CHAPTER 20

WHITHER HOMEGARDENS?

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Abstract. Although homegardens provide sustenance to millions of households in the tropics, their underlying scientific foundations have not been fully explored, and therefore they are not a part of development agendas. While their integrated and complex nature are a challenge to scientific investigations that are often compartmentalized, these very same attributes form the bases of the ecological, economic, and social sustainability of homegardens. In the wake of recent trend towards commercialization and consequent conversion of homegardens to produce market-oriented crops, concerns have been raised about the future of traditional homegardens. Lack of rigorous scientific evidence makes it difficult to make predictions. Nevertheless, experiences about the role and value of homegardens from around the world suggest that homegardens are not on the path to extinction. They will continue to be an essential part of the way of life, but their nature and functions will change in tune with the rapid changes happening all over. The concept of homegardens will increasingly be adopted in urban and periurban areas, not only in the tropics, but also in industrialized societies, reflecting the society's increasing appreciation of traditional values and ecosystem functions.

1. INTRODUCTION

> *"… that whoever could make two ears of corn, or two blades of grass, to grow on a spot of ground where one grew before, would deserve better of mankind and do more essential service to his country …"*
>
> Jonathan Swift

The above quote that I included at the beginning of my first book nearly three decades ago (Nair, 1979) is as apt now as it was then. The subject matter of that book "*Intensive Multiple Cropping with Coconuts in India*," written before the

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advent – or just at the beginning – of "modern" agroforestry, is not very different from the subject matter of this book, i.e., homegardens: multiple cropping with coconuts (*Cocos nucifera*) and other tree crops, now commonly referred to as multistrata agroforestry, is a distinguishing feature of (most) tropical homegardens. What Jonathan Swift envisioned in *making two ears of corn, or two blades of grass, to grow on a spot of ground where one grew before* is exactly what homegardeners have been practicing, especially in the warmer biomes, for centuries, i.e., growing an array of herbaceous species, shrubs, vines, and trees, all in intimate association on the same piece of land around their homes. Yet, these magnificent farming practices and intriguing plant associations are seldom recognized as worthy of consideration in development paradigms and ecological studies, nor are their practitioners treated as "*… better of mankind doing more essential service to their countries …*"

In spite of this apparent neglect of homegardens and homegardeners, the reasons for which have been discussed in several previous writings (Nair, 2001; Kumar and Nair, 2004), the appeal, relevance, and lessons to be learned from this time-tested practice are so overwhelming and fascinating that time and again it attracts the attention of some researchers. For example, publications on homegardens can be found in almost all volumes of *Agroforestry Systems*. While some of them are at best scientific descriptions of a set pattern (characteristics of systems at specific locations), some deal with examining homegardens in the context of current trends and issues in land use systems, such as environmental integrity, carbon sequestration, biodiversity conservation, economic valuation of intangible benefits, and social equity, to name a few. Only very few of these are scientific analyses, however. Nevertheless, all such publications – old and new – on homegardens have had only "good things" to say about the practice: irrespective of its focus – be it C sequestration, biodiversity, soil fertility, or whatever – the study will have the inevitable conclusion that homegardens are "great" on that score.

Other than these occasional researcher-motivated efforts – and, of course, the incessant individual efforts of the homegardeners – there has been no organized institutional initiative to promote homegardens either locally anywhere or internationally. That is hard to understand: if homegardens have all these desirable characteristics, why have they not earned a rightful place as a development vehicle? If homegardens are the "epitome of sustainability" (Torquebiau, 1992), how is it that they "defy" scientific explanation, or is it that homegardens are just a "backyard" activity with little prospects as a development tool and therefore not worthy of any serious scientific investigation? No answer has yet been found to the question that was posed five years ago: "Do homegardens defy science or is it the other way around?" (Nair, 2001). In the meanwhile, commercialization seems to make its way to homegardens that have traditionally been known as anything but commercial. Two chapters in this book report the recent tendency for growing crops in homegardens mainly for commercial use, in Java, Indonesia (Abdoellah et al., 2006) and Kerala, India (Peyre et al., 2006), the two best-known bastions of traditional homegardens. Is this an indication of the heralding of a new genre of homegardens and possibly the demise of the traditional ones? Is such an "evolution" of homegardens good or bad? In other words, what does the future hold for homegardens?

In order to address the above key question, we need to discuss why homegardens (especially their species diversity) have traditionally been important to the households and what the relevance is of the much-acclaimed sustainability attributes of homegardens to the current context and future prospects.

