

Why should anyone figure out their carbon footprint (also known as your ecological footprint)? The reason is simple... it's having a huge impact on the climate.

Discussion

The major component of an ecosystem is plants. They are major modifiers of climate and providers of community structures, and they are pathway through which energy enters the ecosystem. The plant forms a complex interaction between the biotic and abiotic entities of the environment by making use of the biotic entities as food to produce food in form of biomass for the animal communities. High diversity of animal species within the institute vicinities as recorded in this study could therefore be connected to the observed high diversity of plant species.

This study has shown that the institute environments have rich and abundant flora and fauna populations which could be regarded as a biotic community consisting of the populations of different organisms interacting together. It also revealed that the activities on the study area may not be completely detrimental to the existence of the organisms. Thus, if well maintained, institute activities are not entirely unfriendly to the biotic community.

Although, it is not a common practice to base ecological research on questionnaire survey, this study has revealed that the opinion of people who have been used to a particular area over a long period of time on the fauna species usually encountered in such areas should not be discarded. However, there is the need for a field survey to back up verbal responses.

10. Quality Audits on Environment and Energy

CERTIFICAT*CERTIFICATE*СЕРТИФИКАТ*CERTIFICATO*SERTIFIKAT



CERTIFICATE

This is to Certify that the Environmental Management System of

INSTITUTE FOR PLASMA RESEARCH
(CONSTITUENT INSTITUTE OF HOMI BHABHA NATIONAL INSTITUTE)

INSTITUTE FOR PLASMA RESEARCH, BHAT VILLAGE, NEAR INDIRA BRIDGE,
GANDHINAGAR – 382428, GUJARAT (INDIA)

has been audited and found to comply with the requirements of:

ISO 14001:2015
Environmental Management System

For the scope of activities described below:

**RESEARCH INSTITUTE OF THEORETICAL & EXPERIMENTAL
PLASMA PHYSICS & APPLICATIONS.**

IAF Code: 34

Certificate No: EGE/24061E/2264

ISSUED THROUGH

Date of initial registration	Date of this Certificate	Surv. audit on or before	Certificate expiry	Re-certification Due
05.06.2024	05.06.2024	04.05.2025		04.06.2027

Validity of this certificate is subject to successful completion of surveillance audit on or before due date, in case surveillance audit not conducted this certificate shall be suspended/cancelled.


Director

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RWH system at IPR, Gandhinagar

Observation:

IPR is already having three bore well recharge units to recharge the ground water. The necessity to further increase recharge well may depend on reports received by Ground water Authority & under the guidance/ consultation of Civil Engineering dept. of IPR.

- Green Campus Initiatives:** Green Campus Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience.

Green campus audit can be a useful tool for HEIs to determine how and where they are using the most energy or water or resources; the HEIs can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values, and ethics. It provides staff and students with a better understanding of green impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that the HEIs evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

The rapid urbanization and economic development at local, regional, and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institution which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

In recent times, the Green Audit of an institution has been becoming a paramount important for self-assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. Many institutions undertake lot of good measures to resolve these problems but are not documented due to lack of green documentation awareness. All these non-scholastic efforts of the administrations play an important role in ensuring the green quotient of the campus is intact.

Therefore, the purpose of the present green audit is to identify, quantify, describe, and prioritize the framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

Main Objective of Green Campus Audit:

- Geographical Location.
- Floral and Faunal diversity.
- Meteorological parameter.
- Energy Consumptions.
- Waste disposal system.
- Ambient Environmental Condition.
- Awareness & Training on Sustainability for Students.

At Conserve, we audit all the sustainable metrics as per the requirement of National Assessment and Accreditation Council, New Delhi (NAAC) and provide comprehensive reporting on the green quotient of the campus and provide strategic roadmap to institutions to further ensure that their green legacy is intact.

BIODIVERSITY AUDIT

The Biodiversity Audit Approach is an innovative, landscape-scale and evidence-based approach to delivery of biodiversity. It provides a working example of the implementation of an integrated approach to biodiversity delivery in a region. A key element has been the development of an evidence-based approach to understanding the requirements of priority species and providing guidelines for their conservation. Ecological requirements of priority species for conservation have been collated, and synthesized, integrating across numerous individual priority species to produce management guidance for multi-species assemblages. The approach: Collates and examines available evidence to understand what species are present. Objectively defines the suite of conservation priority species. Assess the recent or status of priority species. A key objective of the approach is to provide land managers and conservation advisers with guidance on how to enhance and sustain the important biodiversity. Effective management is best achieved by providing prescriptions based on sound evidence. The novel approach taken is to identify multi-species assemblages and associated flagship invertebrate and plant species, requiring similar ecological processes and conditions (‘guilds’). This has the aim of integrating prescriptions for multiple species into habitat-based approaches, but through an evidence-based approach rooted in an understanding of the requirements of individual species.

