

**Strengthening and rehabilitating the Bioresources  
Nature Park in the KFRI Sub Centre Campus**

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## Abstract of Project Proposal

Code	KFRI 532/2007
Title	Strengthening and rehabilitating the Bioresources Nature Park in the KFRI Sub Centre Campus
Objectives	<ol style="list-style-type: none"><li>1. To strengthen and rehabilitate the Bioresources Nature Park in the KFRI Sub Centre Campus, and</li><li>2. To assemble more species in each theme area of the Bioresources Nature Park</li></ol>
Project period	July 2007 to July 2010
Funded by	KFRI Plan Grant
Scientific personnel	U.M. Chandrashekara

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## ABSTRACT

The Kerala Forest Research Institute, at its Sub Centre at Nilambur has developed about 12 ha of land into a Bioresources Nature Park. The Bioresources Nature Park has conservation themes for the lower groups of plants such as algae, bryophytes and pteridophytes, plants found in specialized ecological niche such as xerophytes (cacti and succulents) and hydrophytes (aquatic plants), beneficial plants (eg. medicinal plants) and ornamental plants (eg. orchids), with special reference to endemic and rare, endangered and threatened (RET) species. In order to improve the facilities in the Bioresources Nature Park, the Institute has initiated a short-term project. The specific objectives of the project were to a) strengthen and rehabilitate the Bioresources Nature Park, and b) assemble more species in each theme area of the Park. In the Nature Park, irrigation facilities such as pipe line, sprinkler and mist outlets provided were inadequate even to manage the existing plants in the garden. Thus, as a part of the project, irrigation facility has been strengthened. During the project period, emphasis has also been given to collect plant propagules of ferns and angiosperms and assemble them in appropriate theme area in the Bioresources Nature Trail. Details of new species introduced and individuals of existing species that were replaced with healthy one are given in the report.

## 1. INTRODUCTION

The campus of KFRI Sub Centre at Nilambur, established in 1978, extends to an area of 43.36 ha. Recently the Institute has developed about 12 ha of land of the Sub Centre campus into a Bioresources Nature Park (Chandrashekara *et al.*, 2009; Chandrashekara and Sasidharan, 2010). The Bioresources Nature Park has conservation themes for the lower groups of plants such as algae, bryophytes and pteridophytes, plants found in specialized ecological niche such as xerophytes (cacti and succulents) and hydrophytes (aquatic plants), beneficial plants (eg. medicinal plants, palms and rattans) and ornamental plants (eg. orchids), with special reference to endemic and rare, endangered and threatened (RET) species. Over, 1000 plant species have been assembled in the theme area, which is also landscaped to provide a good ambience for the visitors of the Park. The Park with germplasm collection of different groups of plants is beneficial to almost all sections of the society, which includes students and researchers, nature enthusiasts, and those engaged in conservation and management of plant biodiversity. Since the Bioresources Nature Park is located in the strategic location adjacent to the world famous Teak Museum on the way to Mysore and Ooty, and in the fringe of Nilgiri Biosphere Reserve also forms an important part of the Ecotourism in the Western Ghats of India. In this context, the Institute has recognized the fact that strengthening of

the Bioresources Nature Park with more emphasis on irrigation, regular weeding, management of plants by providing required nutrients and enrichment of each theme area by adding more species, particularly RET species is necessary. Therefore, the specific objectives of the proposed project were to a) strengthen and rehabilitate the Bioresources Nature Park in the KFRI Sub Centre Campus, and b) assemble more species in each theme area of the Bioresources Nature Park.

## 2. LOCATION AND CLIMATE

Nilambur, in Malappuram District of Kerala State (Figure 1) is the place where the world’s first teak plantation was raised during 1842-1844 by H.V. Conolly, the then collector of Malabar. The historic importance of Nilambur also inspired the establishment in the year 1995, a Teak Museum at the in the KFRI Sub Centre campus (76° 15' 28" E longitude and 11° 18' 14" N latitude) (Figure 2). The Teak Museum provides information on cultivation, management, utilization, ecology and socio-economic and other aspects of teak (*Tectona grandis*)- the reputed timber species of South- east Asia. Each month, an average of about 9,000 visitors including farmers, members of the general public, students and researchers visit the Teak Museum and adjacent Bioresources Nature Trail, both located in the KFRI Sub Centre campus.

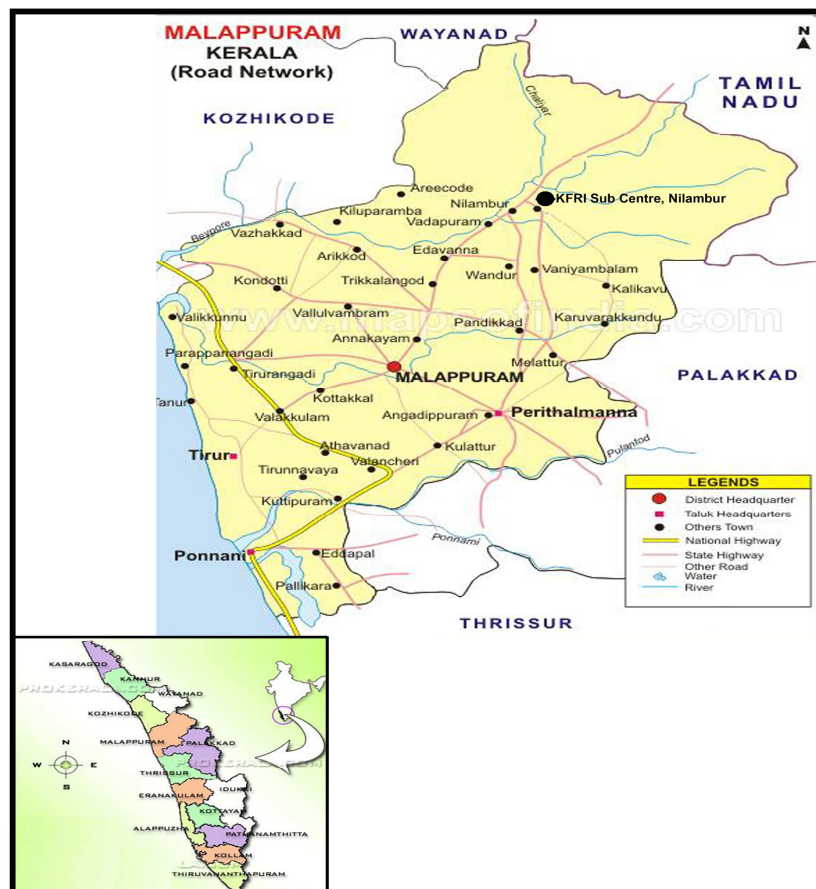


Figure 1. Map of Kerala showing Nilambur where the Bioresources Nature Trail is present.



Figure 2. Imagery from Digital Globe Geo-eye showing the Teak Museum and Bioresources Nature Trail at Nilambur

The altitude of the KFR I Sub Centre campus is about 65 m above msl. The annual rainfall is around 2,360 mm, and it is during the month of July that the area receives the maximum precipitation of about 422 mm, whereas in January, February and March the precipitation is about 30.4 mm, 8.26 mm and 26.4 mm respectively. The mean maximum and minimum temperatures are 37<sup>0</sup> C and 17<sup>0</sup> C respectively. Surface soil is red (oxisol) fine loamy and the sub-surface soil is gravel and red sandy. During the dry period, the humidity is very less and herbs and shrubs tend to dry in the absence of subsoil moisture.

