Plant diversity and area trends in the coconut based homesteads of Kerala

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ABSTRACT

Coconut based homesteads are the most prevalent among homesteads of Kerala. Along with their economic value, they are also known for their plant diversity. This study attempted to study their plant diversity by inventorying 45 coconut based homesteads, in low elevation, medium elevation and high elevation lands in Thrissur district of Kerala. This valuable agricultural system is undergoing radical changes due to high density of population in the state, rising living standards, changing lifestyles and urbanization. The study tried to look at the future of homestead farming system by analyzing the occupational status of the heads of households and temporal changes in area under individual homesteads among a sample of 150 coconut based homesteads. Margalef index for species richness under the surveyed homesteads ranged between 0.31-1.85 which is substantial in comparison to average holding size of less than 0.1ha. The Shannon–Weiner index for evenness ranged between 0.15-2.00 which translates to heterogeneity in spread of species in different homesteads. Major occupation of a wide majority of homestead owners was not agriculture, and the trends in area showed a remarkable decline in the area under individual homesteads. Major function of the homestead was still livelihood support, with other functions like food supplementing, ornamental gardening, recreation and family cohesion maintenance being felt as important by respondents. The study highlighted the potential of homesteads for biodiversity conservation. At the same time it pointed towards the urgent need for promoting development interventions for them, without which this valuable agro ecosystem many soon dwindle beyond repair.

Keywords: Coconut based homesteads, plant diversity, occupation patterns, area trends, functions of homesteads

INTRODUCTION

Homestead farming system is a highly complex and dynamic combination of crops, livestock and other related enterprises for achieving food, nutritional and economic security through the efficient utilization of available resources like land, solar energy, water and manpower. Homesteads or homegardens represent a promising land use system and are common in Kerala, where the average size of farm households is small. Homestead farming has been one of the survival strategies of the traditional farmers of Kerala since time immemorial. Kerala homegardens can be regarded as the most popular and successful integrated farming system model in the state.

Coconut based homesteads are the most prevalent in the state. But most of the farmers have no sustainable livelihood from their small holdings. A combination of two or more interactive farm enterprises in the same unit of land alone can make these small farmsteads' production enough to support a family [1]. Farmers try diversification, but smallness of area stand in way of any substantial livelihood enhancement [2]. Of late, widespread deterioration has occurred in the coconut based homesteads, with roads, housing complexes and other man made structures eating away into the orchards. Even though much media hype is made about this matter, real information

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about the nature of this area reduction and the changes in the occupational patterns of farmers are lacking. A field study covering these aspects was done as part of a KAU plan project on coconut based homesteads.

MATERIALS AND METHODS

Location and sample

For plant diversity analysis three panchayats of Thrissur district were selected. Thrikkur panchayat of Kodakara block representing high elevation lands, Pananchery panchayat of Ollukkara block representing medium elevation lands and Adat panchayat of Puzhakkal block representing low elevation lands were the selected ones, considering the topographic features. From among the three selected Panchayats fifteen homesteads were selected, making a total sample size of 45. These homesteads met with three basic criteria: 1) Having an area 25-50 cents, 2) Representative of the typical homesteads of the area, and 3) Having a resident family. For pattern analyses, five Panchayats in Thrissur District were randomly selected. They were Wadakkanchery, Pullazhi, Madakkathara, Vilvattom and Cherpu. 30 coconut farmers were randomly selected from each of these Panchayats to form the respondents, and thus the sample size was 150.

Methods of data collection and analysis

Plant diversity was estimated using two methods in this study : Margalef Index to assess species richness [3] and Shannon-Wiener Index [4] to assess the species diversity .Species richness was calculated as S-1/Ln (n) [3], where, 'S' is total number of taxa and 'n' is the number of individuals in all species . After obtaining the Margalef Index values for each homestead separately based on elevation they were summed up separately and worked out mean index in order to find out the species richness.

