The results of the probit analysis indicate that the type of employment, age, sex, education level of household head, experience in farming, homegarden size, diversity of homegarden measured by the Shannon Weiner Index (SWI) and perceptions towards climate change, significantly influence the decision to adopt a given strategy. The development programmes to promote adaptation to climate change in homegardens should hence be designed taking the above determinants into consideration.

## Homegardens as a multi-functional land use strategy in Sri Lanka with focus on carbon sequestration (2013)

Mattsson, E., Ostwald, M., Nissanka, S.P. et al. Homegardens as a Multi-functional Land-Use Strategy in Sri Lanka with Focus on Carbon Sequestration. *AMBIO* 42, 892–902 (2013). <https://doi.org/10.1007/s13280-013-0390-x>

This paper explores the concept of homegardens and their potential functions as strategic elements in land-use planning, and adaptation and mitigation to climate change in Sri Lanka. The ancient and locally adapted agroforestry system of homegardens is presently estimated to occupy nearly 15 % of the land area in Sri Lanka and is described in the scientific literature to offer several ecosystem services to its users; such as climate regulation, protection against natural hazards, enhanced land productivity and biological diversity, increased crop diversity and food security for rural poor and hence reduced vulnerability to climate change. Our results, based on a limited sample size, indicate that the homegardens also store significant amount of carbon, with above ground biomass carbon stocks in dry zone homegardens ( $n = 8$ ) ranging from 10 to 55 megagrams of carbon per hectare ( $\text{Mg C ha}^{-1}$ ) with a mean value of  $35 \text{ Mg C ha}^{-1}$ , whereas carbon stocks in wet zone homegardens ( $n = 4$ ) range from 48 to 145  $\text{Mg C ha}^{-1}$  with a mean value of  $87 \text{ Mg C ha}^{-1}$ . This implies that homegardens may contain a significant fraction of the total above ground biomass carbon stock in the terrestrial system in Sri Lanka, and from our estimates its share has increased from almost one-sixth in 1992 to nearly one-fifth in 2010. In the light of current discussions on reducing emissions from deforestation and forest degradation (REDD+), the concept of homegardens in Sri Lanka provides interesting aspects to the debate and future research in terms of forest definitions, setting reference levels, and general sustainability.

## Home food gardening in modern cities: advances, issues, and future perspectives (2024)

Xu J, Lin T, Wang Y, Jiang W, Li Q, Lu T, Xiang Y, Jiang J and Yu H (2024) Home food gardening in modern cities: advances, issues, and future perspectives. *Front. Sustain. Food Syst.* 8:1391732. doi: 10.3389/fsufs.2024.1391732

Against the backdrop of the unexpected COVID-19 epidemic, governments are facing significant challenges in mobilizing food resources, particularly fresh products. It is inevitable that there will be intermittent shortages of food during the pandemic. As a result, home food gardening has gained considerable attention from city residents and policymakers in modern cities. This is due to its potential to provide food during humanitarian emergencies and lockdown. Moreover, home food gardening is increasingly becoming a popular recreational activity in many countries, offering therapeutic benefits such as fostering social bonds through knowledge-sharing and fruit-sharing, improving mental and psychological well-being, promoting outdoor physical exercise, and strengthening the connection between humans and nature. This review provides a comprehensive summary of the latest advancements in home food gardening, including cultivated species, devices, technologies, and current issues. It also proposes perspectives based on current researches to serve as a reference for future research and development.

## Landscape character assessment of Pekarangan towards healthy and productive urban village in Bandung City, Indonesia (2022)

Dahlan, Mohammad & Arifin, Hadi & Arifin, Nurhayati & Kaswanto, Regan & Nadhiroh, Siti & Wahyuni, Tutik & Budiadi, Budiadi & Irawan, SNR. (2022). Landscape Character Assessment of Pekarangan towards Healthy and Productive Urban Village in Bandung City, Indonesia. 10.2991/978-94-6463-086-2\_102.