### **3. ACTIVITIES UNDERTAKEN**

#### **3.1 Management of theme areas in the Garden**

In the Bioresources Nature Park, plants can be seen in three broad areas namely; inside the thematic houses (eg. Orchid House, Fern House, and Xerophytes and Succulent plant House), in the open area of the garden (Medicinal plants Garden, Palms and Rattan Garden, Rock Garden) and in the ponds of various dimensions (hydrophytes). Inside the thematic houses, potted plants are maintained. During the project period, soils in plots were replaced with nutrient rich soil at least once in a year. Regular weeding and tending operations were undertaken to facilitate the planted individuals to grow well. At least around 25-30% of the species planted in each theme house had to be replanted at frequent intervals. This is due to the fact that a) some are short duration plants, b) the weather of Nilambur

and microclimate prevailing inside the thematic house may not be conducive for certain species to flourish well, c) pest and diseases are common for some other species. For the plants in the Orchid House, nutrients were provided through foliar spray at weekly interval. Each potted plant was supplied with clear supernatant of fresh cow-dung slurry at weekly intervals. Plants were sprayed with the supernatant of cow-dung slurry once in a month. Foliar spray of fertiliser mixture of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O in the ratio 3:1:1 during vegetative period and 1:2:2 during flowering period was applied. Such a mixture with a dose of 2-3 g per litre of water was applied to the soil twice a week.

The xerophytes and succulents, in general, prefer well-drained, porous pot compost. Thus, while replacing the pot mixture every year, sand (medium to coarse), clay and silt were mixed at a ratio of 6:2:2. All the ingredients, before mixing, were subjected to solarisation. Before replanting in pots, the roots were examined carefully. Roots showing any indication of rot or other infection was removed and the fungicide treatment given. Inside the pot, tile pieces were placed over the drainage holes arch-wise. Then about ¼<sup>th</sup> of the pot was filled with small pieces of bricks followed by a layer of gravel or coarse sand to ensure good drainage and to check the soil from being percolated out with water. To leave room for watering, the pot was filled leaving a gap of 2-3 cm at the top. Watering was done twice a week during summer and once in a week during rainy season.

In medicinal plants and palm gardens, individuals of each species were planted in 2m x 2m blocks whose borders were raised using laterite bricks or roof tiles. The height of the border was around 25 cm above the ground level. The basin thus formed was filled with partially decomposed leaf litter and freshly fallen leaves. Mulching was done at the close of north-east monsoon (October-November). The purpose of mulching was to avoid weed growth around palm seedlings, control soil erosion and add organic matter to the soil by mulch decomposition. However, despite mulching, some seedlings showed poor growth. In such cases, inorganic fertilizer (urea, super-phosphate and muricate of potash in 1:2:2 ration by weight) was provided in split dose during May-June, September-October, December and February. During dry summer months, plants were irrigated daily at the rate of 40-50 liters of water per each block.

In the Hydrophyte garden, plants are growing in ponds and tubs of different dimensions. During the project period, the bottom of pools and tubs was filled with rich clayey soil at six-monthly interval to provide enough nutrition. Water plants are heavy feeders, and will not bloom unless they receive proper nutrition. Thus the soil was enriched by providing well-decomposed cattle dung manure. The manure was first placed in the bottom and then covered with clayey soil to prevent the floating of manure. Around the ponds/tubs some ornamental leaf or flower beds were also placed. The ponds

and tubs were cleaned occasionally and plants were trimmed as and when required. Once in a year, replanting was done after the organic matter from the bottom of the container were taken out completely and replaced with fresh nutrient rich clayey soil.

Irrigation facilities such as pipe line, sprinklers and mist outlets provided in the Bioresources Nature trail were inadequate even to manage the existing plants in the garden. Thus, irrigation facility has been strengthened. These facilities are sufficient to provide adequate moisture for both the existing plants and the plants added during the project period to grow well even in the hot and humid condition of Nilambur.

### **3.2. Enrichment of theme areas with plants in the Bioresources Nature Park**

In order to replace the damaged plants and to add new plants in the thematic areas the plant specimens were either collected from natural forests/ponds or procured from collections of other research institutes or bought from commercial nurseries. The collected specimens were maintained live either by planting in soil or in earthen pots. The water plants are placed in tanks of varying sizes. Plants which require critical ambient conditions to survive are maintained by controlling light and humidity till they are planted in appropriate seasons and in appropriate places in the garden. The specimen thus collected have been categorized and presented under the different *ex-situ* conservation areas such as orchid house, fern house, xerophytes and succulent house, rock garden, medicinal plant garden, palm garden and hydrophytes garden. Plants assembled in the Bioresources Nature Trail are listed below

#### **3.2.1. Orchid house**

The Orchid House, with an area of about 109.68 m<sup>2</sup>, houses both terrestrial and epiphytic orchids. As a part of the present project, the Orchid House has been enriched by planting species (Table 1) which were not represented earlier. In addition, dried and dead plants were replaced with new individuals of the same species.



Table 1. A list of species present in the Orchid house of Bioresources Nature Trail.

No.	Species	No.	Species
1.	<i>Acampe congesta</i>	39.	<i>Habenaria plantaginea</i> <sup>#</sup>
2.	<i>Acampe ochracea</i> <sup>*</sup>	40.	<i>Ipsea malabarica</i>
3.	<i>Acampe praemorsa</i>	41.	<i>Liparis beddomei</i>
4.	<i>Aerides crispa</i> <sup>#</sup>	42.	<i>Liparis bilobata</i> <sup>#</sup>
5.	<i>Aerides maculosum</i>	43.	<i>Liparis odorata</i> <sup>*</sup>
6.	<i>Aerides ringens</i> <sup>#</sup>	44.	<i>Luisia birchea</i>
7.	<i>Anoectochilus elatus</i>	45.	<i>Malaxis intermedia</i>
8.	<i>Bulbophyllum aureum</i>	46.	<i>Malaxis rheedei</i> <sup>#</sup>
9.	<i>Bulbophyllum fuscopurpureum</i> <sup>#</sup>	47.	<i>Nervilia aragona</i>
10.	<i>Bulbophyllum neilgherrense</i>	48.	<i>Nervilia crociformis</i>
11.	<i>Bulbophyllum rosemarianum</i> <sup>#</sup>	49.	<i>Nervilia infundibulifolia</i>
12.	<i>Bulbophyllum tremulum</i>	50.	<i>Nervilia plicata</i> <sup>#</sup>
13.	<i>Calanthe masuca</i>	51.	<i>Nervilia prainiana</i>
14.	<i>Calanthe sylvatica</i> <sup>#</sup>	52.	<i>Oberonia brunoniana</i>
15.	<i>Cleisostoma tenuifolium</i>	53.	<i>Oberonia ensiformis</i>
16.	<i>Coelogyne breviscapa</i>	54.	<i>Oberonia iridifolia</i> <sup>#</sup>
17.	<i>Coelogyne longipes</i>	55.	<i>Oberonia santapau</i>
18.	<i>Coelogyne mossiae</i>	56.	<i>Oberonia wightiana</i>
19.	<i>Coelogyne nervosa</i> <sup>#</sup>	57.	<i>Peristeria elata</i> <sup>#</sup>
20.	<i>Coelogyne ovalis</i> <sup>#</sup>	58.	<i>Phaius luridus</i>
21.	<i>Coelogyne punctata</i>	59.	<i>Phaius tankervilleae</i>
22.	<i>Cottonia peduncularis</i>	60.	<i>Phalaenopsis decumbens</i> <sup>*</sup>
23.	<i>Cymbidium aloifolium</i>	61.	<i>Pholidota imbricata</i>
24.	<i>Cymbidium ensifolium</i> var. <i>haematodes</i>	62.	<i>Pholidota pallida</i> <sup>#</sup>
25.	<i>Dendrobium anceps</i> <sup>#</sup>	63.	<i>Pholidota species</i>
26.	<i>Dendrobium aqueum</i>	64.	<i>Polystachya concreta</i>
27.	<i>Dendrobium barbatulum</i>	65.	<i>Porpax reticulata</i> <sup>#</sup>
28.	<i>Dendrobium chrysanthum</i>	66.	<i>Rhynchostylis retusa</i>
29.	<i>Dendrobium fimbriatum</i> <sup>#</sup>	67.	<i>Sarcanthus pauciflorus</i>
30.	<i>Dendrobium herbaceum</i>	68.	<i>Seidenfia intermedia</i>
31.	<i>Dendrobium heterocarpum</i>	69.	<i>Seidenfia rheedei</i> <sup>#</sup>
32.	<i>Dendrobium heyneanum</i> <sup>#</sup>	70.	<i>Spathoglottis plicata</i>
33.	<i>Dendrobium macrostachyum</i>	71.	<i>Spatoglottis malabarica</i>
34.	<i>Dendrobium nutans</i>	72.	<i>Vanda coerelea</i>
35.	<i>Dendrobium ovatum</i> <sup>#</sup>	73.	<i>Vanda spathulata</i>
36.	<i>Dendrobium wightii</i>	74.	<i>Vanda tessellata</i> <sup>#</sup>
37.	<i>Disperis neilgherrensis</i>	75.	<i>Vanilla planifolia</i>
38.	<i>Habenaria ovalifolia</i>	76.	<i>Zeuxine longilabris</i> <sup>#</sup>