The Shannon-Weiner Index is the most commonly used diversity index in plant communities, and it takes a value of zero when there is only one species in a community, and a maximum value when all species are present in equal abundance. The following equation from [4], which was used for this study, looks at the diversity of those species in the garden that are grown on an annual or perennial basis.

$$H = - \sum_{i=1}^{s} p_i \ln p_i$$

where, S= no: of species, *i*= no: of individuals, p*i*= proportion of species i relative to the total number of species and ln= natural logarithm. H, is the Shannon-Weiner Diversity Index, the proportion of species i relative to the total number of species is calculated and multiplied by the natural logarithm of this proportion. The resulting product is summed across species and multiplied by –1. After obtaining the H values for each homestead separately based on elevation they were summed up separately and worked out mean index in order to find out the species diversity. Changes in occupation patterns and area under individual homegardens were analyzing farmers' perception regarding both. Respondents were also asked to prioritize the functions of homegardens according to the degree of importance as felt by them. Responses were collected through a pretested, structured interview schedule. Personal interviews were conducted for eliciting responses.

RESULTS AND DISCUSSION

Species Richness

The higher the Margalef index, the richer would be the species in the population. The mean values for three types of lands are given table 1. Low elevation lands in general showed the highest richness of species. This indicates higher species count in the low land region which can be attributed to the water availability and better soil fertility of the low lands. The richness values of mid lands and high lands were lower but the difference was small indicating good species richness generally. Mean Margalef Index was 5.74 in large home gardens, as reported by [5] and 4.61-8.31 as reported by [6] in Mudumalai Wild life sanctuary, India. As this study included home gardens of area less than 0.2 ha, it indicates the declining species richness in marginal homesteads.

Shannon-Weiner Index of Diversity

Highest plant diversity was seen in low elevation lands, followed by high elevation lands and medium elevation lands. The low elevation of lands Kerala house the true-to-type of home gardens. The high elevation lands are mostly cultivated with cash crops like rubber by farmers. Home gardens in medium elevation lands are predominantly found with coconut based cropping pattern, with coconuts, arecanuts and few tubers as intercrops. The nature of the predominance of a couple of species in these homegardens makes the values comparable to Shannon Index (2.38) in home gardens less than 1acre [5], and a range of 3.99-4.90 in Mudumalai wild life sanctuary, Western ghats, India [6].

The seasonal vegetables were not included in the Shannon-Weiner diversity tests, because they would not present an accurate estimate of the diversity index for the entire year. As per Shannon tests conducted in the home gardens of Thailand [7], values ranged from 1.9 to 2.7, which are also fairly comparable to the results from this study. In the present study, the higher Shannon Index value reported in the low elevation land category due to even distribution of perennials. Mainly the species diversity does not depend on the total number of individuals it had but it depends on how equally it is distributed.

To look at the temporal dimension, percentage of perennials and seasonals that were grown in homesteads was calculated. From this study it was clear that perennials are predominantly more in the homesteads (66.67%). Seasonals were comparatively less and mostly grown during the rainy periods. Herbaceous and other plants naturally coming up in the homesteads will be cleared by the farmers, considering them as weeds. Therefore from the temporal dimension, the scope for agro biodiversity cannot be considered as very high in the case of homesteads. Main aim of farming was maximization of profits from a limited area of land in the shortest time span. And they expect trees planted on the farm, should ensure ‘‘profitability’’ (44% of the farmers), ‘‘fast growth’’ (37% of the respondents), and ‘‘multifunctionality’’ (fruits for domestic consumption and sale, leaves as green manure, feed for livestock, firewood, and timber for meeting own needs or as a reserve of capital: 28% of the respondents). Such preferences are usually based on the farmers’ economical, ecological, and social value systems this as reported earlier [8] (Table 2).