2. SPECIES DIVERSITY IN HOMEGARDENS AND HOUSEHOLD FOOD SECURITY

The most distinguishing and possibly important characteristic of all homegardens is their species diversity: the intimate admixture of plants of all types – herbs, shrubs, vines, trees, other perennials, and so on – on the same small parcel of land (Fig. 1). From the homegardener's point of view, the primary objective of growing all these plants together is to produce food, often as a supplementary source. In order to appreciate the role of these plants grown in apparent disarray, we have to first of all recognize the fact that 'he', the traditional homegarden practitioner, is a 'she':

Figure 1. *A "typical" rural homegarden in Kerala, India, showing a large number of economic species in intimate association around the home (Photo: B. Mohan Kumar).*

women have primary responsibilities, or are as involved as men, for homegarden maintenance. This is common wherever homegardening is practiced. Considering

that it is primarily the woman's responsibility in many societies to feed the families, it is perhaps a combination of both inspiration and desperation that prompt them to grow food around their homesteads: inspiration from experience and innovative instinct, and desperation from the lack of other avenues for finding food for the family. Species diversity in these systems may be a consequence of the interplay of these forces of inspiration and desperation. Mixing annual food crops with frequently harvestable tree crops that provide food and sometimes cash income to the family represents a confluence of human ingenuity with ecological ambience, such that the opportunity offered by year-round growing seasons and the amenability of the various species to grow in mixed stands makes it a "win – win" situation. Tracing the historical development of homegardens, Wiersum (2006) observes that in the most widely studied homegarden systems in South- and Southeast Asia, homegardens are used to produce products with high nutritional va1ue (proteins, vitamins, minera1s), medicina1 plants and spices, firewood, and sometimes a1so forage crops and construction wood, and homegardening is always combined with field-crop cultivation often in the form of wetland rice (*Oryza sativa*) in South- and Southeast Asia. These regions with good farming conditions and high population densities contributed to optimal development of the complementary system of staple food cultivation in open fields and supplementary diversified homegarden production for the family's self-sufficiency and trade.

Whatever be the reason for species diversity, and irrespective of whether it will continue to be a conspicuous feature of future homegardens in the wake of the push to commercialization, researchers seem to be quite obsessed (perhaps more than the practitioners) with species diversity of homegardens. Cataloging of species lists is such a common feature of most homegarden literature to the extent that many authors believe that a paper on any aspect of homegarden is incomplete without a species list (Nair and Kumar, 2006). An interesting point that comes out of such species lists is that, irrespective of the geographical focus of the study, the species that dominate such lists are the same from similar ecological regions. This is evident from the species listed in four chapters of this book, summarized in Table 1, from homegardens in Kerala, India (Mohan et al., 2006); Peruvian Amazon (Wezel and Ohl, 2006); and two locations in the Pacific islands (Lamanda et al., 2006; and Thaman et al., 2006). The situation may not be different if the study is extended to all the 135 case studies included in Fig.1 of Nair and Kumar (2006), with the exception that in some locations, the locally important species that are not common outside their limited geographical areas of distribution will be common in homegardens as well. Examples of this category include the peach palm (*Bactris gasipaes*) and various other palm species in Central and South America, fruit trees such as durian (*Durio zibethynus*) in Southeast Asia and breadfruit (*Artocarpus altilis*) in the Pacific islands, and various fruit trees in West Africa (*Cola* spp., *Dacroydes edulis*, *Pterocarpus* spp., *Treculia africana*: Okafor and Fernandes, 1987). Similarly, in the tropical highlands, the dominant species in homegardens will be different from those in tropical lowlands (e.g., Fernandes et al., 1984; and Soini, 2005; for the *Chagga* homegardens of Tanzania and Tesfaye Abebe et al., 2006, for the homegardens of Ethiopian highlands).

The bottom line is, dominant food crops, both herbaceous and woody, that are locally adapted have been the dominant species of homegardens in different ecological regions. The easy access to these crops in the backyard and the opportunity offered by many of them for staggered harvesting as needed (e.g., tuber crops, vegetables, plantain) make them quite attractive to the women who take it on themselves as their obligation and responsibility to find food for the family. Nutritional security (rather than food security) of the homegarden is another important benefit of homegardens. It is well known that several of the tree fruits in the gardens (Table 1) are nutritionally richer than the common, carbohydrate-rich grain crops, and are indeed the main sources of vitamins and minerals to the family (Niñez, 1984; Okafor and Fernandes, 1987; Kumar and Nair, 2004; Nair, 2006). The cash-income opportunity offered by saleable products (especially tree products) from the homegardens make it an attractive proposition for men too. Social and cultural value of the species in the homegardens is yet another important factor to be considered (discussed later). Species diversity of homegardens is thus quite an appealing feature to the homegardeners for a variety of reasons, and has been a major driving force in the maintenance of the gardens over centuries.