\* , Introduced in the Orchid House as a part of this Project. # , Replaced the damaged/dead plants

Total number of species in the Fern House at the time initiation of the present project was one hundred and twenty one. But, individuals of some species either died due to reasons like insect pest attack, fungal infection and desiccation or showed poor growth. During the present project tenure, causality loss was compensated by planting new individuals in new pots that were filled with fresh potting media. The list of fern species in the Fern House at the end of the present project period is given in Table 2.

Table 2. List of species in the Fern house of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	No.	Species
1.	<i>Acrostichum aureum</i> <sup>#</sup>	30.	<i>Bolbitis brasiliensis</i>
2.	<i>Actiniopteris radiata</i> <sup>#</sup>	31.	<i>Bolbitis heterochlita</i> <sup>#</sup>
3.	<i>Adiantum capillus-vineris</i>	32.	<i>Bolbitis preseliana</i>
4.	<i>Adiantum caudatum</i>	33.	<i>Bolbitis prolifera</i>
5.	<i>Adiantum concinnum</i>	34.	<i>Bolbitis semicordata</i>
6.	<i>Adiantum incisum</i>	35.	<i>Botrychium daucifolium</i>
7.	<i>Adiantum indicum</i> <sup>#</sup>	36.	<i>Ceratopteris thalictroides</i>
8.	<i>Adiantum latifolium</i>	37.	<i>Cheilanthes mysurensis</i>
9.	<i>Adiantum nagnum</i>	38.	<i>Cheilanthes opposita</i>
10.	<i>Adiantum peruvianum</i> <sup>#</sup>	39.	<i>Cheilosoria tenuifolia</i>
11.	<i>Adiantum philippense</i> <sup>#</sup>	40.	<i>Christella dentata</i>
12.	<i>Adiantum raddianum</i>	41.	<i>Crepidomanas bilobiatum</i>
13.	<i>Anemia rotundifolia</i>	42.	<i>Cyathea gigantea</i> <sup>#</sup>
14.	<i>Angiopteris evecta</i>	43.	<i>Cyathea spinulosa</i>
15.	<i>Arachniodes aristata</i>	44.	<i>Davallia bullata</i>
16.	<i>Araiostegia pulchra</i>	45.	<i>Davallia fejeensis</i>
17.	<i>Aspidium ciliatum</i>	46.	<i>Diplazium dilatatum</i>
18.	<i>Asplenium formosum</i>	47.	<i>Diplazium esculentum</i> <sup>#</sup>
19.	<i>Asplenium phyllitidis</i>	48.	<i>Doodia dives</i>
20.	<i>Asplenium proemorsum</i>	49.	<i>Doryopteris concolor</i>
21.	<i>Asplenium yoshinagae</i>	50.	<i>Doryopteris ludens</i>
22.	<i>Athyrium hohenackerianum</i>	51.	<i>Dryopteris cochleata</i>
23.	<i>Azolla pinnata</i>	52.	<i>Equisetum giganteum</i>
24.	<i>Blechnum brasiliense</i>	53.	<i>Huperzia ceylanica</i>
25.	<i>Blechnum gibbum</i>	54.	<i>Huperzia macrostachys</i>
26.	<i>Blechnum occidentale</i> <sup>#</sup>	55.	<i>Huperzia phyllantha</i>
27.	<i>Blechnum orientale</i>	56.	<i>Huperzia squarrosa</i>
28.	<i>Bolbitis virens</i>	57.	<i>Hymenophyllum exsertum</i>
29.	<i>Bolbitis appendiculata</i> var. <i>asplenifolia</i>	58.	<i>Idiopteris hookeriana</i>

#, Replaced the damaged/dead plants as a part of the present project activity

Table 2 (cont'd). List of species in the Fern house of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	No.	Species
59.	<i>Lepisorus nudus</i>	92.	<i>Psilotum nudum</i>
60.	<i>Leptochilus axillaris</i> <sup>#</sup>	93.	<i>Pteris argyraea</i>
61.	<i>Leptochilus bahupunctika</i>	94.	<i>Pteris confusa</i>
62.	<i>Lindsaea ensifolia</i>	95.	<i>Pteris ensiformis</i>
63.	<i>Lindsaea malabarica</i>	96.	<i>Pteris longipes</i>
64.	<i>Lindsaea odorata</i>	97.	<i>Pteris quadriaurita</i> 'Argentia'
65.	<i>Lycopodium japonicum</i>	98.	<i>Pteris vittata</i>
66.	<i>Lycopodium wightianum</i>	99.	<i>Pteris woodwardioides</i>
67.	<i>Lygodium flexuosum</i>	100.	<i>Pyrrrosia lanceolata</i>
68.	<i>Lygodium microphyllum</i>	101.	<i>Pyrrrosia mollis</i>
69.	<i>Macrothelypteris torresiana</i>	102.	<i>Pyrrrosia porosa</i>
70.	<i>Marsilea minuta</i>	103.	<i>Salvinia adnata</i>
71.	<i>Microlepis speluncae</i> <sup>#</sup>	104.	<i>Schizaea digitata</i>
72.	<i>Microsorium linguiforme</i>	105.	<i>Selaginealla hovaehollandiae</i>
73.	<i>Microsorium punctatum</i> 'Flabellatum'	106.	<i>Selaginella chrysocaulos</i>
74.	<i>Microsorium linguiforme</i>	107.	<i>Selaginella crassipes</i>
75.	<i>Microsorium punctatum</i>	108.	<i>Selaginella delicatula</i>
76.	<i>Nephrodium articulatum</i>	109.	<i>Selaginella dixitii</i>
77.	<i>Nephrolepis biserrata</i>	110.	<i>Selaginella inequalifolia</i>
78.	<i>Nephrolepis bostoniensis</i>	111.	<i>Selaginella metallica</i> <sup>#</sup>
79.	<i>Nephrolepis cordifolia</i>	112.	<i>Selaginella pilifera</i>
80.	<i>Nephrolepis exaltata</i>	113.	<i>Selaginella plana</i>
81.	<i>Nephrolepis hirsutula</i>	114.	<i>Selaginella tamariscina</i>
82.	<i>Nephrolepis tuberosa</i>	115.	<i>Sphenomeris chinensis</i>
83.	<i>Nephrolepis undulata</i>	116.	<i>Stenochlaena palustris</i>
84.	<i>Ophioglossum reticulatum</i>	117.	<i>Tectaria caudunata</i>
85.	<i>Ophioglossum vulgatum</i>	118.	<i>Tectaria polymorpha</i>
86.	<i>Osmunda regalis</i> <sup>#</sup>	119.	<i>Tectaria wightii</i> <sup>#</sup>
87.	<i>Parahemionitis cordata</i>	120.	<i>Tectaria zeylanica</i>
88.	<i>Phymatosorus scolopendria</i> <sup>#</sup>	121.	<i>Thalyppteris interrupta</i>
89.	<i>Pityrogramma calomelanos</i>	122.	<i>Thelypteris terminans</i>
90.	<i>Platycterium hillii</i>	123.	<i>Vittaria elongata</i>
91.	<i>Pronephrium triphyllum</i>		