This includes the plants, greenery, and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental Policy is enacted, enforced, and reviewed using various environmental awareness programs.

BIODIVERSITY

To keep the greenery on the campus, the institute regularly maintains the gardens which are looked after by concerned staff under the guidance of higher authorities of the institute. Activities organized to create greenery and its conservation at the institute campus is as follows-

- Plantation of diversified species, Uses of medicinal plants, Identification of plants species.
- Awareness of carbon consumption and carbon footprint program.

To create a green cover, Eco-friendly atmosphere, and pure oxygen at the institute campus, a plantation program is organized every year with active participation from the institute community and visitors. A committee has been formed as the Campus Horticulture Committee to keep the greeneries in the institute campus. All gardens are regularly maintained and looked after by the Horticulture Section under the guidance of committee members. Various departmental activities are being carried out every year such as: -

- Plantations and other Landscaping Activities
- Maintenance of Gardens and Landscape
- Maintenance of Plantations

The horticultural activities for landscaping and beautification of IPR are headed by a gardener. There were transformation and redeemed of certain natural vegetation patches for requisite infrastructure development to facilitate the emerging needs for the growth of the institute. However, spaces for academic, administrative and recreational areas are delineated in harmony with the landscape to ensure an eco-friendly campus. The horticulture and gardening unit is posted in the institute and is looking after althea plantation and other landscaping activities within the institute campus. Horticulture and gardening unit has under him a team of dedicated staff who are only dedicated to horticulture and Gardening work & develops strategies for smooth execution of plantation, maintenance, and overall protection of the landscape. Therefore, the greenery of a large area in the campus is well maintained besides keeping remnants of the natural vegetation patches undisturbed. There are block plantations, plantations along the roads side, garden space of departmental building premises, and along the residential compounds, while several tree species regenerated naturally and there are plants that cover the whole natural and scrapes. Several trees and plants are carefully selected for the plantation to provide shelter for birds and to provide a shaded walkway. Massive plantations and different landscaping beautification activities have already been carried out in different parts of the institute campus.

PLANTATIONS

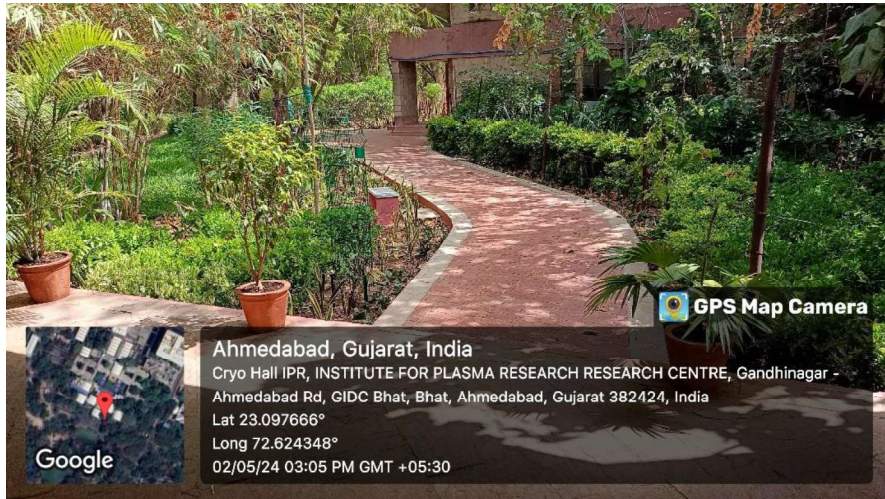
IPR is a continuous process of planting trees of importance, medicinal values & fruit bearing. Institute on various national and international events/occasions with active participation from institute communities and guests. This program helps in encouraging an eco-friendly environment that provides pure oxygen within the institute and awareness among villagers. The plantation program includes various types of indigenous species of ornamental and medicinal wild plant species. The plants have medicinal value, which faculty members of the Horticulture department, Botany department with the help of NSS students to identify with scientific names and give information about medicinal uses of the plants.