Table 1. *Commonly reported plants in homegardens of humid tropical lowlands.*

Category	*Species in homegardens*
Root and tuber crops	*Colocasia esculenta* (taro), *Dioscorea alata* (greater yam), *Dioscorea esculenta* (sweet yam), *Ipomoea batatas* (sweet potato), *Manihot esculenta* (cassava), *Xanthosoma* spp. (tannia or cocoyam)
Other food crops	*Ananas comosus* (pineapple), *Arachis hypogaea* (peanuts), *Cajanus cajan* (pigeon pea), *Passiflora edulis* (passion fruit), *Phaseolus, Psophocarpus* and *Vigna* spp. (beans and other legumes), *Saccharum officinarum* (sugarcane), *Zea mays* (corn = maize), and various vegetables
Fruit and nut yielding perennials	*Anacardium occidentale* (cahew nut), *Annona* spp. (soursop and sweetsop), *Averrhoa carambola* (carambola), *Artocarpus heterophyllus* (jackfruit), *A. altilis* (breadfruit), *Carica papaya* (papaya), *Citrus* spp. (lemon, lime, orange, tangerin), *Cocos nucifera* (coconut), *Ficus* spp. (edible figs), *Mangifera indica* (mango), *Musa* spp. (bananas and plantains), *Persea americana* (avocado), *Psidium guajava* (guava), *Spondias dulcis* (vi apple, hogplum), *Syzygium malaccense* (Malay apple), *Tamarindus indica* (tamarind)
Spices, Social beverages, and stimulants	*Areca catechu* (betel nut), *Cinnamomum zeylanicum* (cinnamon), *Curcuma longa* (turmeric), *Cymbopogon citratus* (lemon grass), *Piper betle* (betel vine), *Piper methysticum* (kava), *Zingiber officinale* (ginger).

3. SUSTAINABILITY AND HOMEGARDENS

Sustainability is perhaps the most widely discussed, yet least well-defined, term across disciplines in contemporary agricultural and land use literature. Even before publication of the much-acclaimed and so-called Brundlandt Commission report (WCED, 1987), sustainability has been a cornerstone of many traditional land use systems and it used to figure prominently in the early debates on agroforestry (Bene et al., 1977). Without going into any discussion on this much-discussed issue, suffice it to say that sustainability is about meeting today's needs without compromising the ability of future generations to satisfy their needs; it is not a new concept, simply the retrieval of ancient wisdom dictating that "you don't eat your seed corn"; and it strives to achieve a balance between ecological preservation, economic vitality, and social justice.

Much of the discussion on ecological sustainability of homegardens is linked to their species diversity. While dealing with species of various forms, life cycle, and nature of products, the number or frequency of occurrence of a species in the homegarden is not a sufficient indicator of the importance or dominance of the species. Ecological parameters and indices that are commonly used to express population complexity and diversity such as Sorenson's index of similarity, Shannon-Weiner and Margalef Indices of species diversity, and Importance Value Index, have lately been reported in homegarden studies (Kumar and Nair, 2004 – for literature until then; Mohan et al., 2006; Abdoellah et al., 2006; Kehlenbeck and Maass, 2006). Some authors have also used statistical procedures such as cluster analysis and correspondence analysis to group descriptive characteristics of homegardens, and to find out factors that may play a significant role in explaining patterns of floristic composition of the complex system; one such study is reported by Tesfaye Abebe et al. (2006) in this volume.

