

Home Gardens and Management of Key Species in the Pachmarhi Biosphere Reserve of India

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ABSTRACT Growing and maintaining of plant species by household members in the vicinity of dwelling places dates back to antiquity. A study was conducted in the Pachmarhi Biosphere Reserve (PBR) - one of the 15 biosphere reserves of India, with the major aim of understanding the perceptions of tribal communities, especially with respect to the home gardens and role of home gardens in their livings. Through questionnaire survey the information was collected from the buffer zone villages of PBR on the species planted, purpose and perceptions of raising home gardens and interrelated traditional knowledge of local people. The study documented 47 ethno-botanical species ranging from forestry to horticulture and agricultural as grown in the home gardens. These species were used for multiple purposes including food, medicine, vegetables, nutraceutical, fodder and cultural significance. The practice of raising home gardens was based on centuries of cumulative traditional knowledge, practices and beliefs with respect to the species and its environmental and ecological requirements.

INTRODUCTION

Worldwide, growing ethnobotanically useful species in the vicinity of homes has a long tradition in various cultural groups. Such portion of land is generally referred to as the home garden or kitchen garden, which offers multiple benefits. A home garden is a small scale socio-ecological and traditional land-use system, which involves the management of useful plant species within the area of individual home (Nair and Sreedharan 1986; Kumar and Nair 2004; Buchmann 2009). Historically, growing and maintaining plant species in the vicinity of home and making their products by household members were primarily intended for the family consumption. However, the changing socio-economic conditions and advent of commercial forces have introduced the concept of cash with home gardens.

Growing number of species together in home gardens do not only deal with making resources available for food and medicine but also reveal invisible social mechanisms and related resilience strategies by avoiding risk and reducing vulnerability as may be noticed generally in single crop cultivation (Buchmann 2009). There are various dimensions of home gardens ranging from conservation of genetic diversity to providing food to poor cultivators during food scarcity (Kumar et al. 1994; Das and Das 2005; Srivastava and Heines 2005; Rowe 2009).

The hunter-gatherer societies traditionally

depend on the forest and forest resources primarily for their livelihood (Kala 2010a, b). However, in due course of time they have adopted marginal agricultural practices, including home gardens. There are about 427 tribal groups in India (Kala 2005), and home garden practices are even prevalent in the primitive tribal groups of north-east and central India (Srivastava and Heines 2005). Realizing the importance of home gardens, the present study aims to understand the perceptions of tribal groups with respect to the home gardens and role of home gardens in their lives and other rural communities of Pachmarhi Biosphere Reserve of India.

METHODOLOGY

Study Area

The Pachmarhi Biosphere Reserve (PBR), one of the 15 biosphere reserves of India, lies between 20° 10' to 22° 50' N latitude and 77° 45' to 78° 56' E longitude. PBR was established on March 3, 1999 in the Satpura Range of Madhya Pradesh. It spans over 3 districts of Madhya Pradesh – Hoshangabad, Betul, and Chhindwara. The total geographical area of PBR is 4926.28 sq km, of which 524.37 sq km is under the core zone and remaining 4462.93 sq km comprises the buffer zone (EPCO 2001). PBR consists of three wildlife conservation units, the Satpura National Park (524.37 sq km),

the Bori Wildlife Sanctuary (518.00 sq km), and the Pachmarhi Sanctuary (461.37 sq km). Satpura National Park is designated as the core zone of PBR and the remaining area including the Bori and Pachmarhi sanctuaries constitutes the buffer zone. In general, the temperature of PBR ranges from 11 to 42° C (Jayson 1990).

PBR endows with rich plant and animal diversity. The forest vegetation of PBR is classified as subtropical hill forest and tropical moist deciduous forest (Jayson 1990). The forests in PBR provide shelter for many wildlife species including tiger, leopard, wild boar, barking deer, guars, cheetal, and Rhesus macaque. PBR is equally known for its cultural diversity, as it is inhabited by number of tribal and non-tribal communities. The major tribal group was Gond in the study area. Because of the numerical strength, the Gond tribes dominate the central parts of India and earlier the Central Province was known as Gondwana state, as the Gond ruled this part of India in the past. The social organization of the Gond reveals that they are divided into clans, such as, Arpanche, Bariba, Dhurwe, Erpachi, Sarada, Sivsarsaran, Barkey, Batti, Eke and Wike.