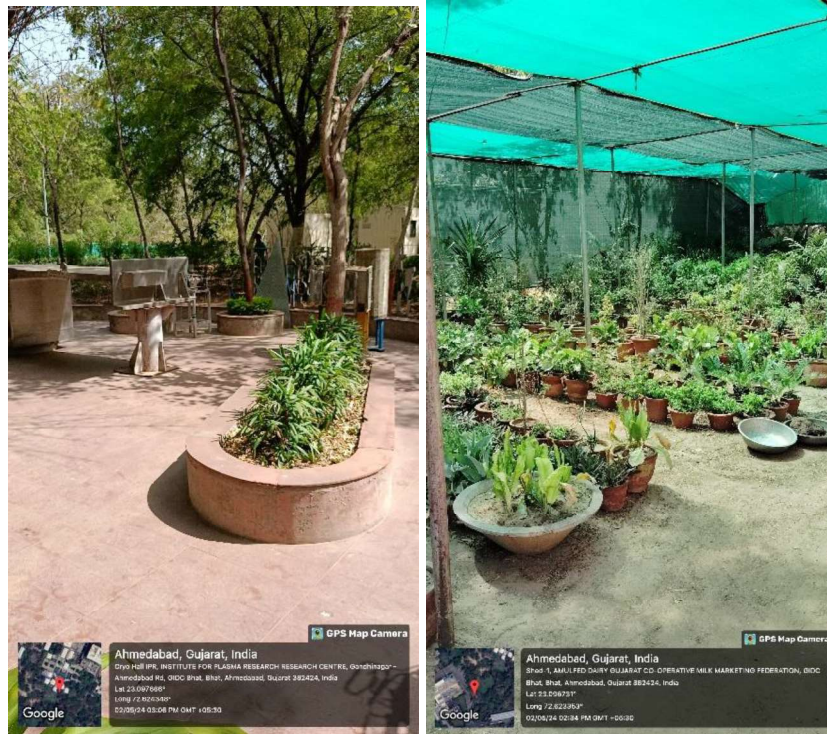
LANDSCAPING AND GARDENING ACTIVITIES

In addition, to carry out different plantation programs, efforts were also made by the Horticulture Section, IPR for beautification of different parts of the institute campus by the development of flower gardens and other landscaping activities such as the development of lawns, hedges, ornamental and avenue plantations, etc. Several green areas have also been developed within the institute campus. Moreover, plantation of different types of medicinal plants on the existing area of different locations of the institute campus has also been done for further beautification of the landscape.

MAINTENANCE OF GARDENS AND LANDSCAPE

In addition to new plantation drives and landscaping/beautification activities, all essential maintenance work (like lawn, hedge, existing plants /shrubs, growing of seasonal flowers) for previously developed flower and other gardens, as well as other locations of the institute campus, is done regularly under the supervision of Horticulture Section.





Greenery Maintained by IPR

MAINTENANCE OF PLANTATIONS

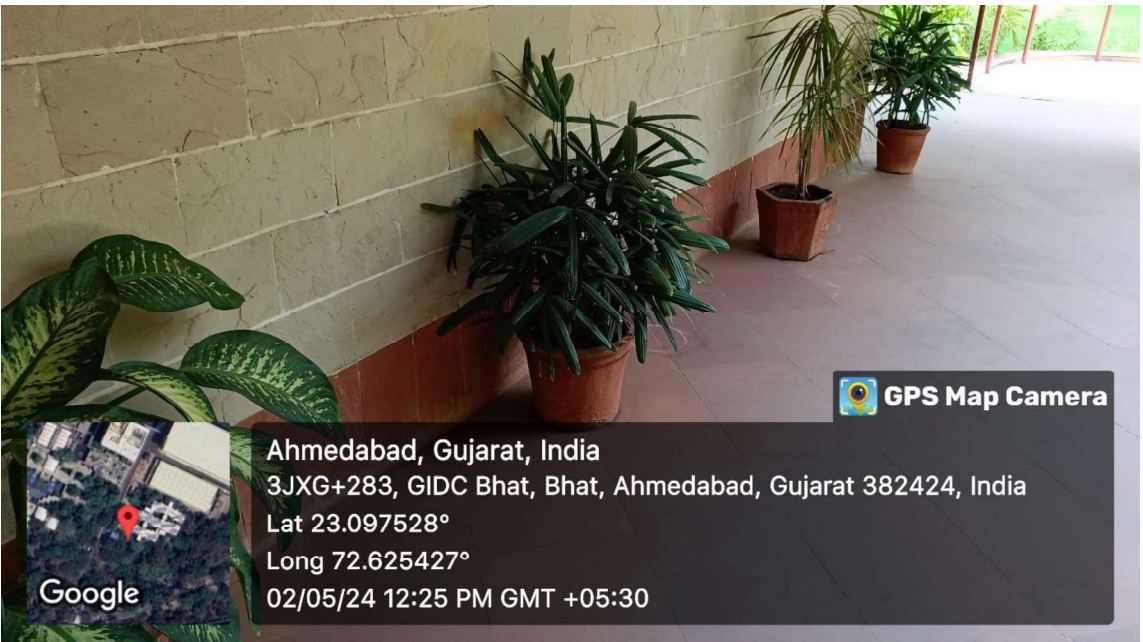
Apart from the maintenance of gardens, all previously planted trees (like roadside and other plantations) in different locations of the institute campus are regularly nurtured by cleaning, fertilization, watering, etc.