The rationale is to use these indices as a basis for comparing homegardens with nearby natural vegetation – usually forests – on the assumption that in terms of species abundance and diversity, homegardens are in between natural systems and managed systems. Homegardens are perhaps the most diverse agroforestry practice, and among all agroforestry practices, they are at one end of the spectrum, two-species (a tree and a crop) associations such as alleycropping being at the other end (Nair, 1993; Rao et al., 1988). Species abundance and diversity of homegardens should not, however, be equated with ecological succession that is characteristic of natural systems and the benefits of which are exploited in some traditional low-input agricultural systems such as shifting cultivation. The fact that natural systems are more diverse than agricultural systems has been known for long, one of the most widely cited articles on the subject being that of Odum (1969). In the very few examples of low-input agriculture that take advantage of the process of succession, the species are all carefully selected, but are not random successional species that seed-in naturally. In homegardens too, the species are selected carefully, and are therefore similar to such systems. Homegardens start off from one particular stage of the natural successional process, but keep natural succession from carrying the community to a so-called "climax" community. On the other hand, agroforestry practices such as alleycropping that are at the "other end" of the species-diversity

spectrum have little similarity with the natural systems and do not fit into the realm of successional processes. Thus, in terms of complexity and species diversity, homegardens represent a unique set of ecological sustainability characteristics of natural systems as well as production benefits of agricultural systems. Another aspect of ecological sustainability in homegardens is the benefit of nutrient cycling experienced in multistrata systems, which is again a consequence of the species diversity (Nair et al., 1999).

It needs to be pointed out in this context that the premise that diversity provides stability to ecosystems, which is the basis of the concept of ecological sustainability of homegardens, is being debated by ecologists: the so-called "diversity – stability debate" (e.g., McCann, 2000). Although the consensus of this debate as of now is that diversity can be expected, on average, to give rise to ecosystem stability, diversity is not the driver of this relationship; rather, ecosystem stability depends on the ability of communities to contain species, or functional groups, that are capable of differential responses. At present, in ecological studies, the role of keystone species is receiving increasing attention; this concept has hardly been used in homegarden studies yet, but seems to offer scope for further studying the diversity – stability issue in homegardens (see Tesfaye Abebe, 2006). If simplified communities are more vulnerable to invasion by other communities/species, then the trend towards commercialization of homegardens (discussed later) should result in higher frequency of invader species as well as pests and diseases in homegardens. The profit-oriented commercial homegarden enterprises will then resort to keeping such invading species under check through use of chemicals, which will inevitably disrupt the harmonious biodiversity and species associations (including micro-organisms and species other than plants) that have been so characteristic of traditional homegardens.

Economic and social sustainability attributes of homegardens are even less well studied than ecological-sustainability attributes. A common problem seen mentioned in most attempts to study economic benefits of homegardens is, again, lack of widely accepted procedures to measure economic benefits of intangible benefits and services. Alavalapati and Mercer (2004) described some procedures for economic valuation of agroforestry systems. Most attempts at economic valuation have two common features: first, they acknowledge the importance and need for "proper" evaluation of the intangible benefits of homegardens, such as aesthetics and ornamentation, nutritional security, food quality, and empowerment of women; then they highlight the difficulties involved in collecting realistic data and therefore caution about the error-prone nature of such analyses. The two chapters on economic analysis presented in this volume are no exception to this general trend: Torquebiau and Penot (2006) articulate the importance of including valuation of such benefits in homegarden evaluation, but stop short of suggesting any new procedures; and, Mohan et al. (2006), following a study applying conventional and some "non-conventional" economic procedures in some Kerala homegardens, confirm that the results are along expected lines and caution that their study procedure will need considerable "fine-tuning" to adapt to local conditions before it is applied elsewhere. Thus, economic sustainability of homegardens remains another

attribute, the importance of which can only be felt qualitatively and intuitively, but is difficult to quantify.

The same can be said about social sustainability. All social studies on homegardens exclaim the social attributes of homegardens, ranging from their role in ensuring gender equality and nutritional security to societal harmony and cultural heritage. Several chapters in this book touch upon these issues. Howard (2006) presents a well researched account of the major role of women in homegardens in Latin America: the presence of a garden rich in a variety of plants epitomizes the woman's exertions on behalf of kin and her proficiency as primary provider of food, health, and overall well-being of the family, and demonstrates her freedom from dependence on products from neighbors and commercial vendors. Abdoellah et al. (2006) describe how the tendency towards conversion of homegardens to produce commercially valuable crops for market in Indonesia has disrupted the community's equality, sharing, and harmonious living (*rukun*) that used to be built around traditional homegardens, and decreased the number of common grounds (*buruan*) in front of homes that serve as playground for children, and as a place for socializing with neighbors and for children to learn cultural and social values from their elders. The strength of these threads that are woven together in the fabric of social sustainability of homegardens cannot be expressed in quantitative terms.

