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An Investigation of Constraints Experienced by Homegarden Farmers of Coastal Agro-Ecological Units of Southern Kerala

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Homegardens or homesteads represent a promising land use system and are common in Kerala, where the average size of farm households is small. The present investigation was carried out in the coastal homegardens of three selected panchayaths of Southern Kerala during 2021-22 to measure the constraints perceived by the coastal homegarden farmers. A total of 105 homegardens were included in the sample, with 35 homegardens purposefully selected from each identified panchayat. Farmers were interviewed using a structured interview schedule containing both open and closed-ended questions to understand the constraints. The constraints were then ranked based on the total scores obtained by summing up the individual scores for each constraint. These constraints were categorized into five main groups: Economic, Personal, Technology, Physical, and

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Other Constraints. Among these, "Lack of scientific knowledge," "Salinity," and "Flooding" were identified as the most critical constraints. Furthermore, the farmers provided valuable suggestions to address these constraints. These recommendations emphasized the development of tailored practices for coastal home gardens, the need for support from extension agencies, collaborative technology development, integration of traditional and scientific approaches, the establishment of market connections, the creation of accessible input centres, and the promotion of Farmer Producer Organizations (FPOs). These suggestions highlight crucial areas for future action and development, potentially enhancing the sustainability and productivity of coastal home gardens in Southern Kerala, benefiting both farmers and the broader community.

Keywords: Home gardening; constraints; coastal homegardens; agro-ecological units; agriculture.

1. INTRODUCTION

Homegardens (HGs) are recognized as one of the most ancient and intricate land-use systems, having evolved over generations in various regions worldwide, particularly in tropical areas [1,2]. They serve as a significant form of sustainable agriculture and food production, primarily for subsistence, and are practiced by diverse cultural and ethnic communities globally. The coastal region of Kerala, spanning over 560 km and constituting approximately 15% of the state's total land area, is home to a population density higher than the state average, with 1500 persons per square kilometre [3]. Livelihoods in this region are intricately tied to fishing and are notably vulnerable to climate fluctuations across seasons [4]. Coastal inhabitants face challenges such as low crop productivity, adverse climatic conditions, prolonged submergence, salinity, rising sea levels, poor soil quality, and hydrological issues [5]. Despite the prevalence of coconut-based homegardens, the region encounters difficulties that include unpredictable lean seasons, exacerbating the challenges faced by these communities [3,6]. The abiotic stresses coastal soils endure, such as salinity, acidity, waterlogging, and sandy texture, further compound the issues faced by homegarden farmers [5].

Sustainability in livelihoods is achieved when communities can endure and recover from external stresses or shocks without depleting the natural resource base, both in the present and for future generations [7]. To expedite the progress of homegarden cultivation and meet the escalating demand for safe and nutritious vegetables, it is essential to identify the issues encountered by farmers and take necessary steps to address them [8,9]. Despite the implementation of numerous programs aimed at enhancing homegarden productivity, a gap in their effectiveness persists. Constraint analysis proves to be an appropriate method for understanding the challenges faced by homegarden farmers and their perceived requirements [10]. Therefore, understanding the issues and solutions offered by homestead vegetable growers, including insights from researchers like Allan Thomas from Kerala Agricultural University, can aid policymakers and authorities in refining existing policies, as well as in planning and designing new programs to empower these coastal communities.

2. METHODOLOGY

The research focused on the coastal Agro-ecological units of Southern Kerala, specifically targeting three distinctive areas: AEU 1 - Southern coastal plains, AEU 3 - Onattukara sandy plains, and AEU 4 - Kuttanadu. Panchayats with the highest number of functional coastal home gardens were purposively chosen from each agro-ecological unit, namely Edava in AEU 1, Alappadu in AEU 3, and Purakkadu in AEU 4. The primary objective was to gain insights into the challenges faced by coastal home garden farmers and understand the constraints affecting their livelihoods. To ensure a representative sample, a comprehensive list of home garden farmers with a minimum of 25 cents of land in each selected panchayat was methodically prepared in consultation with Krishibhavans in the respective study area. Subsequently, 35 home gardens were selected from each identified panchayat, resulting in a total sample size of 105 homesteads. This approach aimed to capture a diverse range of experiences and challenges within the coastal home garden farming community. For data collection, a well-structured interview schedule was developed to assess the constraints encountered by the respondents. The schedule was crafted through discussions with local farmers, incorporating their perspectives, and leveraging insights from an extensive review of

relevant literature and discussion with extension experts. The questions covered economic, personal, technological, and physical constraints, as well as other miscellaneous challenges faced by coastal home garden farmers. To gauge the intensity of these constraints affecting homestead vegetable cultivation, a ten-point continuum scale was employed during interviews. This scale ranged from 1 (representing the least important constraint) to 10 (indicating the most critical constraint). The respondents provided their ratings for each identified constraint. Recorded responses were aggregated, and the total score for each constraint was calculated, allowing for a comprehensive understanding of the perceived severity of each challenge.