Pekarangan, one of the Indonesian homestead agroforestry systems has been recognized as a small-scale landscape unit that can be developed as a mitigation and rehabilitation area by providing a variety of medicinal plants as well as outdoor activity. Thus, a study of the importance of pekarangan is crucial to identify its utilization and to recommend a landscape management strategy. About 90 pekarangan were identified to elaborate their spatial characteristic. Results show that the limited land is a determining factor to build pekarangan. However, no matter how small the remaining space is potentially functioned as a pekarangan. This finding suggests that the pekarangan can be carried out in a multi-scale landscape. Further, the owner's preference to utilize the remaining limited space with a more productive function is an important direction in the development of the pekarangan for the context of the urban village area. In this case, the production function needs to be strengthened compared to the aesthetic function. Considering the importance of pekarangan landscape, further study is important to proceed the planning and design simulation stage. Through a spatial planning and design approach, it can be developed into design guidelines based on local context and wisdom to be realized in a multi-scale landscape.

## Urban gardening in Ho Chi Minh City: class, food safety concerns, and the crisis of confidence in farming (2022)

Faltmann, N. K. (2022). Urban gardening in Ho Chi Minh City: class, food safety concerns, and the crisis of confidence in farming. *Food, Culture & Society*, 26(4), 927–944.  
<https://doi.org/10.1080/15528014.2022.2142753>

In recent years, the southern Vietnamese metropolis of Ho Chi Minh City has seen a proliferation of urban gardening, ranging from the minute home-growing of herbs and vegetables to commercial urban gardens. In this article, I argue that what underlies these phenomena is urbanites' striving to control the food they consume in light of prevalent food safety concerns in Vietnam. Based on ethnographic research, the article demonstrates that urban food growing efforts are largely related to a widespread crisis of confidence in the food system in general and in farming specifically. People are particularly concerned with agrochemical contamination of food and its long-term health effects. Meanwhile, tensions exist between negative views of "unsafe" practices of unknown farmers and the simultaneous romanticization of rural life and of food acquired through personal rural connections. In the context of growing socio-economic inequalities in the late socialist country, the research also examines how urban gardening as an individualized and middle-class activity renders visible class differences in access to locally produced, "safe" food.

## Pekarangan model for supporting food resiliency on household level in transmigration area, East Lampung (2022)

Ali MS, Arifin HS, Nurhayati, Astawan M. 2022. Pekarangan Model for Supporting Food Resiliency on Household Level in Transmigration Area, East Lampung. *JPSL* 12(3): 522-533. <http://dx.doi.org/10.29244/jpsl.12.3.522-533>.

Pekarangan, as one of the potential natural resources and closest to the family, can be the right and strategic choice to be used in realizing family-scale food resiliency. The research was conducted in the transmigration area of East Lampung from June 2021 to December 2021. The determination of the pekarangan sample by purposive sampling was carried out on four transmigration ethnics, i.e., the Javanese (100 samples), the Sundanese (100 samples), the Balinese (100 samples), and the Madurese (13 population), as well as local transmigration, i.e., the Lampungnese (100 samples). Pekarangan model is determined from species diversities in the agroforestry system and its plant multistorey condition. Species diversities and multistorey conditions are determined by Summed Dominance Ratio (SDR) and an average of the number of species per pekarangan. The results of identification found three agroforestry systems as a pekarangan model, i.e., the agroforest system (Maduranese Pekarangan), agrosilvopastoral (Balinese, Javanese, and Lampungnese Pekarangan), and agrosilvopastoralfishery (Sundanese Pekarangan). Each agroforestry system contributed to food sources by 54,54% (agroforest), 46,15% to 65,51% (agrosilvopastoral), and 89,28% (agrosilvopastoralfishery).

## Surviving in the city through homegardens: A case study of home gardeners in Barangay UP Campus (2017)

Barrameda, Teresita Villamor (2017). SURVIVING IN THE CITY THROUGH HOME GARDENS: A Case Study of Home Gardeners in Barangay UP Campus. Philippine Journal of Social Development 2017 Vol. 9.  
[http://cswcd.upd.edu.ph/wp-content/uploads/2021/10/PJSD-Vol-9-2017\\_Barrameda.pdf](http://cswcd.upd.edu.ph/wp-content/uploads/2021/10/PJSD-Vol-9-2017_Barrameda.pdf)