Survey Methods

For the study of home gardens, the villages in buffer zone areas of PBR, close to the boundary of Satpuda Tiger Reserve, were approached. A total of 10 villages in buffer zone of PBR namely, Sabarwani, Shahwani, Fatepur, Singhpur, Anthoni, Badaldhana, Deokho Badalkachhar, Khara and Taperwani were selected for intensive study of home gardens and traditional ecological knowledge interwoven with home gardens. The selected villages were dominated by tribal communities, mostly Gond and Mawasi with their offshoots. The door to door questionnaire survey was conducted in the selected villages of PBR. In most of the villages, generally the male members were available for interviews, however, females were also present and cooperated during the interview.

Through questionnaire survey information was collected on the home gardens, purpose of raising plants and varieties of plants planted in the home gardens. The information was also collected on the traditional uses of plants, plant parts used and the local names of species grown in the home gardens. The local people were

encouraged to give their views and perceptions on the home gardens with respect to the cultural, ecological, economical and conservation perspectives. Participant observations were also employed and information was collected by participating in various cultural activities of the local tribal people in order to understand the cultural significance and rituals associated with home gardens.

RESULTS

Maintaining home gardens was quite common in the study villages of the PBR and almost every household had a home garden. The local people used to grow varieties of plant species in the home gardens, and the present survey resulted in the documentation of 47 plant species in such home gardens (Table 1). The availability of trees was an advantage over the herbs and shrub species in the home gardens as 21 tree species, 18 herb and 8 shrub species were recorded during the field survey. Various parts of these species were used by the local people, of these fruits of highest number of species (27) were used, followed by leaves (12), seeds (10), stem (8), bark (3), root, flower and resin (Fig. 1).

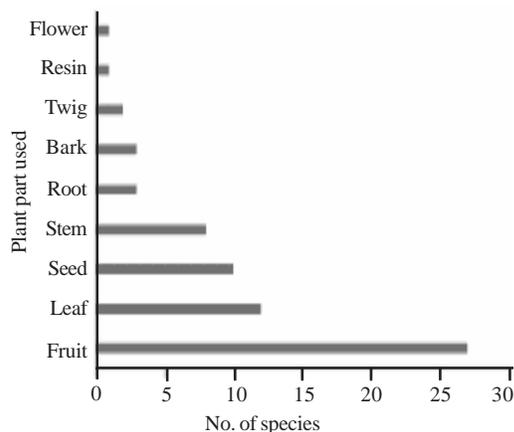


Fig. 1. Utilization pattern of species grown in the home garden

The species raised in the home gardens ranges from forestry to horticulture and agricultural purposes. Some forestry species such as *Shorea robusta*, *Diospyros melanoxylon*, *Aegle marmelos*, *Moringa pterygosperma* and *Terminalia tomentosa* were also found in the home gardens. The major crops grown in

the home gardens were *Zea mays*, *Cajanus cajan*, *Canavalia ensiformis*, *Lycopersicum esculentum*, *Capsicum annum*, *Sorghum sativum*. The most common horticultural plant species raised by local people in their home gardens were *Mengifera indica*, *Citrus sinensis*, *Carica papaya*, *Anona squamosa*, *Psidium guava* and *Tamarindus indica*. Some of these plants were used for multiple purposes, which include food, medicine and rituals.

Edible

Of the total recorded plant species as grown in the home gardens, about 62% were used for food mainly in the form of edible fruits and vegetables. The availability of edible fruit yielding plants was the highest (n=27) in the home gardens. The major seasonal vegetables grown in the home gardens include *Canavalia ensiformis*, *Lycopersicum esculentum*, *Capsicum annum*, and *Solanum melongena*. The leaves and fruits of *Moringa pterygosperma* and *Mucuna pruriens* were edible food for local people. Bamboo shoots were one of the preferred vegetables of local people.

The local people were aware of the nutritious properties of some important plant species, hence they cultivated these plants in their home gardens. *Moringa pterygosperma*, *Annona squamosa*, *Musa* spp., *Lycopersicum esculentum*, *Canavalia ensiformis*, *Mangifera india*, *Citrus sinensis* and *Coriandrum sativum* were considered as nutritious plant species by the local people. Besides, some of these plants were used to flavor the food, which include *Coriandrum sativum*. The mild shoots of bamboo were considered highly nutritious and often consumed by the local people.

