A Multidisciplinary Study of Rural Homegardens in Basht, Southwestern Iran

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Abstract: In order to inspect agrobiodiversity characteristics in homegardens, a multidisciplinary study was conducted in Basht District (Southwest of Iran) during April to September 2008. Eleven villages (5 in Khamin mountainous protected area and 6 in plain-hilly areas around Basht city) were randomly selected and through interviewing 192 household heads, information and on different biophysical and socioeconomic characteristics were gathered. Altogether 97 species were identified. Mean homegarden species richness varied between villages and was significantly less in mountainous area. Vegetables and summer crops were major components in mountainous area, whereas fruit trees and shrubs were the main component in plain-hilly villages. Among different social variables, size of household had a significant positive correlation with species richness ($r_p = 0.189$, p*value*=0.009). Contribution of homegardening in rural livelihoods was slight (averagely 0.71% to 6.61% of total livelihoods). Significant positive relationship between homegarden species richness and household income from homegardening ($r_p = 0.414$, p*value* =0.000) confirmed the role of diversification to improve economic and nutritional conditions of rural communities. Results revealed that along with more facilities accessibility and more contiguity to urban centers, homegardens were developed more appropriately increasing rural women activities in homegardening led to increase of homegarden biodiversity.

Key words: Homegarden · Agrobiodiversity · Socioeconomic · Rural livelihoods · Sustainability

INTRODUCTION

Traditionally, the biodiversity present in farmlands has been overlooked in contrast to other ecosystems so that has been resulted the false belief that the wild species are genetically more diverse than the domesticated ones [1]. Agrobiodiversity as a recently developed discipline includes all crops and livestock, wild relatives, interacting species, pollinators, symbionts, pests, parasites, predators and competitors [2, 3]. Central to efforts aimed at promotion of agrobiodiversity conservation is the issue of how crop species are distributed-both geographically and socially- and which factors shape patterns of species diversity [4-7]. Among the agricultural sites worked in traditional communities, home gardens are often sites of the greatest

agrobiodiversity and the focus of increasing investigation [8-11]. The conservation of cultivated plants in homegardens in addition to preserve a vital resource for humankind also provides significant economic and nutritional benefits for the rural communities [7, 12-14]. These components in fact act as a bridge between biological and social components and conserve species and genetic diversity [10]. Crop diversity in homegardens is attributed to a broad range of known factors and usually as a fruit of ecological conditions, economic context and demands, tastes, knowledge, ethnicity, culture and special experiments of homegarden owner [15, 16]. To fully understand how homegardens function and what benefits they provide to their users, it becomes necessary to integrate and then analyze both socioeconomic and biophysical aspects of

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these systems [17, 18]. Different performed studies on homegardens throughout the world has resulted in clarifying different realities in the interactions among different characteristics of homegardens e.g. household characteristics, literacy, age of household, labour inputs, times devoted to homegardening, agrobiodiversity indices, etc. Until now, most studies on homegardens have been carried out in humid/sub-humid tropical regions, thereby overlooking homegardens in arid and semi-arid regions. Very few studies have been conducted on Iranian homegardens [16, 19, 20] and their circumstance is seldom examined. It seems necessary to characterize different components of Iranian homegardening, especially it`s socio-economic characteristics and to compare the results with the findings in other places of the world. This study was carried out to examine the relationship between socioeconomic aspects and biodiversity of homegardens in Basht.

MATERIAL AND METHODS

Study Area: The study was conducted in Basht District of Gachsaran County, southwest of Iran (Figure 1). The county with 4171 km² areas is located between latitudes 29°56′-30°40′ north and longitudes 50°22′-51°18′ east. Two major climates of Iran encounter in Basht so that overall an ecotone situation is sensibly provided. There are two eco-geographically different areas in Basht district, including Khamin mountainous protected area, in north and northwest and in contrast Bavi area around Basht city with a dominant plain-hilly topography. Some traditional communities are extended sporadically outside of core zone in Khamin protected area. As a result of low accessibility of infrastructures,

harsh mountainous situation e.g. soaring slopes and distance from urban zones and markets, emigration is dominant social hue of this area. Rain-fed crops such as wheat (*Triticum aestivum* L.), barley (*Hordeum vulgare* L.), lentil (*Lens culinaris* L.) along with irrigated rice (*Oryza sativae* L.) and rain-fed or irrigated fruit trees like *Vitis viniferae* L., *Ficus carica* L., *Citrus limon* Burm. F. and *Punica granatum* L., consist agricultural systems of the area. In contrast, plain-hilly area′s villages are better developed and enjoy more facilities and relationships with marketplaces. Cropping systems are livelihood-market oriented and some market crops such as maize (*Zea mays* L.) and Colza (*Brassica rapa* L.) in addition to other mainly irrigated crops are being cultivated.