This article demonstrates the potential of home gardens as a food security strategy that could be adopted by urban residents and as a mechanism that could be integrated in resettlement plans and programs. It examines how gender relations are linked to food security and the right to food, as well as traces the historical development of small-scale home or communal gardens as responses to food insecurity in different localities and time periods. The case study featured in the article surfaces the voices of 13 women and men as they discuss about the economic, social, health, and nutrition benefits of home gardens to their households as well as the problems they face in gardening other peoples' lots. It concludes that home gardens can be a sound strategy for food security in urban communities as well as in resettlements. It also asserts that, for home gardens to be sustainable mechanisms for urban food security, a strong people-government partnership should be forged and the participation of women in decision-making in such partnership should be taken into account since the majority of home gardeners are women.

## Changes in homegardens in relocation villages, a case study in the Baiku Yao area in Southern China (2023)

Hu, R., Xu, C., Nong, Y. et al. Changes in homegardens in relocation villages, a case study in the Baiku Yao area in Southern China. *J Ethnobiology Ethnomedicine* 19, 7 (2023). <https://doi.org/10.1186/s13002-023-00578-4>

### Background

Baiku Yao is an ancient branch of the Yao people in China who have the custom of maintaining homegardens. The local government has relocated some villagers to improve their livelihood. To study the characteristics of Baiku Yao homegardens and the impact of relocation, we conducted an ethnobotanical study on homegardens in the relocated villages of Huaili and Yaozhai and in the ancient villages of Yaoshan and Duonu from January 2019 to May 2022.

### Method

Data on homegarden plants were collected through semi-structured interviews with homegarden households. A total of 4 villages (i.e., two relocated and two ancient villages) were selected for detailed investigation. In each village, 60 homegardens were chosen randomly. In addition, the RFC index and Jaccard value were used to analyze and evaluate the homegarden plants we recorded.

### Result

The study recorded a total of 213 species of homegarden plants with approximately 11 functions. Baiku Yao homegardens are small in size but rich in species and functions, and their utilization efficiency is extremely high. The Jaccard value shows that the homegarden plants in Huaili and Yaozhai have the highest similarity. Neighborhood sharing and market purchasing are the two most important sources of local homegarden plants. Additionally, medicine and food are the two most important uses of homegarden plants. Ornamental plants also play a significant part, especially in relocated villages. The comparisons indicate that the diversity of homegarden plants in the investigated ancient villages is better preserved than in relocated villages. Due to frequent exchanges between the villages and the outside world, Yaoshan Village, as an older relocated village, maintains a good traditional culture in its homegardens. As a newly relocated village, Duonu Community has developed a complicated homegarden system with only much less plant diversity. The development of local tourism has also impacted the composition of homegarden plants. The study found that plants such as *Zea mays*, *Morus alba*, and *Capsicum annuum* are closely related to local life and livelihood.

### Conclusion

The traditional knowledge of homegarden plants in investigated ancient villages maintained good diversity and has been affected much less by the modernization and tourism industry development compared to the relocated villages. The composition of homegarden plants is closely connected to the local livelihood. In the future development of Baiku Yao communities, protecting homegarden plant diversity and functional diversity is crucial.

## Sowing seeds of empowerment: effect of women's home garden training in Bangladesh (2015)

Patalagsa, M.A., Schreinemachers, P., Begum, S. et al. Sowing seeds of empowerment: effect of women's home garden training in Bangladesh. *Agric & Food Secur* 4, 24 (2015). <https://doi.org/10.1186/s40066-015-0044-2>

### Background

There is a lack of scientific evidence that home gardens contribute to women empowerment, which eventually leads to greater gender equality, although it is generally assumed that they do. Using data from poor rural households in Bangladesh, this paper analyzes if and how women's training in home gardening and nutrition empowers women. The study used a mixed methods approach, combining statistical analysis of quantitative data for 456 women with content analysis of qualitative data from in-depth interviews.

### Results

The results show that home garden training is popular and widely accepted by both men and women largely because it does not contest existing socially constructed gender roles. Nevertheless, we find clear signs of increased control by women over food supplies and income, and gains in women's self-confidence and role in the community—as husbands and outsiders begin to recognize their agricultural skills. However, such improvements have been gradual rather than radical. Many men and women appreciated the new opportunity to work together on something of common interest that advanced their quality of life.

