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Conservation of Native Flora and Fauna of Agro-Biodiversity Park in ANGRAU, Hyderabad, Andhra Pradesh, India

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Abstract

Deccan plateau region in India is unique due to presence of diversified geography and ecosystems with rich agricultural diversity including wild flora and fauna. However, it was over exploited by several anthropogenic activities. Acharya N.G. Ranga Agricultural University, Hyderabad has established first Agro-biodiversity Park in August, 2008 and is the first of its' kind in India with a main objective of preserving, conserving and promoting the rich biodiversity of Deccan plateau region of Hyderabad. The park site is naturally spread with hillocks, boulders, undulated terrain with sloppy lands covered diverse vegetation besides a natural water tank. In the initial stage, the dangerous invasive alien species such as *Parthenium hysterophorous*, *Lantana camera* and *Prosopis juliflora* present in the vicinity were removed. Subsequently, several block plantations were developed with Teak and Mahua (70 %) and forest mixed tree species (30 %). Besides, separate generic blocks *viz*., palm and medicinal tree, mixed forest tree gardens and *Ficus* species diversity block were also developed. Of late, a rare, endemic, endangered and globally threatened species *Ceropegia* was identified in 2009. Since then, utmost care was taken for conservation in agro-biodiversity park. Water ponds and bodies were also created as a source of water for all resident and migratory bio-creatures for promotion of faunal genetic resources. At present, 24 species of insects, 5 species of fish and 8 species of reptiles were recorded. Out of 120 species of butterflies present in the Andhra Pradesh, 56 were found in this park.

1. Introduction

Biodiversity is the key to sustain agricultural production and productivity. It would be very difficult for a nation like India to achieve the global target of conservation of up to 70% genetic diversity of crops and other major socio-economically valuable plant species unless efforts are made to incorporate community conserved biodiversity and agricultural landscapes. Conservation of diversity on-farm and *in-situ* in forests and protected areas is likely to backup food and agricultural security options of the future. The loss of diversity is alarming across known species groups. Knowledge and information is limited about the distributional pattern and conservation status of the threatened tree species in India. Further, at times when the world is facing climate change with predictions indicating around 10% of all tree species of India would be lost in near future, care must be taken to minimize the loss. Approximately 600 tree species in India are threatened with extinction and a sizable percentage is being located in South India. Deccan plateau region is one of the richest biodiversity hot spots in India and is over exploited by several anthropogenic activities resulting in loss of life supporting resources, biodiversity, gene pool and natures self sustaining and ameliorative capabilities (Srinivasulu, 2010). Keeping in view of facts with appropriate presumptions pertaining to devastating effects such as degeneration of natural resources, the Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad, Andhra Pradesh has initiated with the following objectives to conserve and promote the native flora and faunal diversity at Agro-biodiversity park at Hyderabad (Kamalakar, 2011).

The agro-biodiversity park is aimed mainly to preserve, conserve and promote the native flora and fauna through *ex-situ* conservation of the species and to establish 15-20 biotic communities including wild relative field crops as a repository that flourished in the Deccan plateau in the past. The main objectives are to restore and develop the existing dry land and wet land habitat to preserve and conserve the genetic resources of both flora and fauna, create a field gene bank for the threatened land races and wild genetic resources of millets, cereals, pulses, oilseed and fiber crops, create different habitat

types which will provide material for resident and migratory birds, mammals, reptiles, amphibians, insects etc., promote and create awareness on nature conservation through education and promote scientific research for preserving the keystone species of ecosystem importance and promote ecotourism which will act as cultural and aesthetic centre for urban dwellers.

2. Materials and Methods

The Acharya N.G. Ranga Agricultural University ANGRAU , Hyderabad is the first in India to establish Agri-biodiversity park (ABDP) in August, 2008 in 60 ha with natural ecosystem. The site selected for agro-biodiversity park in ANGRAU campus is originally under jungle scrub, hillocks, rock structures, water bodies, undulating rocky terrain with different topography lands covered with different natural grown tree species, shrubs, herbs, creepers and different grass species etc. Out of 60 ha, 50% area is under natural water tank. At initial stage, with minimum disturbance to the park , the exotic species such as *Parthenium hysterophorous*, *Lantana camera* and *Prosopis juliflora* present in the vicinity were removed as these suppress the native flora and faunal diversity. Whereas, other natural trees such as Neem, Pongamia, Jamun, Ficus, Banyan, Accasia, *Dalberzia sissoo* and *Albizia lebbak*, Cassia spp were not disturbed.