#, Replaced the damaged/dead plants as a part of the present project activity

### 3.2.3. Xerophytes and Succulents Garden

In the Bioresources Nature Park, xerophytes and succulent species are assembled in two settings- those which can withstand the precipitation of the area were planted in a rock garden while those

which are highly sensitive to ambient precipitation were maintained in a building (Chandrashekara *et al.*, 2009). A list of species present in the rock garden and in the xerophytes and succulent plant house are given below (Table 3). The species, whose Individuals were replaced during the present project tenure are also marked in the list.

Table 3. List of species in the xerophytes and succulents garden of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
1.	<i>Adenium obesum</i> <sup>#</sup>	Apocynaceae
2.	<i>Adromischus cristatus</i>	Crassulaceae
3.	<i>Aeonium haworthii</i>	Crassulaceae
4.	<i>Aeonium simsii</i>	Crassulaceae
5.	<i>Agave victoriae-reginae</i>	Agavaceae
6.	<i>Agave vivipara</i> var. <i>vivipara</i>	Agavaceae
7.	<i>Aloe bakeri</i> <sup>#</sup>	Amaryllidaceae
8.	<i>Aloe jucunda</i>	Amaryllidaceae
9.	<i>Aloe variegata</i>	Amaryllidaceae
10.	<i>Aloe vera</i>	Amaryllidaceae
11.	<i>Aptenia cordifolia</i>	Araceae
12.	<i>Argyreia cuneata</i>	Convolvulaceae
13.	<i>Asparagus racemosus</i>	Liliaceae
14.	<i>Astrophytum asterias</i> <sup>#</sup>	Cactaceae
15.	<i>Astrophytum myriostigma</i>	Cactaceae
16.	<i>Beaucarnea recurvata</i>	Agavaceae
17.	<i>Caralluma indica</i> <sup>#</sup>	Asclepiadaceae
18.	<i>Caralluma stalagmifera</i>	Asclepiadaceae
19.	<i>Cephalocereus senilis</i>	Cactaceae
20.	<i>Cereus jamacaru</i>	Cactaceae
21.	<i>Cereus uruguayanus</i>	Cactaceae
22.	<i>Cissus quadrangularis</i>	Vitaceae
23.	<i>Cleistocactus strausii</i>	Cactaceae
24.	<i>Corynopuntia vilis</i> <sup>#</sup>	Cactaceae
25.	<i>Cotyledon orbiculata</i>	Crassulaceae
26.	<i>Crassula arborescens</i>	Crassulaceae
27.	<i>Crassula falcata</i>	Crassulaceae
28.	<i>Crassula muscosa</i>	Crassulaceae
29.	<i>Crassula ovata</i> <sup>#</sup>	Crassulaceae
30.	<i>Crassula pyramidalis</i>	Crassulaceae
31.	<i>Cyanotis somaliensis</i>	Cactaceae
32.	<i>Dolichothele uberiformis</i>	Cactaceae
33.	<i>Dracaena braunii</i>	Liliaceae
34.	<i>Eberlanzia disarticulata</i>	Aizoaceae
35.	<i>Echeveria affinis</i> <sup>#</sup>	Crassulaceae
36.	<i>Echeveria carnicolor</i>	Crassulaceae
37.	<i>Echeveria leucotricha</i>	Crassulaceae
38.	<i>Echeveria secunda</i>	Crassulaceae
39.	<i>Echinocactus grusonii</i> <sup>#</sup>	Cactaceae

#, Replaced the damaged/dead plants as a part of the present project activity

Table 3 (cont'd). List of species in the xerophytes and succulents garden of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
40.	<i>Echinocereus triglochidiatus</i>	Cactaceae
41.	<i>Echinopsis chamaeceres</i>	Cactaceae
42.	<i>Epiphyllum anguliger</i>	Cactaceae
43.	<i>Espositoa lanata</i>	Cactaceae
44.	<i>Euphorbia cristata</i>	Euphorbiaceae
45.	<i>Euphorbia decaryi</i>	Euphorbiaceae
46.	<i>Euphorbia lactea</i> 'Alba'	Euphorbiaceae
47.	<i>Euphorbia lactea</i> <sup>#</sup>	Euphorbiaceae
48.	<i>Euphorbia supernaus</i>	Euphorbiaceae
49.	<i>Euphorbia suzannae</i>	Euphorbiaceae
50.	<i>Euphorbia tirucalli</i>	Euphorbiaceae
51.	<i>Euphorbia trigona</i>	Euphorbiaceae
52.	<i>Euphorbia trigona</i>	Euphorbiaceae
53.	<i>Gasteria carinata</i> var. <i>verrucosa</i> <sup>#</sup>	Apocynaceae
54.	<i>Gasteria obliqua</i>	Apocynaceae
55.	<i>Gibbaeum petrense</i>	Aizoaceae
56.	<i>Graptopetalum paraguayense</i>	Crassulaceae
57.	<i>Gymnocalycium mihanovichii</i>	Cactaceae
58.	<i>Gymnocalycium</i> sp.1	Cactaceae
59.	<i>Gymnocalycium</i> sp.2	Cactaceae
60.	<i>Gymnocalycium</i> sp.3	Cactaceae
61.	<i>Hatiora salicornioides</i>	Cactaceae
62.	<i>Haworthia fasciata</i>	Cactaceae
63.	<i>Haworthia humulus</i> <sup>#</sup>	Cactaceae
64.	<i>Haworthia attenuata</i>	Cactaceae
65.	<i>Haworthia cymbiformis</i>	Cactaceae
66.	<i>Haworthia limifolia</i>	Cactaceae
67.	<i>Hedera helix</i>	Araliaceae
68.	<i>Hesperoyucca whipplei</i> <sup>#</sup>	Liliaceae
69.	<i>Kalanchoe blossfeldiana</i>	Crassulaceae
70.	<i>Kalanchoe marnieriana</i>	Crassulaceae
71.	<i>Kalanchoe olivacea</i>	Crassulaceae
72.	<i>Lampranthus deltooides</i>	Aizoaceae
73.	<i>Lippia javanica</i> <sup>#</sup>	Verbenaceae
74.	<i>Lithops salicola</i> <sup>#</sup>	Aizoaceae
75.	<i>Mammillaria bocasana</i>	Cactaceae
76.	<i>Mammillaria bombycina</i>	Cactaceae
77.	<i>Mammillaria boolii</i>	Cactaceae
78.	<i>Mammillaria celsiana</i> <sup>#</sup>	Cactaceae
79.	<i>Mammillaria compressa</i>	Cactaceae
80.	<i>Mammillaria elongata</i> <sup>#</sup>	Cactaceae