3. RESULTS AND DISCUSSION

Homegardens are distinctive farming systems managed by families, either independently or with the help of hired labour. These families typically engage in various farming activities and encounter various challenges along the way [11]. Tables 1 and 2 provides a comprehensive breakdown of the constraints faced by coastal homegarden farmers. These constraints are categorized into four main groups: Economic, Personal, Technology, Physical, and a catch-all category labelled "Others." Each constraint was assigned a score, which reflects its perceived impact or severity, and a rank, indicating how each constraint compares to the others in terms of significance.

Table 1. Constraints experienced by the coastal homegarden farmers N=105

Constraints	Score	Rank Over Class	Rank Over Total
Economic constraints			
Labour cost	772	3	18
High cost of inputs	860	2	14
Price fluctuations	875	1	12
Mean Total	**835.67**		
Personal constraints			
Lack of motivational factors	794	3	17
Lack of time in homegarden activity	703	4	22
Lack of supervision	866	2	13
Lack of knowledge in plant protection chemicals	960	1	5
Mean Total	**830.75**		
Technology constraints			
Plant protection methods are not effective in their recommended dosages	969	2	4
Difficulty in finding dosage of chemicals	741	3	20
Varieties are less resistant to salinity, pests and diseases	729	4	21
Lack of scientific knowledge	1031	1	1
Mean Total	**813.00**		
Physical constraints			
Non availability of labour on time	762	7	19
Difficulty in finding alternate plant protection methods	900	4	9
Non availability of supply and services	885	5	10
Non availability of plant protection chemicals required time and quantity	882	6	11
Lack of proper drainage	916	3	7
Salinity	1010	1	2
Flooding	1008	2	3
Mean Total	**909.00**		
Others			
Low research thrust and funding from the government	908	2	8
Climate change	948	1	6
Lack of proper information sources to deliver the latest plant protection technology	858.00	3	15
Lack of follow up activities by officials	824	4	16
Mean Total	**884.50**		

Table 2. The average score of constraint categories

Constraint	Mean Total Score	Standard deviation	Standard error
Economic constraints	835.67	3.33	0.32
Personal constraints	830.75	4.00	0.39
Technology constraints	813.00	5.12	0.50
Physical constraints	909.00	5.84	0.57
Other constraints	884.50	4.66	0.45

Fig. 1. Constraints experienced by the coastal homegarden farmers

Tables 1 and 2 provides a comprehensive breakdown of the constraints faced by coastal homegarden farmers. These constraints are categorised into four main groups: Economic, Personal, Technology, Physical, and a catch-all category labelled "Others." Each constraint was assigned a score, which reflects its perceived impact or severity, and a rank, indicating how each constraint compares to the others in terms of significance.

A brief examination of Table 1 revealed that, among the top four constraints, lack of scientific knowledge (1031) ranked first followed by salinity (1010), flooding (1008) and ineffectiveness of plant protection methods at recommended dosage (969). Other major constraints include lack of knowledge in plant protection chemicals (960), climate change (948) and lack of proper drainage (916) in the decreasing order of importance.

Based on the mean total score of constraint categories, it can be observed that the most important constraints experienced by coastal home garden farmers are Physical Constraints (909), ranked highest), followed by Other Constraints (884.5), Technology Constraints (813), Economic Constraints (835.67) and Personal Constraints (830.75, ranked lowest).

3.1 Economic Constraints

Table 1 outlines the economic challenges experienced by coastal home garden farmers, offering a nuanced understanding of their impact. Noteworthy among these challenges is the "High cost of inputs," ranking 14th overall with a substantial score of 860. This underscores the financial burden borne by farmers in procuring essential agricultural inputs such as seeds, fertilizers, and tools. Additionally, "Price fluctuations," securing the 12th position with a

score of 875, accentuates the volatility in market prices, posing challenges to farmers' financial stability. The concern over "Labour cost," positioned 18th with a score of 772, underscores the financial strains associated with labour expenses. These economic constraints align with the findings of Gedam and Singh [12], emphasizing the financial intricacies in agricultural practices, particularly in contexts similar to orange farming.