### Conclusion

The evidence presented shows gradual but clear signs of women empowerment as a result of training in home gardens and nutrition.

## The dynamic nature of community gardens through history: a literature review (2022)

Salteras, M., Gonsalves, J., Monville Oro, E., Santos-Anunciado, M.S., and Hunter, D. (2022). *The Dynamic Nature of Community Gardens Through History: A Literature Review*. Silang, Cavite, Philippines: International Institute of Rural Reconstruction.

### Introduction

Around the globe, rapid urbanization has created challenges in ensuring access to nutritious and affordable food, as well as protecting green spaces (Guitart et al., 2012). Community gardens have emerged as dynamic spaces that address these issues while offering promising outlooks for the future of food security and sustainable urban development (Burt et al., 2020; Guitart et al., 2012). Since their inception, community gardens have undergone significant evolution. Today, they are regarded as epicenters for building community capacity, inspiring sustainable food systems, and facilitating social empowerment.

However, community and allotment gardens originated as mitigation strategies during times of crisis, rather than as innovative, sustainable solutions for enhancing urban and peri-urban landscapes (Birky, 2009). This literature review aims to highlight the importance of community gardens in urban and peri-urban spaces by examining their roles in food sovereignty, community empowerment, social protection mechanisms, and humanitarian work. It does so by analyzing the literature on the origins, development, and current status of community gardens worldwide.

### Conclusion

Community gardens have a rich history of adaptation and resilience, evolving over decades to address critical issues like food insecurity, poverty, and social inequity. Initially serving as a source of wartime food aid and hope, they later became powerful tools for empowering marginalized communities of color. These gardens facilitated self-sufficiency and food sovereignty, particularly for displaced populations, providing not only sustenance but also a sense of agency and belonging.

Throughout history, community gardens have played a transformative role in national food systems, particularly in times of crisis. They became a framework for food resilience, demonstrating how localized, grassroots efforts could contribute to sustainable solutions during periods of struggle. This adaptability has allowed community gardens to remain relevant in addressing contemporary challenges such as rapid urbanization. By reclaiming abandoned spaces and fostering community participation, these gardens enhance both natural and social capital, creating vibrant, productive public spaces.

Opening these shared spaces fosters collaboration, promotes spatial justice, and helps ensure a more equitable distribution of resources and social outcomes. Whether in urban neighborhoods, refugee facilities, or other contexts, the flexibility of the community garden model makes it a source of innovation, hope, and healthier futures. Despite evolving applications, the core purpose of community gardens remains steadfast: uniting communities and providing local food and social empowerment to all who partake.



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## Home garden interventions in crisis and emergency settings (2023)

Baliki G, Weiffen D, Moiles G and Brück T (2023) Home garden interventions in crisis and emergency settings. *Front. Sustain. Food Syst.* 7:1138558. doi: 10.3389/fsufs.2023.1138558

Home gardens are a key source of food security and micronutrient-rich fruits and vegetables and are promoted by aid organizations to help households cope in humanitarian emergencies. However, there is a strong divide between the popularity of home gardens among practitioners and the academic evidence of its nutritional, economic, social and political outcomes. This review provides a comprehensive summary of the evidence about home garden interventions in crisis settings using a three-pronged approach, triangulating evidence from academic literature, expert discussion (World Café) and a practitioner survey. Our findings show a significant gap between existing research evidence on one hand, and the needs and current practices on the other, particularly where theories and impact pathways of home garden interventions might not hold in crises-affected settings.

## Home gardens can be more important than other urban green infrastructure for mental well-being during COVID-19 pandemics

Marques P, Silva AS, Quaresma Y, Manna LR, de Magalhães Neto N, Mazzoni R. Home gardens can be more important than other urban green infrastructure for mental well-being during COVID-19 pandemics. *Urban For Urban Green*. 2021 Sep;64:127268. doi: 10.1016/j.ufug.2021.127268. Epub 2021 Jul 29. PMID: 34493938; PMCID: PMC8414053.