HOUSE PLANTS

House plants do not just look good – they can make us feel good, too. Studies have shown that house plants-

- Boost our mood, productivity, concentration, and creativity.
- Reduce our stress, fatigue, sore throats, and colds.
- Help clean indoor air by absorbing toxins, increasing humidity & producing oxygen.
- Add life to sterile space, give privacy and reduce noise levels.

Considering the different benefits of houseplants, currently, various types of House plant pots are replaced in the interior space of different administrative offices and Academic buildings, Guest House and Library other amenity centers for beautification, greenery, and purifying the air. Essential maintenance works of these houseplants are carried out regularly under the supervision of the horticulture section, Institute for Plasma Research, Gandhinagar.



House Plant at IPR

Campus Involvement

For sustainable use of resources and for the mission of “GO-GREEN” it is necessary that the students, faculty, and administration welcome it. IPR has an environment that invites opportunities to better its community through campus organizations. The green initiative started on the campus many years ago. The IPR students are actively participating and solely concerned with the environment. These students, under the guidance of faculties strive to create an environmentally friendly campus. Their purpose is to create awareness and eventually act on that awareness. Institute is also actively conducting environmental awareness programs on campus regularly.

Environmental Conservation Program

Institute is very active in the practical education of the students regarding environmental conservation. The institute has arranged visits to their faculties to the Wildlife Institute of India (WII), Botanical Garden, Sanctuaries, Zoological Park sacred groves in order to educate their students. The institute also took their students to different National Parks to educate the students of Conservation of Wildlife.

BIODIVERSITY OF FLORA FAUNA ASSOCIATED WITH IN INSTITUTE CAMPUS

Introduction

Biodiversity is one measure of the health of biological systems. Life on earth today consists of many millions of distinct biological species. Biodiversity is not consistent across the earth. It is consistently rich in the tropics, and it is less rich in Polar Regions where conditions support much less biomass. A complex relationship exists among the different diversity levels.

Identifying one level of diversity in a group of organisms does not necessarily indicate its relationship with other types of diversities. Rapid environmental changes typically cause extinctions. Most species that have existed on earth are now extinct. The period since the emergence of humans has displayed an ongoing reduction in biodiversity. Named the Holocene extinction, the reduction is caused primarily by human impacts, particularly the destruction of plant and animal habitats.

Need for biodiversity conservation

Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water. Through the conservation of biodiversity, the survival of many species and habitats which are threatened due to human activities can be ensured. Other reasons for conserving biodiversity include securing valuable Natural Resources for future generations and protecting the wellbeing of ecosystem functions. Plant genetic resources are the product of natural evolution and human intervention. In-situ biodiversity conservation includes the conservation of habitats, species, and ecosystems where they naturally occur. The conservation of elements of biodiversity out of the context of their natural habitats is referred to as ex-situ biodiversity conservation.

Fauna Survey

The term fauna represents all the animal species found in a particular region at a particular time. These are the naturally occurring animal species of the area. It can be measured by taking a number of quadrats and recording presence/absence in each, or in each of the subdivisions of the quadrat. Fauna use many different parts of the environment. Some are ground-dwellers, others arboreal and some live underground or in rock crevices.

Pilot fauna survey

Animal species present around each of the building locations were assessed. Places such as in and around the institute vicinity, in the soil and on the vegetation around the institute were checked and noted.

Questionnaire based fauna survey

An assessment of animal species commonly cited around the study institute area by pupils and workers of the institute was also conducted through a structured interview schedule (questionnaire). The respondents were allowed to express the names of the animal species in their local language (Hindi or English).