#, Replaced the damaged/dead plants as a part of the present project activity

Table 3 (cont'd). List of species in the xerophytes and succulents garden of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
81.	<i>Mammillaria geminispina</i>	Cactaceae
82.	<i>Mammillaria haageana</i> ssp. <i>elegans</i>	Cactaceae
83.	<i>Mammillaria magnimamma</i>	Cactaceae
84.	<i>Mammillaria prolifera</i>	Cactaceae
85.	<i>Notocactus magnificus</i>	Cactaceae
86.	<i>Opuntia falcata</i>	Cactaceae
87.	<i>Opuntia ficus-indica</i>	Cactaceae
88.	<i>Opuntia microdasys</i>	Cactaceae
89.	<i>Pachyphytum oviferum</i>	Apocynaceae
90.	<i>Pachypodium geayi</i>	Apocynaceae
91.	<i>Pachypodium lamerei</i>	Apocynaceae
92.	<i>Pachyveria scheideckeri</i> <sup>#</sup>	Crassulaceae
93.	<i>Pandanus tectorius</i>	Pandanaceae
94.	<i>Parodia leninghausii</i>	Cactaceae
95.	<i>Parodia mammulosa</i>	Cactaceae
96.	<i>Peireskiopsis velutina</i>	Cactaceae
97.	<i>Portulacaria afra</i>	Portulacaceae
98.	<i>Rebutia minuscula</i>	Cactaceae
99.	<i>Rhipsalis pilocarpa</i>	Cactaceae
100.	<i>Sansevieria cylindrica</i>	Liliaceae
101.	<i>Sansevieria desertii</i>	Liliaceae
102.	<i>Sarcostemma acidum</i>	Asclepiadaceae
103.	<i>Schlumbergera bridgesii</i>	Cactaceae
104.	<i>Schlumbergera russelianum</i>	Cactaceae
105.	<i>Sedum marganianum</i> <sup>#</sup>	Crassulaceae
106.	<i>Sedum sieboldii</i>	Crassulaceae
107.	<i>Sedum treleasei</i>	Crassulaceae
108.	<i>Senecio elegans</i>	Asteraceae
109.	<i>Senecio petraeus</i>	Asteraceae
110.	<i>Sulcorebutia arenacea</i> 'hybrid'	Cactaceae
111.	<i>Sulcorebutia arenacea</i> 'hybrid'	Cactaceae
112.	<i>Sulcorebutia arenacea</i> 'hybrid'	Cactaceae

#, Replaced the damaged/dead plants as a part of the present project activity

### 3.2.4. Medicinal Plants Garden

The Medicinal Plant Garden is an assemblage of more than 190 species of medicinal plants, many of which are mainstay drug-producing plants whose products such as variety of alkaloids, glycosides, steroids and other group of compounds are currently in use in clinical practice around the world. Some of the plants that were introduced to the Garden as well as those replaced with healthy individuals during the present project tenure are marked in the list given below (Table 4).

Table 4. List of species in the medicinal plants of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
1.	<i>Abrus precatorius</i>	Fabaceae
2.	<i>Achyranthes aspera</i>	Amaranthaceae
3.	<i>Acorus calamus</i> <sup>#</sup>	Araceae
4.	<i>Adhatoda beddomei</i> <sup>*</sup>	Acanthaceae
5.	<i>Aerva lanata</i>	Amaranthaceae
6.	<i>Alangium salvifolium</i>	Alangiaceae
7.	<i>Aloe vera</i>	Liliaceae
8.	<i>Alpinia calcarata</i>	Zingiberaceae
9.	<i>Alternanthera sessilis</i>	Amaranthaceae
10.	<i>Amaranthus gangeticus</i>	Amaranthaceae
11.	<i>Amorphophallus companulatus</i>	Araceae
12.	<i>Andrographis alata</i>	Acanthaceae
13.	<i>Aphanamixis polystachya</i>	Meliaceae
14.	<i>Aristolochia indica</i>	Aristolochiaceae
15.	<i>Asparagus racemosus</i>	Liliaceae
16.	<i>Averrhoa carambola</i>	Oxalidaceae
17.	<i>Bacopa monnieri</i>	Scrophulariaceae
18.	<i>Baliospermum montanum</i>	Euphorbiaceae
19.	<i>Bauhinia acuminata</i> <sup>#</sup>	Fabaceae
20.	<i>Biophytum candolleianum</i>	Oxalidaceae
21.	<i>Bixa orellana</i>	Bixaceae
22.	<i>Boerhaavia diffusa</i>	Nyctaginaceae
23.	<i>Butea monosperma</i>	Fabaceae
24.	<i>Calotropis gigantea</i>	Asclepiadaceae
25.	<i>Capsicum frutescens</i>	Solanaceae
26.	<i>Cardiospermum halicacabum</i>	Sapindaceae
27.	<i>Carica papaya</i>	Caricaceae
28.	<i>Cassia occidentalis</i>	Fabaceae
29.	<i>Cassia tora</i>	Fabaceae
30.	<i>Catharanthus roseus</i>	Apocynaceae
31.	<i>Celastrus paniculatus</i>	Celastraceae
32.	<i>Centella asiatica</i>	Apiaceae
33.	<i>Cissus quadrangularis</i>	Vitaceae
34.	<i>Citrus aurantifolia</i>	Rutaceae
35.	<i>Citrus medica</i> <sup>#</sup>	Rutaceae
36.	<i>Cleome viscosa</i> <sup>#</sup>	Capparidaceae
37.	<i>Clerodendron viscosum</i>	Verbenaceae
38.	<i>Clerodendron paniculatum</i>	Verbenaceae

<sup>\*</sup>, Introduced in the medicinal plants garden as part of this Project. ‘

<sup>#</sup>, Replaced the damaged/dead plants as a part of the present project activity

Table 4 (cont'd). List of species in the medicinal plants of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
39.	<i>Clitoria ternatea</i>	Fabaceae
40.	<i>Coccinia grandis</i>	Cucurbitaceae
41.	<i>Coleus amboricus</i>	Lamiaceae
42.	<i>Coleus parviflorus</i>	Lamiaceae
43.	<i>Coscinium fenestratum</i> <sup>#</sup>	Menispermaceae
44.	<i>Costus mexicana</i>	Zingiberaceae
45.	<i>Costus pictus</i>	Zingiberaceae
46.	<i>Costus speciosus</i>	Zingiberaceae
47.	<i>Cucumis sativus</i>	Cucurbitaceae
48.	<i>Curculigo orchioides</i>	Amaryllidaceae
49.	<i>Curcuma aromatica</i>	Zingiberaceae
50.	<i>Curcuma longa</i>	Zingiberaceae
51.	<i>Cyathula prostrata</i>	Amaranthaceae
52.	<i>Cyclea peltata</i>	Menispermaceae
53.	<i>Cynodon dactylon</i>	Poaceae
54.	<i>Cyperus rotundus</i>	Cyperaceae
55.	<i>Datura metel</i> <sup>#</sup>	Solanaceae
56.	<i>Desmodium gangeticum</i>	Fabaceae
57.	<i>Desmodium gyrans</i>	Fabaceae
58.	<i>Dracaena terniflora</i>	Liliaceae
59.	<i>Eclipta prostrata</i>	Asteraceae
60.	<i>Elaeocarpus serratus</i>	Elaeocarpaceae
61.	<i>Elephantopus scaber</i>	Asteraceae
62.	<i>Elettaria cardamomum</i>	Zingiberaceae
63.	<i>Embelia tsjeriam-cottam</i>	Myrsinaceae
64.	<i>Emilia sonchifolia</i>	Asteraceae
65.	<i>Ensetae superba</i>	Musaceae
66.	<i>Entada scandens</i>	Mimosaceae
67.	<i>Eryngium foetidum</i>	Apiaceae
68.	<i>Eupatorium triplinerve</i>	Asteraceae
69.	<i>Euphorbia nivulia</i>	Euphorbiaceae
70.	<i>Evolvulus alsinoides</i>	Convolvulaceae
71.	<i>Ficus microcarpa</i>	Moraceae
72.	<i>Ficus racemosa</i>	Moraceae
73.	<i>Flacourtia jangomas</i>	Flacourtiaceae
74.	<i>Garcinia morella</i>	Clusiaceae
75.	<i>Geophila repens</i>	Rubiaceae
76.	<i>Gloriosa superba</i>	Liliaceae