Methodology: During April to September 2008, from two areas 11 villages were selected as survey samples (5 and 6 villages in Khamin and Bavi, respectively) and through providing a semi-structured questionnaire and direct observation, 192 rural households were randomly visited and by a face to face interview of household heads, information about biophysical and socio-economic characteristics were acquired (In each village, 30% of households were randomly selected). Most of the household heads were male (94%). Information about household head characteristics and sexuality role in homegarden management were asked. Stepwise regression analysis was ran to characterize mostly related variables with homegarden diversity and their trend performed by SAS (version 9.1). Socioeconomic and biophysical analyses and clustering villages were processed using SPSS (version 16) software. Excel (version 2007) used for making graphs. Between groups comparisons for each variable were evaluated with a one-way analysis of variance.

Fig. 1: Distribution of studied areas and villages in Basht District of Gachsaran
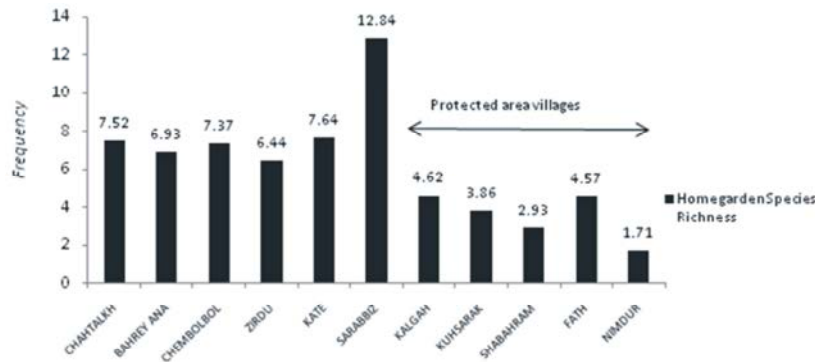
Fig. 2: Mean homegarden species richness in studied villages.

RESULTS AND DISCUSSIONS

Agrobiodiversity in Homegardens: Altogether 97 agricultural plants belonging to 55 families were observed. However, distribution and species presentation were too fewer in mountainous villages so that only 33 species were present there. Mean homegarden species richness differed considerably between studied villages, although it was significantly less in protected area villages (F value = 7.794, $p$value = 0.006) (Figure 2.). However, in predefined categories there was an interesting pattern. In case of vegetable and summer crop category, despite of none significance of t-test between two areas (p value = 0.923), presentation was more sensible in mountainous villages and this category was the first component of homegardens in all of these villages. In case of fruit trees and shrubs (F value = 21.57, p value = 0.00) and other homegarden species (ornamental, medicinal, etc.) (F value = 60.49, p value = 0.00) categories, species richness was significantly more in plain-hilly topography villages. Fruit tree and shrub category species were first component of plain-hilly topography. Due to harsh climate, less contiguity with urban centers and markets and lack of infrastructures, homegardens enjoyed less species richness in mountainous villages and were severely subsistence-oriented. So some necessary crops such as onion (*Allium cepa* L.), garlic (*A.sativum* L.), tomato (*Lycopersicum esculentum* Mill.), aubergine (*Solanum melongena* L.) and other vegetables are grown for subsistence. Facilities for fruit growth, especially irrigation equipments were not provided and because of difficulties and weak web relationships, households were not engaged especially for ornamental or other homegarden species. In contrast, because of more accessibility of facilities e.g. more contiguity with urban centers and extension services, main roads and marketplaces, plain-hilly topography villages enjoyed more developed and species rich homegardens.

Socio-Economic Characteristics: Age of household head; The mean age of household heads interviewed was high (55.8 and 53 years in Khamin and Bavi area, respectively; t= 1.219, $p$value = 0.224). Only a small part of the villagers, were at age range of 30-45 years (21.6 and 31.2 percent in Khamin and Bavi, respectively). By the way, there was not a significant relationship between household heads' age and homegarden species richness. Cromwell and Oosterhout [21] observed a direct significant relationship between age of household head and varietal and species richness of farming systems in Zimbabwe.