3.2 Personal Constraints

Personal constraints, encompassing factors related to motivation, time management, and knowledge, add another layer of complexity to coastal home garden farming. "Lack of knowledge in plant protection chemicals" emerges as a substantial constraint, ranking 5th with a high score of 960. This underscores the critical need for enhanced information and training in the effective management of plant protection. Moreover, "Lack of supervision" and "Lack of motivational factors" securing the 13th and 17th positions, respectively, emphasize the pivotal role of guidance and support in the efficient management of homegardens.

3.3 Technology Constraints

In the realm of technology, "Lack of scientific knowledge" takes precedence, ranking first with a score of 1031. This accentuates the paramount significance of scientific understanding in coastal home garden farming. Challenges such as "Difficulty in finding alternate plant protection methods" (ranked 9th), "Non-availability of supply and services" (ranked 10th), and "Non-availability of plant protection chemicals required time and quantity" (ranked 11th) further underscore the intricate technological landscape faced by farmers. Additionally, concerns regarding the efficacy and dosage of plant protection methods are evident, as reflected in the lower ranks of "Plant protection methods are not effective in their recommended dosages" (ranked 4th) and "Difficulty in finding dosage of chemicals" (ranked 20th), signifying their heightened significance.

3.4 Physical Constraints

Coastal home garden farmers contend with significant physical constraints primarily linked to environmental factors. "Salinity" (ranked 2nd) and "Flooding" (ranked 3rd) emerge as the most severe challenges, highlighting the adverse impacts of coastal environments, especially saltwater intrusion and flooding. "Lack of proper drainage" (ranked 7th) emphasizes the critical importance of robust water management and drainage systems. Furthermore, "Non-availability of labour on time" (ranked 19th) underscores the challenge of securing timely labour support, adding another layer to the physical constraints faced by coastal farmers.

3.5 Other Constraints

The "Others" category encapsulates a diverse range of challenges. "Low research thrust and funding from government" (ranked 8th) signals the need for increased support and investment from governmental authorities. "Climate change" (ranked 6th) highlights the vulnerability of coastal homegardens to changing climatic conditions. Additionally, "Lack of proper information sources to deliver the latest plant protection technology" (ranked 15th) and "Lack of follow-up activities by officials" (ranked 16th) underscore the importance of information dissemination and administrative support. These observations align with the findings of Patil et al. [9], emphasizing the broader societal and environmental challenges faced by coastal home garden farmers.

Addressing these multifaceted constraints is crucial for bolstering the resilience and sustainability of coastal homegardens, thereby ensuring food security for the communities reliant on them.

3.5.1 Suggestions for refinement as perceived by coastal homegarden farmers

The suggestions put forward by farmer respondents for overcoming the constraints are given in Table 2.

Table 3 reflects the views and preferences of respondents, primarily related to improving the agricultural practices and conditions of coastal home garden systems. It's evident that the majority of respondents see value in tailored practices, extension agency support, collaborative technology development, integration of traditional and scientific approaches, market connections, accessible input centres, and the promotion of FPOs. These suggestions highlight key areas for action and development to enhance the sustainability and productivity of coastal home gardens in Southern Kerala.

Table 3. Suggestions for refinement as perceived by coastal homegarden farmers N=105

Sl. No.	Suggestion	Frequency	%
1.	Development of a package of practices in tune with the coastal home garden systems	99	94.29
2.	Follow-up and assistance by extension agencies on the adoption of recommended scientific practices	96	91.43
3.	Participatory technology development between the extension unit and the farmers	91	86.67
4.	Inclusion of traditional farmer practices and developing a unified mix of scientific and farmer practices	88	83.81
5.	Inclusion of market cluster to increase profit and to reduce the risk	87	82.86
6.	Setting up input centres near to the farm to ensure the availability of technologies to the farmers	82	78.10
7.	Promotion of FPOs for post-harvest handling and marketing	79	75.24

1. Development of a Package of Practices in Coastal Home Garden Systems:

This suggestion, supported by an overwhelming 94.29% of respondents, emphasizes the need for a tailored package of practices to address challenges unique to coastal home garden systems. This package would provide comprehensive guidelines for crop selection, planting techniques, irrigation, pest control, and other practices customized for coastal environments [13]. In the context of global food security challenges and the impending increase in world population, implementing sustainable measures is crucial, especially in the face of climate change and resource degradation. Prevailing adaptation practices in coastal agriculture, such as salt-tolerant crop varieties and innovative water management, provide a foundation upon which the proposed package can build, offering a holistic solution to enhance the resilience of coastal home garden systems [14].