4. HOMEGARDENS AND SOME CURRENT LAND USE ISSUES

4.1. Biodiversity

Biodiversity (short form for biological diversity) is often used as a synonym for species diversity. The importance of maintaining biodiversity in sustaining food production and protecting human and ecosystem health is now universally recognized, and land use systems that promote biodiversity are considered to be quite desirable from that perspective. A classification based on the production systems and species diversity ranked homegardens top with its highest biological diversity among all manmade agroecosystems (Swift and Anderson, 1993). Species richness and extent of biodiversity in homegardens depend, however, on ecological and socioeconomic factors and household preferences. Gajaseni and Gajaseni (1999) have reported, for example, the existence of non-commercial indigenous varieties of durian (*Durio* sp.) and rare varieties of mango (*Mangifera indica*) in homegardens of Thailand. Large numbers of cultivars of banana (*Musa paradisiaca*), coconut, and breadfruit have been reported in the homegardens of Micronesia (Falanruw, 1990; Thaman et al., 2006). Indeed, as already mentioned, most publications on homegardens from around the world (see Fig. 1: Nair and Kumar, 2006) report the large numbers of species present. The role of homegardens as repositories of plant biodiversity is thus indisputable. In a recent study from seven New- and Old-World tropical forest dynamic plots, Wills and 33 collaborators from 21 institutions around the world reported that an erosion of an ecological community's species diversity (that tends to happen as a result of stochastic extinction, competitive exclusion, and unstable host-enemy dynamics) can be prevented over the short-term through

preferential introduction of rare species (Wills et al., 2006). They found that when species were rare in a local area, they had a higher survival rate than when they were common, resulting in enrichment for rare species and increasing diversity with age and size class in these complex ecosystems. Thus, it can be surmised that the preferential introduction of rare species such as medicinal plants (Rao and Rajeswara Rao, 2006) and fruit trees that homegardeners have been practicing for centuries around the world contributes to species biodiversity even if economic and social gains are the primary motivations for such introductions.

4.2 Genetic-diversity conservation and species domestication

In addition to the wide array of plants grown in homegardens for a variety of reasons, homegardens have high potential for *in situ* conservation of genetic resources (Watson and Eyzaguirre, 2002; McNeely, 2004; Schroth et al., 2004). An important issue, the significance of which is seldom recognized in the extant species-listing-dominated literature on homegardens, is the continuous interaction of homegardeners with these large groups of plants and the resultant contribution to species domestication. Simons and Leakey (2004) describe the deliberate selection and management of trees (*domestication*) by humans that has been going on for millennia in agroforestry systems. For example, Leakey et al. (2004) present evidence that subsistence farmers have domesticated locally popular indigenous fruits (*Dacroydes edulis* and *Irvingia gabonensis*) in Cameroon and Nigeria. It is reasonable to assume that much of this *in situ* domestication has taken place in homegardens. It is also likely that similar patterns of domestication have happened for other plant species in homegardens around the world, especially in those with long history as in South- and Southeast Asia (Wiersum, 2004).

4.3. Carbon sequestration

Most discussions on carbon sequestration potential of homegardens – and, indeed agroforestry systems in general – are based more on hypothetical considerations than empirical results. The argument is that these systems have high carbon storage (*sequestration*) potential in their multiple plant species, especially in woody perennial species, and soil; they help in *conservation* of C stocks in existing forests by alleviating the pressure on natural forests (Schroth et al., 2004); and, to some extent, in C *substitution* by reducing fossil-fuel burning through promotion of wood fuel production. Most reports indicate that the addition of a large proportion of the relatively high quantity of plant materials produced in a system will increase C stock in soils (Lal, 2004); therefore it is reasonable to surmise that homegardens will help substantially in C sequestration. All reports on C sequestration potential of homegardens (e.g., Montagnini and Nair, 2004; Kumar, 2006), however, are related to aboveground biomass. In the case of soils, C stored in surface soils has received some mention. But C exists in soils in labile (mobile) or recalcitrant (stable) form; the latter is more important for C sequestration; and, no study has been reported on this "real" form of C sequestration within soil profiles in homegardens. Most C

sequestration reports also have disclaimers and caveats that lack of reliable inventories/estimates and uncertainties in the methods of estimation present serious difficulties. Thus, as in the case of other intangible and difficult-to-measure benefits and services, C sequestration benefit of homegardens remains one of the "potential benefits" that has not been even quantified, let alone exploited.