\*, Introduced in the medicinal plants garden as part of this Project.

#, Replaced the damaged/dead plants as a part of the present project activity



Table 4 (cont'd). List of species in the medicinal plants of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
77.	<i>Glycosmis pentaphylla</i>	Rutaceae
78.	<i>Gmelina arborea</i>	Verbenaceae
79.	<i>Gymnema sylvestre</i>	Asclepiadaceae
80.	<i>Hedyotis corymbosa</i>	Rubiaceae
81.	<i>Heliotropium indicum</i> <sup>#</sup>	Boraginaceae
82.	<i>Heliotropium scabrum</i> <sup>#</sup>	Boraginaceae
83.	<i>Helminthostachys zeylanica</i>	Ophioglossaceae
84.	<i>Hemidesmus indicus</i>	Asclepiadaceae
85.	<i>Hemigraphis colorata</i>	Acanthaceae
86.	<i>Hemionitis arifolia</i>	Cheilanthaceae
87.	<i>Holarrhena pubescens</i>	Asclepiadaceae
88.	<i>Holoptelea integrifolia</i>	Ulmaceae
89.	<i>Holostemma ada-kodien</i>	Asclepiadaceae
90.	<i>Hygrophila auriculata</i>	Acanthaceae
91.	<i>Indigofera tinctoria</i>	Fabaceae
92.	<i>Ipomoea batatas</i>	Convolvulaceae
93.	<i>Ipomoea mauritiana</i>	Convolvulaceae
94.	<i>Ipomoea obscura</i>	Convolvulaceae
95.	<i>Ixora coccinea</i>	Rubiaceae
96.	<i>Jasminum grandiflorum</i>	Oleaceae
97.	<i>Jatropha gossypifolia</i>	Euphorbiaceae
98.	<i>Jatropha multifida</i>	Euphorbiaceae
99.	<i>Justicia adathoda</i>	Acanthaceae
100.	<i>Justicia gendarussa</i>	Acanthaceae
101.	<i>Justicia nilgherrensis</i>	Acanthaceae
102.	<i>Kaempferia galanga</i>	Zingiberaceae
103.	<i>Kaempferia rotunda</i>	Zingiberaceae
104.	<i>Kalanchoe pinnata</i>	Crassulaceae
105.	<i>Laportea crenulata</i>	Urticaceae
106.	<i>Lawsonia inermis</i>	Lythraceae
107.	<i>Leucas aspera</i>	Lamiaceae
108.	<i>Madhuca longifolia</i>	Sapotaceae
109.	<i>Maranta arundinaceae</i>	Marantaceae
110.	<i>Mentha spicata</i>	Lamiaceae
111.	<i>Mimosa pudica</i>	Fabaceae
112.	<i>Mimusops elengi</i>	Sapotaceae
113.	<i>Murraya koenigii</i>	Rutaceae
114.	<i>Musa paradisiaca</i>	Musaceae
115.	<i>Myristica malabarica</i>	Myristaceae
116.	<i>Myxopyrum smilacifolium</i>	Oleaceae

\*, Introduced in the medicinal plants garden as part of this Project.

#, Replaced the damaged/dead plants as a part of the present project activity

Table 4 (cont'd). List of species in the medicinal plants of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
117.	<i>Naravelia zeylanica</i>	Ranunculaceae
118.	<i>Naregamia alata</i> <sup>#</sup>	Meliaceae
119.	<i>Nervilia aragoana</i>	Ranunculaceae
120.	<i>Ocimum basilicum</i>	Lamiaceae
121.	<i>Ocimum sanctum</i>	Lamiaceae
122.	<i>Oroxylum indicum</i> <sup>#</sup>	Bignoniaceae
123.	<i>Orthosiphon aristatus</i> <sup>*</sup>	Lamiaceae
124.	<i>Oxalis corniculata</i>	Oxalidaceae
125.	<i>Pandanus amarylifolius</i>	Pandanaceae
126.	<i>Passiflora edulis</i>	Passifloraceae
127.	<i>Pentanema indicum</i>	Asteraceae
128.	<i>Persea macrantha</i>	Lauraceae
129.	<i>Peucedanum graveolens</i>	Apiaceae
130.	<i>Phaseolus trilobus</i>	Fabaceae
131.	<i>Phyllanthus acidus</i> <sup>*</sup>	Euphorbiaceae
132.	<i>Phyllanthus amarus</i>	Euphorbiaceae
133.	<i>Physalis minima</i>	Solanaceae
134.	<i>Pimenta dioica</i>	Myrtaceae
135.	<i>Piper barberi</i>	Piperaceae
136.	<i>Piper betel</i>	Piperaceae
137.	<i>Piper longum</i>	Piperaceae
138.	<i>Piper nigrum</i>	Piperaceae
139.	<i>Pittospermum tetraspermum</i> <sup>*</sup>	Pittosporaceae
140.	<i>Plectranthus hadiensis</i> <sup>#</sup>	Lamianaceae
141.	<i>Plumbago repens</i> <sup>*</sup>	Plumbaginaceae
142.	<i>Plumbago rosea</i>	Plumbaginaceae
143.	<i>Plumbago zeylanica</i>	Plumbaginaceae
144.	<i>Pogostemon heyneanus</i>	Lamianaceae
145.	<i>Premna serratifolia</i>	Verbenaceae
146.	<i>Pseudarthria viscida</i>	Fabaceae
147.	<i>Psidium guajava</i>	Myrtaceae
148.	<i>Psilanthus travancorensis</i>	Rubiaceae
149.	<i>Pterocarpus marsupium</i>	Fabaceae
150.	<i>Pterocarpus santalinus</i>	Fabaceae
151.	<i>Punica granatum</i>	Punicaceae
152.	<i>Putranjiva roxburghii</i> <sup>#</sup>	Euphorbiaceae
153.	<i>Rauwolfia serpentina</i>	Apocynaceae
154.	<i>Rauwolfia tetraphylla</i>	Apocynaceae
155.	<i>Ricinus communis</i>	Euphorbiaceae
156.	<i>Ruta graveolens</i>	Rutaceae

\*, Introduced in the medicinal plants garden as part of this Project.