2. Follow-up and Assistance by Extension Agencies on Adoption of Scientific Practices:

With 91.43% of respondents supporting this recommendation, the crucial role of extension agencies in facilitating the adoption of scientifically endorsed practices is evident. Ongoing support is essential for farmers to implement recommended practices correctly. However, challenges such as an imbalanced extension worker-to-farmer ratio and bureaucratic constraints highlight the need for recalibrating extension service delivery models [8]. By optimizing resources, reducing bureaucratic hurdles, and adopting a demand-driven approach, extension agencies can significantly contribute to the sustainable adoption of scientifically endorsed agricultural practices [15].

3. Participatory Technology Development between Extension Units and Farmers:

Endorsed by 86.67% of respondents, the recommendation highlights the importance of collaborative efforts between extension units and farmers in developing and implementing agricultural technologies. Participatory technology development involves a synergistic partnership where farmers actively engage with extension units to conceptualize, test, and refine technologies. Recognizing the vulnerability of coastal regions to climatic stressors, policy initiatives tailored to these areas can substantially enhance adaptive capacity. The integration of participatory approaches in research and development projects facilitates knowledge exchange and collaborative decision-making, enhancing the overall effectiveness of agricultural extension initiatives. Area-specific policies can substantially enhance adaptive capacity to climatic impacts [16], while also aligning with other inter-sectoral issues pertinent to the country's sustainable development planning [17].

4. Inclusion of Traditional Farmer Practices and Unified Mix with Scientific Practices:

Supported by 83.81% of respondents, this proposition advocates for integrating traditional farming practices with contemporary scientific approaches. This collaborative approach aims to blend the time-tested knowledge inherent in

traditional practices with modern methodologies, fostering a holistic framework for farming [18]. Traditional practices play a crucial role in sustaining community livelihoods and fortifying landscape resilience against climate change [15]. Recognizing the complementarity of traditional and scientific knowledge systems is essential for devising comprehensive and sustainable strategies that address the complexities of modern agriculture while preserving the invaluable insights embedded in traditional farming practices [19].

5. Inclusion of Market Cluster for Increased Profit and Risk Reduction:

This recommendation, backed by 82.86% of respondents, emphasizes the importance of establishing market linkages and creating clusters to enhance profitability and mitigate risks associated with marketing agricultural products [20]. Connecting farmers with market clusters contributes to a more efficient and profitable agricultural supply chain [21]. The significance of cluster structures extends to the development of small economic entities in the agro-industrial complex, promoting interdependence, innovation exchange, and public-private partnerships. Market clustering has the potential to bring about positive transformations in the agricultural landscape, fostering increased profitability and risk mitigation [22].

6. Setting up Input Centres near Farms for Technology Availability:

Endorsed by 78.10% of respondents, this recommendation highlights the critical importance of establishing input centres in close proximity to farms. These centres would provide convenient access to essential technologies and resources, reducing transportation costs and delays [23]. The establishment of input centres near farms emerges as a pragmatic strategy to address the immediate needs of farmers and promote the widespread adoption of advanced agricultural technologies [24].

7. Promotion of Farmer Producer Organizations (FPOs) for Post-Harvest Handling and Marketing

A substantial 75.24% of surveyed respondents endorse the promotion of Farmer Producer Organizations (FPOs) as a strategic approach to streamline post-harvest handling and marketing of agricultural products. Large-scale aggregation within FPOs culminates in economies of scale, leading to a reduction in costs and a concurrent augmentation of bargaining power [25] Viewed as 'engines' of development, farmers' organizations play a transformative role that extends beyond local confines, affording benefits to the broader society [26]. Elevating FPOs can effectively fortify farmers' negotiation capabilities, mitigate post-harvest losses, and enhance overall marketing efficiency, thereby fostering a tangible uptick in income for the farming community (Amritha et al. 2021).

4. CONCLUSION

In conclusion, the study sheds light on the significant challenges faced by coastal home garden farmers in Southern Kerala. These challenges encompass economic, personal, technological, physical, and other constraints, with physical constraints emerging as the most pressing ones. The findings underscore the urgent need for tailored solutions that include scientific knowledge, infrastructure improvements, and the integration of traditional practices. It is imperative to strengthen extension services and promote collaboration between farmers and relevant agencies to overcome these constraints. Regular feedback is essential to fortify existing programs and maximize the benefits for home garden farmers. By heeding the recommendations of home garden farmers, policymakers and authorities can strengthen the resilience and sustainability of these vital agricultural systems, ensuring a more secure future for the communities that depend on them.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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