The main conservations steps taken up I Agro-biodiversity are as follows:

- At begining itself the entire border and boundaries were strengthened by link mesh as such valuable young plants in different blocks were protected from grazing by cattle.
- Since planting onwards utmost care has taken for survival in general and in particular to important sensitive and rare species in terms of watering, manuring and intercultural operations.
- During summer at high temperatures to over moisture stress timely watering was done to some sensitive species.
- Dead and dried plants were removed immediately gap filling was also done.
- Against slopes *insitu* soil and water conservation was taken by planting Vitiver grass, formation of counter bunds and stone dams to utilize monsoon rain water and to increase water recharging.
- Alien species such as Parthenium, Lantana and *Prosopis juliflora* as soon as found were removed regularly so as to encourage the spread of native flora. Otherwise they will suppress the growth of local seasonal, annual herbs and many grass species.
- Cultivated traditional varities of Paddy (10), redgram (3) and groundut (3)

Depending upon topography, soil profiles were dug. Initial surface and sub-surface soils and water samples from different locations of tank were collected and analyzed for different parameters by following standard methods (AOAC, 1980).

3. Results and Discussion

Soil data of agri-biodiversity park revealed that most of the soil types were red gravelly to sandy loams with shallow to medium deep soils and few are black clay loamy deep soils near to water tank area. Soils are neutral to alkaline in reaction (6.54 to 8.69) and non-saline to medium saline in nature (0.06 to1.87 dSm^{-1}). Organic carbon content was recorded low to high (0.45-1.2%). Regarding nutrient status, it was found to be very low to medium in terms of available N (125-326 kg ha^{-1}), medium to very high P_2O_5 (34.6-130.2 kg ha^{-1}) and low to high K_2O (233-782 kg ha^{-1}). It is well known that different plant species promote different groups of soil biota, and ~~that~~ the changes in below-ground organisms can feed back to enhance the rate of vegetation change. Therefore, the planting of different species into degraded soils might be used to promote soil biodiversity and function, there by enhancing the rate of restoration (Aariff Khan et.al 2011; Kamalakar, 2011).

Different plant community dominated blocks were developed such as teak, mahuva, ficus, palm, medicinal garden, mixed forest tree block, natural jungle scrub and plain lands in Agri biodiversity park site and the details are furnished below.

3.1. Teak dominated plant community block (No. of plants planted were 2040 in 2.08 ha)

In this block, plantation was done during September, 2008 with mixed plant species of different forms, shapes, canopy structures, growth promoting the native flora and fauna in the locality with an objective of creating natural habitat. Teak was planted with a composition of 30% in mixed plant community in the block. Hence, it is called Teak dominated plant community block.

3.2. Mahuva dominated plant community block (no. of plants planted were 1355 in 1.36 ha)

A Mahuva dominated plant community block was also established in September, 2008 with 30% composition in mixed plant community.

The following different categories of tree species were included in the plantation of the above said blocks (Table 1).

3.3. Ficus garden block (202 no., 30 species in 0.3 ha)

In this block, different species diversity of genus Ficus were planted during September, 2009 to denote genetic diversity in the species. About 30 Ficus species like *Ficus bengalensis, Ficus religiosa, Ficus nodosa, Ficus benzamin, Ficus bengalensis* (variegated) etc., were planted in Ficus garden block. The different Ficus species planted in the block are presented in Table 2.

3.4. Medicinal tree garden block (535 no., 29 species in 0.6 ha)

In this block, about 29 tree species which have medicinal value were planted to establish a medicinal tree garden in agri-biodiversity park. The following medicinal ~~valued~~ tree species were planted in September, 2009 (Table 3)

3.5. Palm garden block (300 no., 22 species in 0.4 ha)

In this block, about 22 species of palms were planted to establish as a model farm for genetic diversity of palm species during November, 2009. Some of the palms like sugar date palms and date palms will with stand harsh dry conditions (Maarten van ginkel, 2010) (Table 4).