Medicine

Though growing plants in home gardens primarily for curing diseases were not the major objective of the common local people in the study villages of PBR however as and when required some of these plants were used as medicine. A total of 20 medicinal plant species were found in the home gardens. *Aegle marmelos*, *Annona squamosa*, *Jatropha curcas*, *Psidium guava*, *Ocimum sanctum* and *Cynolon dactylon* were used for curing diseases by specialized herbal

practitioners and some knowledgeable persons. The fruits of *Aegle marmelos* were recommended for consumption by these knowledgeable people largely during summer, as they considered that it regulates the body temperature and keeps the body cool. The seeds of *Tamarindus indica* were used for ethno-veterinary purposes. Citrus fruits were used to cure stomach disorders including making juice and pickle. *Ocimum sanctum* was considered a holy plant and was also used to cure cough and cold by mixing with honey.

Cultural Use

Plants grown in the home gardens were used in various cultural practices as about 26% of total species reported during the study were used to perform a range of rituals. The leaves of some plant species mostly used to perform some specific rituals of these *Cynodon dactylon*, *Ocimum sanctum*, *Mangifera indica* and *Aegle marmelos* were important. *Shorea robusta*, *Terminalia tomentosa*, *Tamarindus indica*, and *Madhuca indica* are the most important religious plants in which they used to worship their deities. Many individuals of these plant species were marked as sacred and abode of local deities and hence people had high faith and respect for these individual plants. The branches of *Shorea robusta*, *Madhuca indica* and bamboo were used during marriage ceremonies. Leaves of *Mangifera indica* were used for decorating the marriage spot, locally called as mandap. Bamboo was also used for making special baskets called as *thatri* for performing some specific village festivals. 'Thatri' is a bamboo made basket in which the local people used to grow paddy (*Oryza sativa*), wheat (*Triticum aestivum*) and *Phaseolus mungo* and offered it to the village goddess Khedapati. Some people were in strong opinion of not selling bamboo due to its religious significance.

Other Uses of Home Garden

The home gardens were used as resting places by the local people. They took rest in the shade of broad leafed large tree species raised in the home garden, especially during daylight hours. *Mangifera indica*, *Shorea robusta*, *Tamarindus indica*, and *Psidium guava* were some of the shade providing plants grown in home gardens.

Table 1: Plant species grown in the home garden with their habit and traditional uses

S. No.	Botanical name	Local	Habit	Part used	Uses
1	<i>Aegle marmelos</i> Correa.	Bel	Tree	Fruit	Edible, Medicinal (Stomach disorder)
2	<i>Aloe vera</i> L.	Gourpatha	Tree	Leaf	Religious (Offer to Goddesses)
3	<i>Anona squamosa</i> L.	Sarifa/Sitaphal	Shrub	Bark	Digestive, burnt, headache
				Fruit	Edible
4	<i>Azadirachta indica</i> A.H.L. Juss.	Neem/Lim	Tree	Leaf	Ethno-veterinary use
				Fruit	Oil (use in scabies)
				Leaf	Medicinal (Malaria), Mosquito repellent
				Bark	Medicinal (Fever)
5	<i>Bauhinia purpurea</i> L.	Keolar	Tree	Stem	Toothbrush/toothache, Fever, Agricultural implement
6	<i>Bombax ceiba</i> L.	Sennel	Tree	Leaf	Vegetable
7	<i>Cajanus cajan</i> (L.) Millsp.	Tuar/Leher	Tree	Fruit	Medicine (boil)
8	<i>Canavalia ensiformis</i> DC.	Semi/Barhar	Herb	Grain	Edible
9	<i>Capsicum annuum</i> L.	Mirch	Herb	Fruit	Edible
10	<i>Carica papaya</i> L.	Papita	Tree	Fruit	Edible
11	<i>Chlorophytum tuberosum</i> Baker	Safed Musli	Herb	Root	Medicinal (tonic)
12	<i>Cicer arietinum</i> L.	Chana	Herb	Seed	Edible
13	<i>Citrus sinensis</i> (L.) Osbeck	Narangee	Shrub	Fruit	Edible
14	<i>Citrus medica</i> L.	Nimbu	Tree	Fruit	Edible Medicinal (Stomach Disorder, Headache)
15	<i>Coriandrum sativum</i> L.	Dhaniya	Herb	Seed	Spice
16	<i>Cucurbita maxima</i> Duch. ex Lam.	Kaddu	Herb	Fruit	Edible
17	<i>Cynodon dactylon</i> (L.) Pearsoon	Dub	Grass	Whole plant	Cut and wound, Cultural
18	<i>Dendrocalamus strictus</i> Nees.	Bamboo	Tree	Stem	House construction, Door making, Cultural (Making of 'Gatha' to carry the dead body) Fishing trap, Making of 'Tharri' during village festival
19	<i>Diospyros melanoxylon</i> Roxb.	Tendu	Tree	Twig	Edible (karla)
				Fruit	Edible (Ripe)
				Leaf	Selling
20	<i>Sorghum bicolor</i> (L.) Moench	Jowar	Herb	Grain	Edible
21	<i>Ficus recemosa</i> L.	Dumri/ Gular	Tree	Fruit	Edible
22	<i>Guzotia abyssinica</i> Cass.	Lagni	Tree	Seed	Oil extraction
23	<i>Gymnema sylvestri</i> (Retz.) R. Br.	Gudmar	Shrub	Root, twig	Medicinal (diabetes)
24	<i>Ipomea</i> sp.	Besaram	Shrub	Stem	Land boundary
25	<i>Jatropha curcas</i> L.	Rattanjot	Shrub	Fruit	Oil (applied on wound)
26	<i>Lawsonia inermis</i> L.	Hina	Shrub	Stem	Fencing and making of bunds
27	<i>Lycopersicon esculentum</i> Mill.	Tamatar	Herb	Fruit	Edible
28	<i>Madhuca indica</i> L.	Mahua/ Guli	Tree	Flower	Edible after cooking, Liquor preparation, Offer to Deities
29	<i>Mengifera indica</i> L.	Aam	Tree	Fruit	Oil (Curry preparation), Massage in body
				Stem	Cultural (marriage)
				Fruit	Edible (raw and ripe)
				Seed	Edible
30	<i>Moringa pterygosperma</i> Gaertn.	Munga/Sahjan	Tree	Leaf	Cultural (making of marriage spot)
31	<i>Mucuna pruriens</i> DC.	Keunch	Shrub	Leaf	Edible
32	<i>Musa</i> sp.	Kela	Herb	Fruit	Snakebite
				Fruit	Edible, Cultural