Fauna Details

Sr No	Scientific name	Common name	Family	Phylum
1	<i>Pycnonotus cafer</i>	Red vented Bulbul	Pycnonotidae	Chordata
2	Strigiformes	Owl	Tytonidae	Chordata
3	<i>Pavo cristatus</i>	Peacock	Phasianidae	Chordata
4	<i>Pavo cristatus</i>	Peahen	Phasianidae	Chordata
5	<i>Passer domesticus</i>	House Sparrow	Passeridae	Chordata
6	<i>Pernis ptilorhynchus</i>	Honey Buzzard	Accipitridae	Chordata
7	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	Chordata
8	<i>Sturnia pagodarum</i>	Brahminy starling	Sturnidae	Chordata
9	<i>Columba livia</i>	Pigeon	Columbidae	Chordata
10	<i>Melopsittacus undulatus</i>	Parakeet	Psittacidae	Chordata
11	Sciuridae	Squirrel	Sciuridae	Chordata
12	<i>Sciurus carolinensis</i>	albino squirrel	Sciuridae	Chordata
13	<i>Corvus brachyrhynchos</i>	Crow	Corvidae	Chordata
14	<i>Naja naja</i>	Indian Cobra Snake	Elapidae	Chordata
15	<i>Arctia caja</i>	Brown hairy caterpillar	Erebidae	Arthropoda
16	<i>Polytela gloriosae</i>	Lily moth caterpillar	Noctuidae	Arthropoda
17	<i>Rattus norvegicus</i>	Rat	Rodentia	Chordata
18	<i>Bipalium sp.</i>	Hammer headed worm	Geoplanidae	Platyhelminthes
19	Gastropoda	Snail	Bradybaenidae	Mollusca
20	Picinea	Woodpecker	Picidae	Chordata
21	<i>Copsychus saularis</i>	Magpie robin	Muscicapidae	Chordata
22	<i>Argya striata</i>	Jungle babbler	Leiothrichidae	Chordata
23	<i>Psilopogon viridis</i>	white-cheeked barbet	Megalaimidae	Chordata
24	<i>Varanus bengalensis</i>	Lizard	Gecko	Chordata
25	Muscicapidae	Flycatcher	Muscicapidae	Chordata
26	<i>Varanus</i>	Monitor Lizard	Varanidae	Chordata
27	<i>Phylloscopus collybita</i>	Common Chiffchaff	Phylloscopidae	Chordata
28	<i>Acrocephalus dumetorum</i>	Blyths-reed-warbler	Acrocephalidae	Chordata
29	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker	Picidae	Chordata
30	<i>Alcippe poioicephala</i>	Brown-cheeked Fulvetta	Alcippeidae	Chordata
31	<i>Prinia inornata</i>	Plain Prinia	Cisticolidae	Chordata
32	<i>Pseudibis papillosa</i>	Indian Black Ibis	Threskiornithidae	Chordata
33	<i>Ciconia ciconia</i>	White Stork	Ciconiidae	Chordata
34	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Estrildidae	Chordata
35	<i>Euodice malabarica</i>	Indian Silverbill	Estrildidae	Chordata
36	<i>Eudynamys scolopaceus</i>	Asian Koel	Cuculidae	Chordata
37	<i>Danaus plexippus</i>	Butterfly	Papilionidae	Arthropoda
38	<i>Semnopithecus entellus</i>	Langur Monkey	Cercopithecidae	Chordata

Fauna Details

39	<i>Felis catus</i>	House Cat	Felidae	Chordata
40	<i>Boselaphus tragocamelus</i>	Nilgai	Bovidae	Chordata
41	<i>Canis lupus familiaris</i>	Dog	Canidae	Chordata
42	Hystricidae	Porcupine	Hystricidae	Chordata
43	<i>Pogona vitticeps</i>	Bearded Dragon	Agamidae	Chordata
44	<i>Python molurus</i>	Indian Python	Pythonidae	Chordata
45	<i>Daboia russelii</i>	Russell's Viper snake	Viperidae	Chordata
46	<i>Eryx johnii</i>	Red sand poa	Boidae	Chordata
47	<i>Ptyas mucosa</i>	Common Rat snake	Colubridae	Chordata
48	Treron	Green pigeon	Columbidae	Chordata
49	<i>Clanga hastata</i>	Eagle	Accipitridae	Chordata
50	<i>Centropus sinensis</i>	Greater Coucal	cuckoo	Chordata
51	<i>Copsychus fulicatus</i>	Indian Robin	Muscicapidae	Chordata
52	<i>Orthotomus sutorius</i>	Tailor bird	Cisticolidae	Chordata
53	Ploceidae	Weaver bird	Ploceidae	Chordata
54	<i>Upupa epops</i>	Hoopoes	Upupidae	Chordata
55	Alcedinidae	King fisher	Alcedinidae	Chordata
56	<i>Musca domestica</i>	House Fly	Muscidae	Arthropoda
57	Culicidae	Mosquito	Culicidae	Arthropoda
58	Formicidae	Ant	Hymenoptera	Arthropoda
59	Isoptera	Termite	Termitidae	Arthropoda
60	<i>Lasius niger</i>	Black Ant	Formicidae	Arthropoda
61	<i>Hersilia savignyi</i>	Spider	Hersiliidae	Arthropoda
62	<i>Argiope anasuja</i>	Signature Spider	Araneidae	Arthropoda
63	Blattodea	Cockroach	Blattodea	Arthropoda
64	<i>Lumbricus terrestris</i>	Worm	Lumbricidae	Annelida
65	Caelifera	Grass hopper	Acrididae	Arthropoda
66	Hirudinea	Leech	Hirudinidae	Annelida
67	<i>Trithemis annulata</i>	Purple Dragon fly	Libellulidae	Arthropoda
68	Apis	Honey bee	Apidae	Arthropoda
69	Vespidae	Wasp bee	Vespidae	Arthropoda
70	Xylocopa	Carpenter bee	Apidae	Arthropoda
71	<i>Nomadacris succincta</i>	Locust	Acrididae	Arthropoda
72	<i>Lampyrus noctiluca</i>	Glow Worm	Lampyridae	Arthropoda
73	<i>Dendrocitta vagabunda</i>	Rufous Treepie	Corvidae	Chordata
74	<i>Accipiter badius</i>	Shikra	Accipitridae	Chordata
75	<i>Merops philippinus</i>	Blue tailed bee eater	Meropidae	Chordata
76	<i>Streptopelia senegalensis</i>	Laughing Dove	Columbidae	Chordata
77	<i>Vanellus indicus</i>	Red-wattled lapwing indicus	Charadriidae	Chordata
78	<i>Saxicola caprata</i>	Pied Bushchat	Muscicapidae	Chordata
79	<i>Cinnyris asiaticus</i>	Purple Sub bird	Nectariniidae	Chordata
80	<i>Oriolus kundoo</i>	Indian golden oriole	Oriolidae	Chordata
81	Scincidae	Skinks	Scincidae	Chordata
82	Diplopoda	Millipede	Polyxenidae	Arthropoda