Household size: Mean size of households interviewed was 6.36 (_+2.25) members. There was not a significant difference between two main areas (F = 1.794, sig = 0.182). Meanwhile, the simple regression analysis revealed a significant correlation between size of households and homegarden species richness (n= 192, r_p = 0.189, sig = 0.004). Due to household characteristics in the area such as high level of household head age, populous households enjoyed more labor inputs and times devoted to homegardening and had more trophic needs, so they engaged more diverse homegardens. This was not accordant with Blanckaert *et al.* [22] report on no relationship between household size and homegarden species richness in Mexico.

Literacy: Magnitudes of household heads were illiterate, although in Khamin protected area, trend was more evident (60.8% v.s 47.1% in Khamin and Bavi, respectively). There was not a significant relationship between households' literacy level and homegarden species richness.

Evaluation of Farmers from Themselves Households' Economic Situation in the Area: In form of a question, household heads were asked to carefully explain their livelihood and economic conditions in the area. Despite of some biases, the method is a good way to obtain livelihoods and welfare conditions and was utilized formerly by some authors for similar purposes [23]. The study revealed that only a minority of households expressed themselves' economic situations as "good" or "excellent" and this was twofold in Bavi area villages (26.43% v.s 11.76% in Bavi and Khamin, respectively). In mountainous villages, more than half of total households (54.9%) expressed themselves status as weak, whereas the amount was significantly less in plain-hilly villages (27.14%).

Subsistence Sources of Households: Information about subsistence sources of households were acquired into five defined categories including agronomic activities, horticultural activities, animal husbandry, homegardening and other sources (non-agricultural sources e.g. gathering and selling firewood and medicinal plants, shop keeping, assistances from supportive services, official employment, etc.). In case of agronomic activities contribution in household subsistence, a non area-oriented difference observed between sample villages (df = 10, ANOVA F value = 4.983, sig = 0.000). In two most remote villages i.e. Fath and Nimdur in Khamin area, eventually due to limited available flat lands, agronomy played the least contribution in total household subsistence. In case of income from horticultural sector, the differences were very significant (t = 8.057, sig = 0.000) and in mountainous area, the contribution was significantly higher. In spite of high contribution of horticultural activities in total subsistence of households, the contribution was very low in plain-hilly villages. Although T-test for comparison of areas was not significant in case of role of homegardens, plain-hilly situated villages enjoyed more contribution from homegardening. However, the results showed that homegardening is not an important component of household subsistence in this district of Iran. In Sarabbiz village in Bavi plain-hilly area whith the highest average, it consisted only 6.61% of total household subsistence. This was less than observation of Khoshbakht *et al.* [16] in four sub-areas of Savadkouh, North of Iran which homegardening contributed 2-16 percent of total households' livelihood, averagely. Both of these studies in Iran

indicated little weight of homegardening among Iranian rural communities. Trinh *et al.* (2003) reported that in four ecosystems studied in Vietnam, homegardening contributed 24-54 percent of total households' income, averagely. In villages inside protected area, animal husbandry was a major source of livelihood and its' contribution was significantly more (averagely 36% and 15.7% in Khamin and Bavi areas, respectively). In two mountainous villages i.e. Kuhsarak with 49.3% and Kalgah with 54.7%, the contribution was vital.

In case of non-agricultural sources of livelihood (shop keeping, retail dealing, official works, etc. and incomes obtained by no works) there was a significant difference between studied villages, although no between two areas. According to our observations and perception from rural residents, in plain-hilly topography villages, this contribution was mainly from occupation of household members' service-official activities and working in nearby factories and urban centers. In contrast, in mountainous villages, this contribution was acquired mainly due to many households' dependence on supportive auxiliary organizations e.g. Komiteye emdad and social welfare (Behzisti).

Times Devoted to Homegardening: Pearson correlation analysis showed a direct significant relationship between household work times devoted to homegardening per week and homegarden species richness (n= 192, r_p= 0.308, p value = 0.000). This demonstrated along with more times devoted to homegardening, species diversity increased. In plain-hilly villages, work times in homegardening per week was significantly less (3.2 and 6.1 hours per week in Bavi and Khamin areas, respectively). However, in plain-hilly topography, women work per week was more than men, nonetheless in mountainous area, interval was low and even in two villages (Nimdur and Shabahram) men were more engaged in homegardens per week. Despite of lower species richness in mountainous homegardens, due to their vital roles for daily livelihoods of households, more and heavier works were needed, so men role was more palpable. In plain-hilly topography villages, due to subsistence-market oriented farming systems and better access to infrastructures, men were more engaged in outwork activities, so diverse homegardens were mainly managed by women and there was a positive relationship between women work in homegardens and extant species richness (n = 141, Pearson correlation = 0.428, sig = 0.000).