Table 1: Contd.....

S. No.	Botanical name	Local	Habit	Part used	Uses
33	<i>Ocimum sanctum</i> L.	Tulsi	Herb	Leaf	Cultural, Cough - cold
34	<i>Paspalum scrobiculatum</i> L.	Kodu/ Badheli/Kora	Herb	Seed	Edible after boiling, Given after delivery
35	<i>Phyllanthus officinalis</i> L.	Amla	Tree	Fruit	Edible and medicinal (digestive)
				Leaf	Cultural (Offer to Gods and Goddesses)
				Leaf	Stomach disorder
36	<i>Psidium guava</i> L.	Jam/ Amrud/ Bithi	Tree	Fruit	Both raw and ripe fruits are eaten
37	<i>Ricinus communis</i> L.	Arandi	Shrub	Leaf	Medicinal (Dysentery)
38	<i>Sesamum indicum</i> L.	Til	Herb	Fruit	Oil (Headache, massaging body)
39	<i>Shorea robusta</i> Gaertn.	Sal/ Sarei	Tree	Root	Easy delivery
				Seed	Oil Edible
				Stem	House construction, Furniture, Fuel wood, Plough making, Cultural (to prepare marriage spot), Offer to deities for appeasement Toothbrush
40	<i>Solanum nigrum</i> L.	Makoi	Herb	Resin	Medicinal (burn wound)
41	<i>Solanum melongena</i> L.	Baigan	Herb	Fruit	Edible
42	<i>Syzygium cumini</i> (L.) Skeels	Jamun	Tree	Fruit	Edible
				Stem	Cultural (marriage)
				Fruit	Edible
				Leaf	Medicinal (Dysentery), Cultural (placed on marriage spot)
43	<i>Tamarindus indica</i> L.	Emli	Tree	Seed	Medicinal (Diabetic)
				Bark	Medicinal (Dysentery)
				Fruit	Edible, Pickle preparation, Medicinal (Ethno-veterinary)
44	<i>Terminalia tomentosa</i> W and A	Saja	Tree	Stem	House construction, Fuel wood, Used during marriage
45	<i>Vitex nigundo</i> L.	Nirgundi	Herb	Whole	Fencing land
46	<i>Zea mays</i> L.	Makka	Herb	Seed	Edible
47	<i>Zizyphus jujuba</i> Lam.	Ber/ Renga	Tree	Fruit	Edible

Local people believed that resting beneath *Tamarindus indica* is good for health as this plant possesses some medicinal properties and eradicate certain diseases. People also stored paddy straw and some firewood over the big trees of home gardens for their use in the next season or year, realizing that such method avoided pest attack and also kept dry the paddy straw and firewood. Grasses and bamboo leaves grown in home garden were used as fodder. Growing plants mostly for vegetables during different seasons of the year continued the greenery of home gardens, which also provided the cultural services, especially in terms of scenic beauty.