The current COVID-19 pandemic is a major threat to human populations. The disease has rapidly spread, causing mass hospitalization and the loss of millions of people mainly in urban areas which are hubs for contagion. At the same time, the social distancing practices required for containing the outbreak have caused an eruption of mental illnesses that include symptoms of depression, anxiety and stress. The severity of such mental distress is modulated by the context of media coverage and the information and guidelines from local health authorities. Different urban green infrastructures, such as gardens, parks, and green views can be important for mitigating mental distress during the pandemic. However, it is unclear whether some urban green infrastructures are more efficient than others in reducing mental distress or whether their effectiveness changes with the context. Here we assess the relative importance of different urban green infrastructures on the mental distress of residents of Rio de Janeiro, Brazil. We show that although urban parks and green views are important, home gardens are the most efficient in mitigating mental distress. This is likely related to the practice of self-isolation seen for the residents of Rio de Janeiro. Information on the efficiency of different urban green infrastructures in mitigating mental distress can be important to help guide programs to inform the public about the best practices for maintaining mental health during the current outbreak. This can also help planning cities that are more resilient to future pandemics.

# Findings and Recommendations



# Key Findings

- Proximity to dwellings, diversity of plants, and minimal external inputs are common descriptions of home gardens.
- There is no universally accepted or standard classification of home gardens. Frequent classifications include: size, structure, ecological types (tropical and temperate), main functions and main species (with fruit trees, with pond and covered livestock area, with vegetables, and with forest trees), socio-economic value (subsistence and budget).
- Access to home gardens increases food security and dietary diversity for landless households.
- Increased crop diversity in home gardens improves dietary diversity.
- Notably, the benefits of on food security and dietary diversity was greater for landowners with wider land areas.
- Home garden promotion among vulnerable poor households improved food security and dietary diversity, which in turn, leads to better nutritional status.

## Overarching multi-functional roles of home gardens

- **Nutrition.** Home gardening increases diversity of food intake leading to effective consumption of nutrients. Incorporating vegetables in meals make dishes more appetizing leading to increase food intake and better-quality diets. It is effective in addressing numerous micronutrient deficiencies and seasonal availability of vegetables and fruits.
- **Agrobiodiversity** within a home garden system provides more stability of yield and promotes sustainable practices as dependency on external farm inputs is decreased.
- **Genetic biodiversity conservation.** Home gardens serve as germplasm banks for conservation, which further broadens their utility for nutritional and medicinal purposes. Higher genetic diversity ensures the continuous survival of multiple species.
- **Climate change adaptation.** In urban areas, home gardens provide cool environments and reduce heat island effect. During extreme weather conditions, the diversity of home garden species offers physical and socio-economic protection. Home garden systems also enhance microclimate regulation, with trees acting as barriers from strong heat and winds.

- **Nature-based Solutions.** Tribal home gardens serve as socio-ecological solutions and Nature-based Solutions (NbS) for climate change adaptation and sustainable development in protected areas like forests.
- **Women empowerment.** Home garden systems have been linked to women's empowerment, as evidenced by increased control over food supplies and income, as well as enhanced self-confidence and community participation.
- **Humanitarian aid.** The role of community gardens in humanitarian efforts for internally displaced people - either by pandemic outbreaks, climate change, peace and security risks - offers opportunity in alleviating their environmental and social security conditions.
- **Livelihood.** Fruit, vegetable, animal production from home gardening serve as an important source of income to poor rural and urban households.
- **Therapeutic value.** Home gardening offers therapeutic value by improving physical and psycho-social well-being, especially during pandemics and in times of social conflict. Social interactions between home gardeners foster a sense of solidarity and community as they share knowledge, experiences, and resources (seeds, produce, etc.). Additionally, home gardens provide green spaces in urban areas that reduce heat island effect and enhance well-being.
- **Cultural value.** Home gardens are sites where ethnobotanical knowledge, customs, traditions, as well as aesthetic and species diversity preferences are actively preserved.

### Effectivity period of home garden intervention

- The positive impact of home gardening interventions persisted for at least six years, though with a gradual decline in size and significance.
- Women's control over home gardens was notable in the third year of interventions but diminished by the sixth year.

### Bioavailability of animal food

- Animal foods are a good source of micronutrients. Their bioavailability is better than that of micronutrients of vegetables.