3.6. Mixed forest trees

The following tree samplings having large and small crown growing habit nearly 6000 were planted in 10 acres in July, 2010 itself. As these were planted in monsoon season almost all plants were survived (Table 5).

3.7. Identification of endangered species

Of late, a rare, endemic, endangered and globally threatened species *Ceropegia* (Asclepiadaceae) commonly called as chain of hearts was identified in 2009. From then onwards utmost care was taken towards conservation in agro-biodiversity park. *Ceropegia* is an old world tropical genus having 200 species. About 48 species are found in India and out these 28 are endemic to the Peninsular region. In Andhra Pradesh, four species are reported such as *Ceropegia attenuata, Ceropegia odorata, Ceropegia spiralis,*

Ceropegia pusilla. The roots and tubers contain an alkaloid called Ceropegin is having medical importance and active against many diseases especially diarrhea, dysentery, ulcers and inflammations.

3.8. Other activities

As part of other activities water ponds and water bodies were also created as a source of water for all resident and migratory bio-creatures for promotion of faunal genetic

Table1: Some important generic diversity tree species

Common name	Scientific name
Peepal	*Ficus religiosa*
Copper pod tree	*Peltophorum ferrugeneum*
Sapta padi	*Alastronia scholaris*
Indian cork tree	*Millingtonia hertensis*
Spathodia	*Spathodia companulata*
Pride of India	*Lagarstromia florsegene*
Camel foot tree	*Bauhinea* spp
Karanj	*Pongamia pinnata*
Tabubea	*Tabubea rosea*
Neem	*Azadirachta indica*
Tamarind	*Tamarindus indica*
Jamun	*Syzigium cumini*
Amla	*Emblica officinalis*
Wood apple	*Ferrunea elephanta*
Teak	*Tectona grandis*
Mahuva	*Madhuca latifolia*

Table 2: Some important species diversity of genus Ficus

Ficus pandurata	*Ficus pandurata*
Benjamina blackiana	*Ficus prestige*
Ficus regenald	*Ficus wasteland*
Ficus bengalensis	*Ficus religiosa*
Ficus glomorata	*Ficus bengalensis*
Ficus noda	*Ficus hispida*
Ficus benjamina	*Ficus iceland*
Ficus pumela	*Ficus mysorensis*
Ficus elastica	*Ficus dammaropsis*
Ficus bushking	*Ficus triangle*
Ficus milenusi	*Ficus religiosa*
Ficus drooping	*Ficus avoa gold*
Ficus long leaf	*Ficus tussil*
Ficus mexicana	*Ficus plurocarpa*

Table 3: Some important medicinal tree species

Adathoda vasika	*Thespesia populnee*
Syzigium cumini	*Ceiba pentandra*
Acacia sinuta	*Erythrina indica*
Cassia alata	*Aegel marmalose*
Simarouba glauca	*Plumbago jailana*
Asparagus recimosus	*Alstonia venenata*
Commiphora wightii	*Terminelia bellerica*
Holorhena antidecentrica	*Adenanthera povonia*
Casia glauca	*Sterculia urens*
Pongamia pinnata	*Butea monosperma*
Azaridacta indica	*Emblica officinalis*
Casia fistula	*Haemophyllum canophyllum*
Tabubea avalanda	*Casia siamea*
Sterculia foetida	*Dalebergia latifolia*
Madhuca latifolia	-