Fauna Details				
83	Chilopoda	Centipede	Scolopendridae	Arthropoda
84	Ocyeros birostris	Grey Hornbill	Bucerotidae	Chordata
85	Athene brama	Spotted Owlet	Strigidae	Chordata
86	Dendrelaphis tristis	Bronze-back Tree Snake	Colubridae	Chordata
87	Dicrurus macrocercus	Black Drongo	Dicruridae	Chordata

Observation: It was informed that total of **eighty-seven** animal species were cited in the institute area. Fauna species observed in the study area were good representatives of the animals & birds kingdom as they are from various insect groups, other invertebrates, reptiles, amphibians, birds and mammals.

Fauna species were noted to be common to each of the study areas. Among the fauna species common to the institute study area, peacock, peahen, termites, ants, earthworms, lizards, spiders and springtails were observed to be more in abundance.

It's great to know that institute has worked extra ordinarily, and scientific methods has been adopted.

Flora survey

Direct observation of plants growing freely around the institute was done to ensure a proper and more accurate plant survey.

We have identified different trees from different genera and families and ornamental plants and have studied their properties and uses. There are many trees and ornamental plants which are rare on the institute campus. Such plants are planted in different parts of campus and monitored for proper growth.

Flora Details				
S. No	Botanical name	English name	Family	Habit
1	Acacia auriculiformis	Australian acacia	Fabaceae	Tree
2	Acacia catechu	Cutch tree	Fabaceae	Tree
3	Acacia nilotica	Gum Arabic	Fabaceae	Tree
4	Acalypha wilkesiana	Khalifa	Euphorbiaceae	Shrub
5	Acalypha Sps.	Red hot cat's tail	Euphorbiaceae	Plants
6	Achras sapota	Sapota	Sapotaceae	Plants
7	Adansonia digitata	Monkey bread	Malvaceae	Tree
8	Adenium obesum	Desert rose	Apocynaceae	Shrub
9	Adathoda vasica	Malabar nut	Acanthaceae	Shrub
10	Aegle marmelos	Bael / Bilwa	Rutaceae	Shrub
11	Ailanthus excelsa	Tree of heaven	Simaroubaceae	Tree
12	Albizia julibrissin	Mimosa / Silk Tree	Fabaceae	Tree
13	Albizzia lebbek	Indian walnut	Fabaceae	Tree
14	Aloe vera	Barbados aloe	Asphodelaceae	Shrub
15	Alstonia scholaris	Devil's tree	Apocynaceae	Tree
16	Anona squamosa	Sugar apple	Annonaceae	Tree
17	Anthocephalus Kadamba	Kadamba	Rubiaceae	Tree
18	Aralia sps.	Aralia	Araliaceae	Tree
19	Aralia balfouriana	Dinner Plate Aralia	Araliaceae	Shrub
20	Araucaria cookie	Fountainhead tree	Araucariaceae	Tree
21	Areca catechu	Betel nut palm	Arecaceae	Tree