5. NEW DIMENSIONS OF HOMEGARDENS

5.1. Commercialization of homegardens

Consequent to liberalizations in many formerly tightly controlled economies, agricultural enterprises, just as other production enterprises, are becoming increasingly subject to market pressures. A direct consequence of this is development and adoption of new strategies to promote commercialization of even traditional operations such as homegardens. Abdoellah et al. (2006) describe a case study of such a transformation in a West Java village in Indonesia, where some villagers, attracted by economic possibilities, have transformed their homegardens in such a way that they have become dominated by few plant species or are approaching even monocultures; the dominant species are cash crops such as vegetables that are in high demand in nearby urban markets. Similar examples are also prevalent in the Pacific islands as described by Thaman et al. (2006), where promotion of a wide range of export cash crops in rural areas has led to the clearing of diverse agroforests. Increasing trend towards commercialization has also been reported from Kerala homegardens (Kumar and Nair, 2004).

This so-called commercialization is, however, not new to homegardens. It has been in existence to varying degrees in most well-known homegardens (of South and Southeast Asia). Perennial species that produce commercial products such as spices, fruits and nuts, medicinal plants, and even timber have been a component in many of these systems. As Kumar and Nair (2004) have pointed out, although interest in homegardens has been primarily focused on producing subsistence items, its role in generating additional cash income has been quite substantial in many places. Considerable variations from place to place have also been reported in the proportion of homegarden products that are used for household consumption as opposed to sale, and the contribution of the net income derived from sale of products to the total household income. Conversion of homegardens to intensive production units of market-oriented systems as described by Abdoellah et al. (2006) is not a totally new phenomenon; similar trends have occurred in several rapidly urbanizing and periurban centers. A case in point is the conversion of the traditional *shamba* gardens of Kenya's highlands to produce vegetables for sale in Nairobi, the capital city, and for export to Europe (author's personal experience).

5.2. Urban homegardens

Another relatively new trend related to commercialization of homegardens is the extension of the homegarden practice from its conventional rural settings to urban

environments. Two chapters in this book (Drescher et al., 2006; and Thaman et al., 2006) describe such developments; while the former includes examples from several places around the world representing both developing and developed countries, the latter deals primarily with such developments in the Hawaiian Islands, USA. These urban homegardens are often the "modern" cousins of their traditional relatives in the sense that while they maintain the species diversity that is characteristic of the traditional homegardens, their aesthetic and recreational value is as important as – if not more than – their nutritional role. As Fig. 2, a photograph of an urban homegarden in Kona, Hawaii, USA, shows, the gardens with manicured lawns and hedges, well tended fruit trees, and attractive ornamentals surrounding a "modern" home look more like tourist resorts, in sharp contrast to the "natural" look of the subsistence-oriented homegardens and the type of "traditional" homes they surround (Fig. 1).

Figure 2. *An urban homegarden with fruit trees such as avocado (*Persea americana*), litchi (*Litchi chinensis*), mango (*Mangifera indica*), papapya (*Carica papaya*, and various ornamentals, in Kona, Hawaii, USA (Photo: Craig Elevitch).*

This trend towards urban homegardening may be seen in the context of other similar activities such as urban forestry and organic agriculture that have gained considerable prominence in urban and periurban areas during the recent past. These activities constitute a substantial portion of the green space and are considered to be the lungs of the cities. For example, the role of urban vegetation in mitigating atmospheric greenhouse gas concentrations and improving air quality in Santiago, Chile (a city of more than 4 million inhabitants), was illustrated in a recent study

(F. Escobedo, personal communication; January 2006). Gaston et al. (2005) reported that the 'domestic gardens' with mean area of only 151 m^2 per garden covered approximately 33 km^2 or 23% of the predominantly urban area of the city of Sheffield, U.K., and provided tremendous opportunities for maintenance of biodiversity and provision of ecosystem services in urban areas. Furthermore, there is a revival of appreciation of recreational and social values of ornamental and other types of homestead gardening in the industrialized world such as the United States (Westmacott, 1992) and Europe (Vogl and Vogl-Lukasser, 2003). An increasing number of gardeners are now finding pleasure in growing plants for various uses and deriving satisfaction from agrarian life-style, self-reliance, and private ownership – a clear expression of the appreciation of the aesthetic, cultural, and landscape values of such integrated systems, and perhaps the bygone days.