Table 4: Some important species of palms

Fish tail palm	*Caryota urens*
Royal palm	*Roystonea regia*
Ruffled fan palm	*Licuala grandis*
Areca palm	*Ptycho sperma*
Sugar date palm	*Phoenix sylvestris*
Triangle palm	*Dypsis decaryi*
Date palm	*Phoenic roebeleni*
Kentia palm	*Dictyosperma album*

resources. The faunal diversity present in agro-biodiversity Park consists of insects 24 species (Table 7) belonging to the orders of Dictyoptera (5), Hemiptera (4), Hymenoptera (2) Coleoptera (13), Dragon files and Damselflies (10 species) and Fish (5 species)-Osteoglossiformes (1), Cypriniformes (3), Siluriformes (1). Regarding butterflies present in the Andhra Pradesh state 56 were recorded in the Agro-biodiversity Park. Among 120 different species of butterflies consists of families (33 no.) Nymphalidae (23), Lycaenidae (5), Pieridae (9), Hesperiidae (2), Papilionidae (4). Reptiles (8 species): Snakes-Python, Crait, Vipers, Indian Cobra *(Naja naja)*, Lizards and Chameleon. Pertaining to birds the species increased from 35 to 162 species within 4 years of duration (Table 6). Besides, there are 11 types of mammals in the park as detailed in Table 8.

3.9. Expected out come of the agro-biodiversity park

- The Biodiversity Park may nurture variety of ornamental plants, medicinal and aromatic plants, aquatic plants, orchids, palm groves, bamboo groves and mixed forest trees etc.,
- A Heritage Garden enhances the joy of aesthetic exploration and education as much as academic study.
- The park will attract a host of insect species, birds and other wild creatures.
- The park will help as a tool of informative herbarium for the benefit of students, visitors, researchers etc.,
- It will act as research resource for colleges and research institutes
- It will help in promotion of Ecotourism

3.10. Proposed activities

- Preservation, conservation and maintenance of traditional varieties and land races of cereals, millets, pulses and oil seeds.

Tabe 5: Some important large, medium and small crowned tree species

Large crowed tree species	Medium and small crowned species
Ficus religious	*Emblica officinalis*
Ficus bengalensis	*Cassia fistula*
Ficus mollis	*Bauhinia recemosa*
Terminalia arjuna	*Mimusops elengi*
Madhuca longifolia	*Santalum album*
Sizizium cumini	*Putranjiva roxburghi*
Tamirindus indica	*Swietenia mahagony*
Sterculia foetida	*Millingtonia hortensis*
Terminalia catappa	*Dalbergia latifolia*
Hordurickia binata	*Dendracalmus strictus*
Terminalia tomentosa	*Ferronia elebphantum*
Anthocephlus cadamba	*Emblica officinalis*

Table 6: Some important names of birds found in agro-biodiversity park

Large egret	*Ardea alba*
Paddy bird	*Ardeola grayii*
Yellow-wattled lapwing	*Vanellus malabaricus*
Black winged stilt	*Himantopus himantopus*
Indian courser	*Cursorius coromandelius*
Indian whiskered term	*Chlidonias hybrida*
Indian pitta	*Pitta brachyura*
Plaies	*Prinia sybflowren-warbler*
Ashy uren	*Prinnia warbler socialis*
Tailor bird	*Orthotomus sutorius*
Indian pea cock	-

Table 7: Some important mammals found in Agro-biodiversity park

Jackal	*Caniz aurauz*
Indianfox	*Vulpez bengalensis*
Monkeys	*Macaca mulatta*
Black nappad hare	*Lopus nigricollis*
Three stripped palm squirrel	*Funambabas palamarum*
Common mungoosa	*Harpastas adwardsii*
Indian porcupine	*Hystrix indica*
Larger bandicoot rat	*Bandicota bengalensis*
Common bat	*Hipporidaroa spaoria*
Common longur	*Prabytis antellus*
Wild boar	*Suscriatatus*

Table 8: Some important insects found in agro-biodiversity park

Longa horn beetle
Red velvet bug
Common hopper
Lady bird beetle
Dung beetle
Dragon files
Sand cockroach
Common cockroach
Praying mantid

- Development of butterfly garden
- Development of range lands
- Development of water ponds, water bodies
- Development of wetland eco system

4. Conclusion

Establishing agro-biodiversity park in Acharya N.G. Ranga Agricultural University, Hyderabad will promote and conserve the native flora and faunal diversity of Deccan plateau

Hyderabad region that flourished in the past. In addition, it also improves the micro climate, environment, vegetation and soil biota as well as carbon sequestration. The agro-biodiversity park will also create awareness and promote scientific research education and finally encourage ecotourism in future.

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