Flora Details				
S. No	Botanical name	English name	Family	Habit
22	<i>Areca lutescens</i>	Butterfly palm	Arecaceae	Tree
23	<i>Artabotrys odoratissimus</i>	Bhandari vine	Annonaceae	Shrub
24	<i>Asystasia coromandeliana</i>	Chinese violet	Acanthaceae	Shrub
25	<i>Azadirachta indica</i>	Neem	mahogany	Tree
26	<i>Bauhinia alba</i>	White orchid tree	Fabaceae	Tree
27	<i>Bauhinia purpurea</i>	Purple orchid tree	Fabaceae	Tree
28	<i>Bignonia megapotamica</i>	Vitex megapotamica	Bignoniaceae	Tree
29	<i>Bombax malabaricum</i>	Silk cotton tree	Malvaceae	Tree
30	<i>Bougainvillea</i> sps.	Paper flower	Nyctaginaceae	Shrubs
31	<i>Brahea Armata</i>	Mexican Blue Palm	Arecaceae	Tree
32	<i>Brassia arboricola</i>	Dwarf Schefflera	Orchidaceae	Shrubs
33	<i>Butea monosperma</i>	Flame of the forest	Fabaceae	Tree
34	<i>Caesalpinia pulcherrima</i>	Peacock flower	Fabaceae	Shrubs
35	<i>Calliandra haematocephala</i>	Powder puff / Saving brush	Fabaceae	Shrubs
36	<i>Callistemon lanceolatus</i>	Bottle brush	Myrtaceae	Shrubs
37	<i>Calophyllum inophyllum</i>	Beauty leaf	Clusiaceae	Tree
38	<i>Carica papaya</i>	papaya	Caricaceae	Tree
39	<i>Caryota urens</i>	Fishtail palm	Arecaceae	Tree
40	<i>Cassia auriculata</i>	Mature tea tree	Fabaceae	Tree
41	<i>Cassia biflora</i>	Twin flowered cassia	Fabaceae	Shrubs
42	<i>Cassia fistula</i>	Indian Laburnum	Fabaceae	Tree
43	<i>Cassia javanica</i>	Pink Shower tree	Fabaceae	Tree
44	<i>Cassia alata</i>	Candle Bush	Fabaceae	Shrubs
45	<i>Cassia siamea</i>	Kassod tree	Fabaceae	Tree
46	<i>Casuarina equisetifolia</i>	She oak	Casuarinaceae	Tree
47	<i>Cestrum diurnum</i>	Day jasmine	Solanaceae	Shrubs
48	<i>Cestrum nocturnum</i>	Night jasmine	Solanaceae	Shrubs
49	<i>Chamaedorea Seifrizii</i>	Bamboo Palm	Arecaceae	Tree
50	<i>Cieba pentandra</i>	Kapok tree	Malvaceae	Tree
51	<i>Citrus limon</i>	Sour lime	Rutaceae	Tree
52	<i>Cocos nucifera</i>	Coconut palm	Arecaceae	Tree
53	<i>Cordia mixa</i>	Indian cherry	Boraginaceae	Shrubs
54	<i>Cordia sebestena</i>	Geiger tree	Boraginaceae	Tree
55	<i>Cordia dichotoma</i>	Indian cherry	Boraginaceae	Tree
56	<i>Couroupita guianensis</i>	Cannonball tree	Lecythidaceae	Tree
57	<i>Cycas revolute</i>	Sago palm	Cycadaceae	Tree
58	<i>Dalbergia sissoo</i>	Indian rosewood	Fabaceae	Tree
59	<i>Delonix regia</i>	Peacock flower	Fabaceae	Tree

Flora Details				
S. No	Botanical name	English name	Family	Habit
60	Dendrocalamus strictus	Solid bamboo	Poaceae	Tree
61	Duranta erecta	Pigeonberry	Verbenaceae	Shrubs
62	Elaeocarpus ganitrus	Rudraksha	Elaeocarpaceae	Tree
63	Embllica officinalis	Indian gooseberry	Phyllanthaceae	Tree
64	Erythrina indica	Indian coral tree	Fabaceae	Tree
65	Eucalyptus citriodora	Lemon eucalyptus	Myrtaceae	Tree
66	Syzygium cumini	Black plum	Myrtaceae	Tree
67	Euphorbia tirucalli	Pencil Cactus	Euphorbiaceae	Shrubs
68	Limonia acidissima	Wood apple	Rutaceae	Tree
69	Ficus elastica	Rubber plant	Moraceae	Tree
70	Ficus racemose	Cluster fig / Indian fig tree / Gular	Moraceae	Tree
71	Ficus krishnae	Krishna's fig	Moraceae	Tree
72	Ficus Carica	Common fig	Moraceae	Tree
73	Ficus religiosa	Peepal	Ficus religiosa	Tree
74	Ficus bengalensis	Banyan	Moraceae	Tree
75	Gardenia florida	Gardenia	Rubiaceae	Shrubs
76	Gmelina arborea	White teak	Lamiaceae	Tree
77	Grevillea robusta	Silver oak	Proteaceae	Tree
78	Hamelia patens	Hummingbird bush	Rubiaceae	Shrubs
79	Hibiscus sps.	Shoe flower	Malvaceae	Shrubs
80	Howea Forsteriana	Kentia Palm	Arecaceae	Tree
81	Ixora sps.	Flame of the Woods	Rubiaceae	Shrubs
82	Ixora singaporensis	Jungle flame	Rubiaceae	Shrubs
83	Jacaranda minosifolia	Blue jacaranda tree	Bignoniaceae	Tree
84	Jasminum nitidum	Angel Wing Jasmine	Oleaceae	Shrubs
85	Jasminum sambac	Arabian jasmine	Oleaceae	Shrubs
86	Jatropha gossypifolia	Jatropha	Euphorbiaceae	Shrubs
87	Jatropha integerrima / Panduraefolia	spicy jatropha	Euphorbiaceae	Shrubs
88	Justicia coccinea	Pachystachys	Acanthaceae	Shrubs
89	Kigelia pinnata	Indian sausage	Bignoniaceae	Tree
90	Lagerstroemia indica	Crape myrtle / crepeflower	Lythraceae	Shrubs
91	Lantana camara depressa	Lantana yellow	Verbenaceae	Shrubs
92	Lantana camara nivea	Lantana white	Verbenaceae	Shrubs
93	Lantana sellowiana	Lantana purple	Verbenaceae	Shrubs
94	Leucaena leucocephala	Wild Tamarind	Fabaceae	Tree
95	Mangifera indica	Mango tree	Anacardiaceae	Tree
96	Manilkara hexandra	Milk tree	Sapotaceae	Tree
97	Milletia grandis	Umzimbeet	Fabaceae	Tree
98	Millingtonia hortensis	Indian cork tree	Bignoniaceae	Tree
99	Mimusops elengi	Indian medaller	Sapotaceae	Tree
100	Moringa oleifera	Drum stick tree	Moringaceae	Tree