## Suitability of interventions under different conditions

- Home garden interventions are complex with varying models and designs. However, research evidences on which designs are more suitable remain limited.
- Replication of integrated home garden interventions involves the combination of training in gardening, nutrition education, behavior change communication, and the provision of agricultural inputs such as quality vegetable seeds. A failure to understand the local and cultural context of the community results to low beneficial impact.

## Barriers to home gardening success

- Lack of land, water, capital, labor, access to nutrition education, extension communication, stakeholder interest, and cultural preference were identified barriers to successful home garden development programs.
- Challenges persist due to uncertainty in land use planning influenced by key stakeholders.
- Land challenges include ownership disputes, which discourage land owners from temporarily allowing home gardening in unused and underutilized urban or rural lands.

# Recommendations

## Research focus

- Identifying which naturally occurring species are most likely to do well in local home gardens based on horticulture, local preferences, diets and markets.
- Measuring and analyzing the costs and benefits of home gardening interventions can standardize monitoring. By comparing their effectiveness, appropriate models for each local context can be determined.
- Ethnobotanical studies on traditional management practices within home gardens is further needed to properly preserve traditional knowledge and uncover its scientific significance for sustained practice.
- Focusing more on spatial dynamics of home gardens than with temporal scale, specifically of large-scale home garden systems as nature-based solutions, presents opportunity for comprehensive research.

## Intervention pathways

- During implementation, adapting to local conditions based on feedback from the ground is an integral component of program intervention.
- The incorporation of fruit trees as part of the intervention ensures the program's sustainability.
- Demonstrating and communicating the value of money saved from not having to buy food from external sources may encourage sustained home gardening practices.
- Building on indigenous knowledge offers a deeper understanding of gardening practices and constraints towards designing appropriate improvements.
- Blending agriculture with biodiversity conservation and diversification is crucial in fostering resilience within indigenous socio-ecological system (SES).
- Participatory appraisal assessment within the participating households aids in identifying perceived risks to derive appropriate technical solutions to biophysical, agronomic and economic constraints.

- The integration of nutrition education and communication ensures that home gardens are able to provide a whole-year supply of nutritious food compatible with local preferences and culture in mind.
- The promotion of economic benefits of home gardening (such as food provision, income generation, the production of value-added products, fruit and vegetable processing) enhances the continuous adoption of home gardening interventions.

### **Policy support**

- Integration of food security and nutrition strategy in national and local development plans involves communication and synergy among health, education, natural resource, and agriculture sectors, private and public institutions, and non-government organizations. There is a need to strengthen policy support in these key areas, especially in the water and land use sectors to secure a community's right to food.

### **Refresher training**

- To understand the dynamics of women's control throughout implementation, it is essential to identify the factors contributing to its decline as programs near completion.
- A refresher training after 5 or six years is recommended to create a sustained impact on socio-economic and nutritional outcomes.

### **Animal husbandry integration**

- Integrating animal husbandry and fish into home gardening program provide access to micronutrient and better bioavailability animal food sources.

### **Seed production and marketing**

- Establishing stronger linkages with commercial seed producers improves nursery owners access to a good market for selling part of the seeds produced.

## Women, children, and elderly engagement

- Understanding the roles of women, children, and the elderly in home gardening as a family activity, along with regional and cultural variations, is essential for promoting home gardening and empowering women and disadvantaged groups.
- Incorporating the knowledge of women and the elderly enhances the effective use of garden income and facilitates the transfer of indigenous knowledge to future generations. Their collective contributions significantly improve family welfare and empowerment.

## Local perceptions and practices

- Identifying local barriers to improving diets through home garden interventions helps inform effective design, adaptation strategies, and the selection of suitable participant populations.
- Understanding local people's perceptions and practices regarding home gardens is crucial in unlocking how key differences in gender roles, food attitudes and practices, and food environments affect the role of home gardens.

## Land use access

- Utmost care must be practiced in spatial planning to open spaces for home and communal gardening as allocating land has significant social and political implications.



# Tropical Home Gardens:

**Biodiverse, Climate-resilient and Nutrition-sensitive  
Forms of Agriculture**

**A Compilation of Abstracts**

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