Table 1: Stepwise regression analysis with homegarden *species richness* as dependent variable

Step	Variables entered	β coefficient	Partial r^2	Model r^2	F value	Pr > F
1	Homegarden area	0.30854	0.3480	0.3480	98.75	0.0001
2	Women decision-making ratio in ornamental crops	0.30929	0.1623	0.5103	60.98	0.0001
3	Women activity ratio in vegetable crops	0.24581	0.1027	0.6130	48.59	0.00001
4	Income ratio from homegardening sector	0.19318	0.0449	0.6579	23.87	0.00001

Intercept = 3.389 $Y = 3.389 + 0.308 X_1 + 0.309 X_2 + 0.246 X_3 + 0.193 X_4$
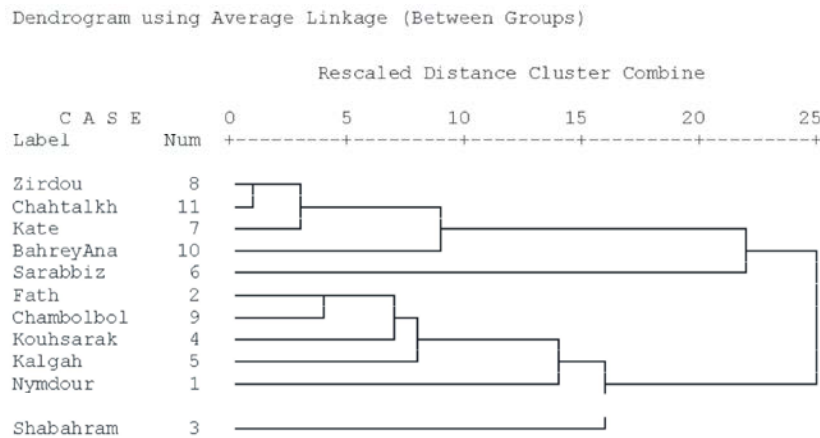

Fig. 3: Dendrogram obtained using cluster analysis due to similarity scores of studied villages based on 20 directly related variables in homegardens

Stepwise regression analysis was performed to characterize variables, which had the most relationships with homegarden species richness (as dependent variable; y), on socio-economic and biophysical variables (Table 1). Four variables including homegarden area (m^2), perception ratio of women in ornamental crops, women work ratio in vegetables and household income from homegardening, with explaining 66% of total variances entered the equation. Homegarden area had the most positive correlation with species richness and was in accordance with founds of Khoshbakht *et al*. [16] in Savadkouh, Iran. This confirmed whenever homegarden area increased, more opportunities were provided for different species existence. Meanwhile along with more women decision-making and activities in homegardening, more species would be brought into homegardens especially in case of vegetable and ornamental species by them. Finally it was revealed that more species presentation in homegardens overall meant more income opportunities for rural households and more secure livelihoods.

Cluster analysis is a way of grouping cases of data on the similarity of responses to several variables. In order to acquire similarity of villages based on 20 directly related variables to homegarden characters, cluster analysis was performed. Due to different scales of selected variables, they were standardized based on their standard deviations. The results showed that all mountainous villages in addition to one of plain-hilly topography villages were in one cluster of dendrogram and other villages in the second one (Figure 3).

CONCLUSIONS

The survey attempted to present a hue of biophysical and socioeconomic characteristics of Iranian homegardens. Iran enjoys one of the richest floras of the world. Due to its highly diverse climatic and ecosystems, a magnitude of agricultural domesticated species had arisen in Iran plateau. In case of farming systems, it seems that fewer attentions were paid to homegardens. This may be farther than climatic limitations, due to cultural context of Iranian communities and should be more considered from different aspects e.g. socio-economic characteristics of households and other probable limiting factors. According to our findings, access to possibilities and infrastructures, are critically determinant variables in development of

homegardens. Along with less accessibility, homegardens will be less diverse and households grow some necessary crops such as onions and vegetables for their daily subsistence. Wherever labor inputs and times devoted to homegardening were more provided, homegardens settled more species inwards and from another hands, more diverse homegardens contributed more in total household livelihoods. Some limited studies which have been conducted in Iran (e.g. Khoshbakht *et al*. [16]), revealed homegardening is not a significant part of livelihoods. Some revise and urgent endeavors should be carried out by Iranian involved stakeholders such as ministries of agriculture and hygiene, Iranian department of environment and research institutes and universities on this increasingly important components for sustainable livelihoods.

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