6. FUTURE OF HOMEGARDENS

Prompted by the lack of appreciation of the value of homegardens in development paradigms and the trends towards commercialization of homegardens and urban homegardens, the question has been posed "are homegardens becoming extinct?" (Kumar and Nair, 2004). Wiersum (2006) argues that this illustrates that "the notion of socioeconomic sustainability of homegardens should be interpreted as referring not only to their ability to contribute towards the livelihood needs of traditional rural dwellers, but also to their ability to adjust to the process of rural change."

Obviously, no one can accurately predict the future of an activity such as homegardening that is deeply rooted in ecological, socioeconomic, and cultural milieu of the land and its people. Some of the well-known predictions such as the 200-year-old Malthusian theory are even better known today for their failures to hold up in a changing world. As the old adage goes, change is the only constant thing. Homegardens are no exception; they will certainly be affected by the changes happening in the local ecology, economics, and culture. The rate and extent of the impact of such changes will depend on a myriad of factors. Economic and cultural forces often pull the society and people's attitudes in opposite directions. If some farmers in periurban centers are attracted by the forces of economics to convert their homegardens or sections of them to growing crops that can fetch money in the market, there will be an equally strong (if not stronger) section of farmers who are not attracted by the lure of money to abandon their age-old traditions. When, rather than if, some genetically modified crops find their way to homegardens, that may not necessarily mean a proliferation of transgenic homegardens – at least in the near future. In fact, homegardens are "testing grounds" of many innovations of the gardeners, and today's gardens of long standing are a result of such continuous innovation and improvement. The migration of the youth to urban and even overseas centers in search of jobs and cash income, a common feature in many homegarden-dominated societies, naturally raises concerns about the future of homegardens, particularly the scope for bringing any technological innovations to the practice of homegardening. What is seldom recognized, however, is the reverse migration of older workforce who, after long stays in industrialized urban centers get disenchanted and seek to return to their roots in increasing numbers and take up

hobby farming and homegardening for the pure pleasure of doing something they have grown up with and to which they possess a cultural bondage; this reverse migration seldom gets the media attention of out-migration of youth.

What conclusion can, then, be drawn on the future of homegardens? Will they survive or will they become extinct? It is anybody's guess. I, for one, have relentlessly argued for quantitative and measurable evidence in support of a conclusion. But I don't have much evidence of that nature to draw upon in this case. So, I would rather make no prediction. Nevertheless, my intuition is that homegardens will not become extinct. Because of the difficulties in quantitative valuation of the sustainability attributes of homegardens, it is unlikely that homegardens will become a part of the development bandwagon; therefore it is unlikely that there will be any "big push" towards research on homegardens. But that will not lead to the demise of homegardens. I have only my personal experiences of interactions with homegardeners around the world to support this intuitive prediction: the innovative spirit of the Japanese settler farmer in Tomé-Açu (Brazil), the sentimental attachment to ancestral land and way of life of the homegardeners in Kerala (India), the tenacity of the farmers who maintain economically attractive Kandyan homegardens (Sri Lanka), the community's commitment to traditional life style of the homegardeners in Nakhon Sawan (Thailand), the intuitive skills of the industrious and tradition-bound homegardeners of Java even after they were transmigrated under government pressure to unfamiliar and distant lands in Kalimantan (both in Indonesia), the friendliness and confidence of the ecotourism-oriented homegardeners of the Blue Mountain region (Jamaica), the hope and aspirations built around homegardens of the hapless rural folks in Koutiala (Mali) and Cap Haitien (Haiti), the satisfaction of the gardeners in being able to produce a variety of food and other essential needs in their homegardens in mountainous landlocked terrains in Mount Hagen (Papua New Guinea) and water-locked Gizo (Solomon Islands), the pride and self-confidence effused by the female gardeners in the *shambas* of the Kikuyuland (Kenya) and the *chagga* in Arusha region (Tanzania), the ingenuity of the farmers who have successfully introduced rearing in captivity through stall-feeding of the African grasscutter (*Thryonomys swinderianus*, a herbivorous rodent that is harvested for delicious and pricy bush meat) in Kumasi (Ghana), … – the list can be long – all point to continuation of the homegardens, of sorts, in perpetuity. So, my submission is, homegardens will undergo changes; but they will not become extinct; they will continue to exist with their mysterious, enigmatic charm to provide sustenance, satisfaction, income, and aesthetic appeal to many, and fascination to scientists who care to look at them.

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