#, Replaced the damaged/dead plants as a part of the present project activity

Table 4 (cont'd). List of species in the medicinal plants of Bioresources Nature Trail at Nilambur, Kerala

No.	Species	Family
157.	<i>Saccharum officinarum</i>	Poaceae
158.	<i>Salacia fruticosa</i>	Hippocrateaceae
159.	<i>Salacia reticulata</i>	Hippocrateaceae
160.	<i>Sapindus trifoliata</i>	Sapindaceae
161.	<i>Saraca asoca</i>	Fabaceae
162.	<i>Sarcostemma acidum</i>	Asclepiadaceae
163.	<i>Sauropus androgynus</i>	Euphorbiaceae
164.	<i>Scoparia dulcis</i>	Scrophulariaceae
165.	<i>Sesbania grandiflora</i> *	Fabaceae
166.	<i>Setaria italica</i>	Poaceae
167.	<i>Sida rhombifolia</i>	Malvaceae
168.	<i>Solanum nigrum</i>	Solanaceae
169.	<i>Solanum violaceum</i>	Solanaceae
170.	<i>Solanum xanthocarpum</i>	Solanaceae
171.	<i>Sphaeranthus indicus</i>	Asteraceae
172.	<i>Spilanthes calva</i>	Asteraceae
173.	<i>Spondias pinnata</i>	Anacardiaceae
174.	<i>Stachyphrynium spicatum</i>	Marantaceae
175.	<i>Strobilanthes ciliatus</i>	Acanthaceae
176.	<i>Strychnos potatorum</i>	Loganiaceae
177.	<i>Tabernaemontana coronaria</i>	Apocynaceae
178.	<i>Tagetes erecta</i>	Asteraceae
179.	<i>Tephrosia purpurea</i>	Fabaceae
180.	<i>Terminalia bellirica</i>	Combretaceae
181.	<i>Terminalia chebula</i>	Combretaceae
182.	<i>Thottea siliquosa</i>	Aristolochiaceae
183.	<i>Tiliacora acuminata</i>	Menispermaceae
184.	<i>Tinospora cordifolia</i>	Menispermaceae
185.	<i>Tinospora sinensis</i>	Menispermaceae
186.	<i>Tragia involucrata</i>	Euphorbiaceae
187.	<i>Trichopus zeylanicus</i> *	Trichopodaceae
188.	<i>Tylophora asthmatica</i>	Asclepiadaceae
189.	<i>Vallis solanacea</i>	Apocynaceae
190.	<i>Vernonia cinerea</i>	Asteraceae
191.	<i>Vetiveria zizanioides</i>	Poaceae
192.	<i>Vitex negundo var. purpurescens</i>	Verbenaceae
193.	<i>Woodfordia fruticosa</i>	Lythraceae
194.	<i>Wrightia tinctoria</i>	Apocynaceae
195.	<i>Zanthoxylum rhetsa</i>	Rutaceae
196.	<i>Zingiber officinale</i>	Zingiberaceae
197.	<i>Zingiber zerumbet</i> #	Zingiberaceae

\*, Introduced in the medicinal plants garden as part of this Project.

#, Replaced the damaged/dead plants as a part of the present project activity

### 3.2.5. Palm and Rattan Garden

The Palm and Rattan Garden established in the KFRI Sub Centre with the financial assistance of Planning and Economic Affairs (WGC) Department, Government of Kerala had 56 palms including of 20 indigenous and 36 exotic palms. However, some of them were completely damaged due to attack by wild boar and other reasons. Therefore, as a part of the present project, damaged plants were replaced with new individuals apart from introducing some new species into the Garden (Table 5).

Table 5. List of species planted in the palm and rattan garden of Bioresources Nature Park at Nilambur.

No.	Species	No.	Species
1.	<i>Aiphanes horrida</i>	34.	<i>Corypha utan</i>
2.	<i>Areca catechu</i>	35.	<i>Cyrtostachys renda</i>
3.	<i>Areca sp.</i>	36.	<i>Daemonorops kurzianus</i>
4.	<i>Areca triandra</i>	37.	<i>Daemonorops rarispinosa</i>
5.	<i>Arenga engleri</i>	38.	<i>Dypsis decaryi</i> <sup>#</sup>
6.	<i>Arenga hookeriana</i>	39.	<i>Dypsis lutescens</i>
7.	<i>Arenga wightii</i>	40.	<i>Elaeis guinensis</i>
8.	<i>Arenga sp.</i>	41.	<i>Howea forsteriana</i>
9.	<i>Bentinckia condapanna</i>	42.	<i>Howea sp.</i>
10.	<i>Bismarckia nobilis</i>	43.	<i>Hyophorbe lagenicaulis</i>
11.	<i>Borassus flabellifer</i>	44.	<i>Korthalsia laciniosa</i> <sup>#</sup>
12.	<i>Calamus baratangensis</i>	45.	<i>Korthalsia rogersii</i>
13.	<i>Calamus brandisii</i>	46.	<i>Lantania lontaroides</i>
14.	<i>Calamus dransfieldii</i> <sup>#</sup>	47.	<i>Licuala grandis</i>
15.	<i>Calamus lakshmana</i>	48.	<i>Licuala spinosa</i>
16.	<i>Calamus longisetus</i>	49.	<i>Livistona rotundifolia</i>
17.	<i>Calamus metzianus</i>	50.	<i>Mascarena revanghanii</i>
18.	<i>Calamus nagbettai</i> <sup>#</sup>	51.	<i>Nypa fruticans</i> <sup>#</sup>
19.	<i>Calamus pseudotenius</i>	52.	<i>Phoenicophorium borsigianum</i>
20.	<i>Calamus rotang</i>	53.	<i>Phoenix pusilla</i>
21.	<i>Calamus stoloniferus</i> <sup>#</sup>	54.	<i>Phoenix roebelenii</i> <sup>#</sup>
22.	<i>Calamus thwaitesii</i>	55.	<i>Phoenix sylvestris</i>
23.	<i>Calamus travancoricus</i>	56.	<i>Pinanga dicksonii</i>
24.	<i>Calamus vattayila</i>	57.	<i>Pritchardia pacifica</i>
25.	<i>Caryota urens</i>	58.	<i>Ptychosperma macarthurii</i> <sup>#</sup>
26.	<i>Chamaedorea elegans</i>	59.	<i>Rhapis excelsa</i>
27.	<i>Chamaedorea metallica</i>	60.	<i>Ravenea insignis</i>
28.	<i>Chamaedorea seifritzii</i>	61.	<i>Ravenea rivularis</i>
29.	<i>Chambeyroni lepidota</i>	62.	<i>Roystonea regia</i>
30.	<i>Cocos nucifera</i>	63.	<i>Syagrus romanzoffiana</i> <sup>#</sup>
31.	<i>Cocothrinax alata</i> <sup>#</sup>	64.	<i>Wallichia disticha</i>
32.	<i>Cocothrinax sp.</i>	65.	<i>Washingtonia robusta</i>
33.	<i>Corypha umbraculifera</i>	66.	<i>Wodyetia bifurcata</i>

#, Replaced the damaged/dead plants as a part of the present project activity

### 3.2.6. Hydrophytes gardens

In the Hydrophytes Garden of the Bioresources Nature Trail at Nilambur hydrophytes were planted in concrete pools and tubs of different dimensions. During the present project tenure at least once or twice a year, the mud in the pools and tubs were removed and then filled with rich clayey soil to provide enough nutrition. Once in a year, replanting was also done after the organic matter from the bottom of the container were taken out completely and replaced with fresh nutrient rich clayey soil. Occasionally, dead and decayed plants were removed and replaced with new individuals. A list of hydrophytes present in the garden is given below (Table 6).