Area and occupation patterns of farmers in homestead systems

To understand this, respondent homestead farmers were asked about the occupational patterns in their family from the known ancestral generation. The analysis was intended to bring into light the shift of focus in occupation over the generations. The results clearly indicated that from the third generation’s time, up to the current generations time the shift has been more than eight-fold. Only 4% of the coconut growers had other occupation about 60 years ago, where as, in the new generation, 88% had other occupation and engaged in coconut cultivation. For these farmers coconut cultivation is only a subsidiary activity. In the new generation, only 6% of the farmers relied on agriculture as their major occupation. The second analysis tried to look at the shift in area

that has come over coconut based homesteads. The data show that in the case of majority of the coconut farmers the area under coconut has reduced to more than one third of that existed 30 years ago. Only 12% of the homesteads remained more or less the same, in 30 years. 26% of the homesteads had reduced into half their size in the last decade. This is a pointer towards the changing scenario of coconut based homesteads in the state. The analysis is a clear indicator of the shift in occupation from agriculture to other remunerative jobs by once farming families. Looking at the area reduction, it can be seen that during the past decade, it has accelerated. Only 12% of the homesteads retained their original size during the last three decades (Table 3, 4).

Table 1. Mean Margalef index values of species richness.

Species richness	Mean index
High elevation lands	0.80
Medium elevation lands	0.73
Low elevation lands	1.05

Table 2. Mean Shannon-Weiner Index values.

Species richness	Mean index
High elevation lands	1.26
Medium elevation lands	0.82
Low elevation lands	1.56

Table 3. Classification of respondents according to their occupation (n=150).

Persons	Agriculture	Agriculture and other occupation	Other occupation
Grand Father	103	23	24
Father	69	47	34
Self	13	94	43
New Generation	38	15	97

Table 4. Perception of respondents on the shift in area under coconut based homesteads over the years (n=150).

Time	More or Less same	Reduction into half	1/3rd reduction
30 yrs ago	14	54	82
20 yrs ago	23	75	52
10 yrs ago	34	91	25

Functions of homesteads

The respondents were asked to prioritize the major functions of homegardens in a four point continuum ranging from 'most important' to 'least important'. Based on the frequency of responses, weighted scores were arrived at and the functions were ranked. A score of 4 was assigned to 'most important' responses, score of 3 to 'important' responses, score of 2 to 'less important' responses

and 1 to 'least important' responses. The score was multiplied by the frequency under each and summed up to arrive at the weighted score for each function. The priority ranking shows that homestead owners still rely on these systems for livelihood in spite of having diversified into other occupations. There were many other functions, like storage of crops and inputs, role in waste recycling, waste management, simple implements for household use and pet space, which did not quality as majority opinion. But the value of a homegarden is paramount from the expressed opinions of all these respondents alike and they cannot be quantified truly using any measurement tools. The emotional, personal and family value of a homestead is simply beyond the scope of a scientific study (Table 5).

Table 5. Priority ranking of functions of homesteads by farmers (n=150).

Sl. No.	Function
1	Livelihood support
2	Food supplementing
3	Ornamental gardening
4	Source of fuel
5	Recreation
6	Temperature regulation
7	Family cohesion maintenance
8	Source of home remedies
9	Biodiversity conservation
10	Ground water recharge
11	Wind break
12	Soil enrichment
13	Cultural icon
14	Habitat for birds
15	Source of green manure
16	Introduces children to nature

CONCLUSION

Coconut based homesteads of Kerala are under transition. Even though their plant diversity is on the low side, with a view to the small area, homegardeners are still seen to squeeze in many multipurpose species. The occupation pattern of homestead farmers have substantially shifted to non agriculture jobs. Area of the average homegarden has also radically declined. But farmers keep up homestead farming as an alternate and perennial source of livelihood support and value the system highly, due to many reasons. This study highlighted both the positive sides and the challenges faced by homegarden system. On a positive note, even with many odds against the system, homegardens still remain the most significant and viable agricultural system in a fast developing state like Kerala. Main challenges for the system may lie in the changing lifestyles and disenchantment of the young generation with agriculture, both of which can be addressed if this system is recognized as an independent agricultural system in future development plans and policies. Specific interventions and support mechanisms need be designed for homestead farms, irrespective of area, nature of crops and management strategies.

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