The practice of marketing cultivated species of home gardens was limited to a few households. They sold some vegetables and fruits in the nearby market for monetary benefits. The most marketable vegetables were *Canavalia ensiformis*, *Lycopersicon esculentum*, and *Coriandrum sativum* and marketable fruits were *Anona squamosa*, *Citrus sinensis*, *Zizyphus jujuba*, *Tamarindus indica* and *Moringa pterygosperma*. Three oil producing plants such as *Ricinus communis*, *Sesamum indicum*, and *Jetropa curcas* were grown by most of the households, of these *Sesamum indicum* was mainly grown for sale. To mark the boundary of the home garden, besides wall fencing, bio-fencing was in practice traditionally and *Jetropa curcas* were used to mark boundary and once its fruits ripen it was harvested for extraction of oil.

DISCUSSION

The observations and findings of the present study pointed towards a vital role of home gardens in the life of local people of PBR. The home gardens have provided them the number of services in terms of not only for food, fodder, firewood and medicine but also cultural and aesthetic services. Some of the plants and crops cultivated in home gardens were quite nutritious and available within the vicinity of the residence as and when required. Growing a few individuals of many species in a small area many not only enhance the dietary diversity of the home garden's owner but also maintain the fertility of soil, as established by Fernandes and Nair (1990), and Das and Das (2005). Besides, there was barter in home gardens produce that strengthen the social fabric and maintain the harmony within the community.

In India, there are studies which determine the importance and role of home gardens in the life of local people, especially in terms of livelihood and economic significance (Samati 2004; Das and Das 2005; Srivastava and Heines 2005; Tangjang and Arunachalam 2009; Tynsong and Tiwari 2010). Raising home gardens by local people in PBR may determine the concept of Folke (2006), which reads "learning to live with change and uncertainty". Given the small size and location of home gardens within the compound of individual household, hiring of labour was not generally required and mainly raising home gardens was dependent on the family labour. However, in some families there was mutual labour support mechanism with neighbors in the study villages of PBR. Similar observations are made to raise home gardens elsewhere across the world such as in Cuba (Buchmann 2009) and Tajikistan (Rowe 2009).

The species selected to grow in the home gardens were based on the ecological requirements of the species as determined by the local people through centuries of experimentation. Such practically refined knowledge was passed through generations by word of mouth and visual observations. The selection of shade loving crops to grow under large tree species was based on the years of accumulated traditional ecological knowledge. Further, the local people had established the understanding on various intra and inter specific interactions to raise varieties of plant species in a small piece of land. Plant responses with seasonality and adaptability were some other aspects of TEK that have accumulated by local people through trial and errors. In general, the practice of raising home gardens is based on the cumulative traditional knowledge, practices and beliefs with respect to the species and its environmental and ecological requirements.

The low availability of some highly useful plant species in the wild (e.g. ritual, edible and medicinal plant species) had also instigated people to cultivate it in the home gardens for easy availability. This fact not only helps in conserving the genetic pool of species declining in the wild but also home garden provides a safety net to the local people in case of exigency. Given the valuable TEK interwoven with home gardens along with their ecological, environmental and economic significance, the farmers may be encouraged to continue the tradition of

raising home gardens in view of maintaining the biodiversity as well as the livelihood of local people. The dilemma of including home gardens as a part of agriculture or forestry needs to be resolved in order to develop some suitable policy for maintaining such valuable traditional art and ecological knowledge.

CONCLUSION

The present study on home gardens reflects the wise use of land, traditionally, by the local people of PBR for day to day requirement of resources for their continued existence. By setting up home gardens, a number of ecosystem services have been trapped by local people in the vicinity of their dwelling places. The continuous existence and maintenance of home gardens have enhanced the soil fertility and dietary diversity of local people including social fabrics of the community. Besides, the home gardens have been helping in conservation of genetic diversity of useful ethnobotanical species since antiquity, hence this important heritage and art needs proper care, respect and recognition.

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