Table 6. List of species in the Hydrophyte garden of Bioresources Nature Park

No.	Species	Family
1.	<i>Aeschynomene aspera</i>	Fabaceae
2.	<i>Acorus calamus</i>	Araceae
3.	<i>Alisma oilgococcum</i>	Alismataceae
4.	<i>Alternanthera philoxeroides</i>	Amaranthaceae
5.	<i>Aponogeton appendiculatus</i>	Aponogetonaceae
6.	<i>Aponogeton natans</i>	Aponogetonaceae
7.	<i>Asteracantha longifolia</i>	Acanthaceae
8.	<i>Azolla pinnata</i>	Azollaceae
9.	<i>Bacopa monnieri</i>	Scrophulariaceae
10.	<i>Baledelia ranunculoides</i>	Alismataceae
11.	<i>Bauhinia anguina</i>	Caesalpiniaceae
12.	<i>Bergia capensis</i>	Elatinaceae
13.	<i>Blyxa aubertii</i>	Hydrocharitaceae
14.	<i>Caboma caroliniana</i> <sup>#</sup>	Cabomaceae
15.	<i>Centella asiatica</i>	Apiaceae
16.	<i>Ceratophyllum demersum</i>	Ceratophyllaceae
17.	<i>Ceratopteris thalictroides</i>	Ceratopteridaceae
18.	<i>Crinum asiaticum</i>	Amaryllidaceae
19.	<i>Cryptocoryne spiralis</i>	Araceae
20.	<i>Cyperus distans</i> var. <i>distans</i>	Cyperaceae
21.	<i>Cyperus malaccensis</i>	Cyperaceae
22.	<i>Cyperus pangorei</i> <sup>#</sup>	Cyperaceae
23.	<i>Cyperus tenuispica</i> <sup>#</sup>	Cyperaceae
24.	<i>Derris</i> sp.	Fabaceae
25.	<i>Echinodorus paleofolius</i>	Alismataceae
26.	<i>Eichhornia crassipes</i>	Pontederiaceae
27.	<i>Equisetum ramosissimum</i>	Equisetaceae
28.	<i>Eriocaulon cuspidatum</i>	Eriocaulaceae

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Table 6 (cont'd). List of species in the Hydrophyte garden of Bioresources Nature Trail

No.	Species	Family
29.	<i>Eriocaulon heterolepis</i>	Eriocaulaceae
30.	<i>Hydrilla verticellata</i> <sup>#</sup>	Hydrocharitaceae
31.	<i>Hydrocharis dubia</i>	Hydrocharitaceae
32.	<i>Hygrophila difformis</i>	Acanthaceae
33.	<i>Hygrophila schulli</i>	Acanthaceae
34.	<i>Hygroryza aristata</i>	Poaceae
35.	<i>Ipomoea aquatica</i>	Convolvulaceae
36.	<i>Ischaemum</i> sp.	Poaceae
37.	<i>Jussiaea repens</i>	Onagraceae
38.	<i>Lagenandra toxicaria</i>	Araceae
39.	<i>Lemna paucicostata</i>	Lemnaceae
40.	<i>Limncharis flava</i>	Limncharitaceae
41.	<i>Limnophila conferta</i>	Scrophulariaceae
42.	<i>Limnophila heterophylla</i>	Scrophulariaceae
43.	<i>Limnophyton obtusifolium</i>	Alismataceae
44.	<i>Lindernea</i> sp.	Scrophulariaceae
45.	<i>Ludwigia octovalvis</i>	Onagraceae
46.	<i>Marsilea minuta</i>	Marsileaceae
47.	<i>Monochoria hastata</i>	Pontederiaceae
48.	<i>Monochoria vaginalis</i>	Pontederiaceae
49.	<i>Myriophyllum alternifolium</i>	Haloragaceae
50.	<i>Nelumbo nucifera</i>	Nymphaeaceae
51.	<i>Nymphaea marliacea</i>	Nymphaeaceae
52.	<i>Nymphaea omarana</i>	Nymphaeaceae
53.	<i>Nymphaea pubescens</i>	Nymphaeaceae
54.	<i>Nymphaea rubra</i> <sup>#</sup>	Nymphaeaceae
55.	<i>Nymphaea</i> sp.	Nymphaeaceae
56.	<i>Nymphaea stellata</i>	Nymphaeaceae
57.	<i>Nymphaea stellata</i> (pink)	Nymphaeaceae
58.	<i>Nymphaea stellata</i> (rose)	Nymphaeaceae
59.	<i>Nymphaea stellata</i> (white)	Nymphaeaceae
60.	<i>Nymphoides cristata</i>	Menyanthaceae
61.	<i>Nymphoides indica</i>	Menyanthaceae
62.	<i>Nypa fruticans</i>	Arecaceae
63.	<i>Ottelia alismoides</i>	Hydrocharitaceae
64.	<i>Phragmites karka</i>	Poaceae
65.	<i>Pistia stratiotes</i>	Araceae
66.	<i>Plectranthus species</i>	Lamiaceae

#, Replaced the damaged/dead plants as a part of the present project activity

Table 6 (cont'd). List of species in the Hydrophyte garden of Bioresources Nature Trail

No.	Species	Family
67.	<i>Pogostemon auricularia</i>	Lamiaceae
68.	<i>Pogostemon heyneanus</i>	Lamiaceae
69.	<i>Rotala indica</i>	Lythraceae
70.	<i>Rotala macrandra</i>	Lythraceae
71.	<i>Saccharum spontaneum</i>	Poaceae
72.	<i>Sagittaria guayanensis</i>	Sagiteraceae
73.	<i>Salvinia auriculata</i>	Salviniaceae
74.	<i>Salvinia molesta</i>	Salviniaceae
75.	<i>Schoenoplectus articulatus</i>	Cyperaceae
76.	<i>Scirpus articulatus</i>	Cyperaceae
77.	<i>Smithia sensitiva</i>	Fabaceae
78.	<i>Thalia geniculata</i>	Marantaceae
79.	<i>Typha angustata</i>	Typhaceae
80.	<i>Utricularia exoleta</i>	Lentibulariaceae
81.	<i>Utricularia flexuosa</i>	Lentibulariaceae
82.	<i>Utricularia stellaris</i>	Lentibulariaceae
83.	<i>Utricularia uliginosa</i> <sup>#</sup>	Lentibulariaceae
84.	<i>Vallisneria spiralis</i>	Hydrocharitaceae
85.	<i>Wolffia arrhiza</i>	Lemnaceae

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#### 4. CONCLUSION

The ultimate goals of this Project were to ensure that all the plants growing in the Bioresources Nature Park at KFRI Sub Centre Campus are healthy and well maintained and the number of species in the garden is increased. Successful attempt has been made to improve facilities in different theme areas in the Nature Park and to collect plant propagules to assemble them in appropriate theme areas in the Bioresources Nature Park. Therefore, the project enabled to strengthen the Bioresource Nature Park so that it can play a significant role for increasing public awareness of the value of biodiversity conservation needs. It may also be mentioned here that live specimens of several species which fall under rare category of IUCN (IUCN,2000), can be seen in the *ex-situ* gardens of Bioresources Nature Park at KFRI Sub Centre, Nilambur. However, like any other *ex-situ* garden, most species cultivated here are on an average represented by only two or three specimens and the genetic diversity within wild species could not be represented. In this context, further attempts can be made to collect more specimens covering a range of diversity of wild species, particularly endemic and RET species, to facilitate germplasm distribution.

## 5. LITERATURE CITED

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