Flora Details				
S. No	Botanical name	English name	Family	Habit
101	Morus alba	Silkworm mulberry	Moraceae	Tree
102	Murraya exotica	Orange jasmine	Rutaceae	Shrubs
103	Murraya koenigii	Curry leaf tree	Rutaceae	Shrubs
104	Nerium oleander "red"	Red Oleander	Apocynaceae	Shrubs
105	Nerium oleander "Moned"	Dwarf Red Oleander	Apocynaceae	Shrubs
106	Nerium oleander "Petitie pink"	Dwarf Pink Oleander	Apocynaceae	Shrubs
107	Nerium oleander "Pink"	Pink Oleander	Apocynaceae	Shrubs
108	Nerium oleander 'Splendens'	Splendens Double Pink	Apocynaceae	Shrubs
109	Nerium oleander 'White"	White Oleander	Apocynaceae	Shrubs
110	Nerium spices	Nerium oleander	Apocynaceae	Shrubs
111	Nyctanthes arbortristis	Night flowering jasmine	Oleaceae	Tree
112	Ocimum basilicum	Common basil	Lamiaceae	Shrubs
113	Ocimum sanctum	Holy basil / Sacrel basil	Lamiaceae	Shrubs
114	Roystonea regia	Royal palm	Arecaceae	Tree
115	Pandanus fascicularis	Umbrella tree	Pandanaceae	Tree
116	Peltophorum pterocarpum	Copperpod	Fabaceae family	Tree
117	Pentas cornea	Star Cluster	Rubiaceae	Shrubs
118	Petrea volubilis	Queen's Wreath	Verbenaceae	Tree
119	Phoenix rupicola	Indian date palm	Arecaceae	Tree
120	Phoenix dactylifera	Date palm	Arecaceae	Tree
121	Samanea saman	Rain tree	Fabaceae	Tree
122	Pithecolobium dulce	Manila tamarind	Fabaceae	Tree
123	Plumbago capensis	Plumago	Plumbaginacea e	Shrubs
124	Plumeria alba	White Frangipani	Apocynaceae	Shrubs
125	Plumeria rubra	Temple tree	Apocynaceae	Shrubs
126	Polyalthia longifolia	Must tree	Annonaceae	Tree
127	Pongamia pinnata	Indian beach	Fabaceae	Tree
128	Prosopis cineraria	Spung tree	Fabaceae	Tree
129	Prosopis juliflora	Vilayati babul	Fabaceae	Tree
130	Psidium guajava	Apple guava	Myrtaceae	Tree
131	Punica granatum	Pomegranate	Lythraceae	Tree
132	Putranjiva roxburghii	Putranjiva tree	Putranjivaceae	Tree
133	Quisqualis indica	Rangoon Creeper	Combretaceae	Tree
134	Revenela madagascariensis	Traveler's palm	Strelitziaceae	Tree
135	Ruellia elegans	Red Ruellia	Acanthaceae	Shrubs
136	Russelia juncea	Fountain Mary	Plantaginaceae	Shrubs
137	Sansevieria 'Golden Hahnii'	Snake plant	Asparagaceae	Succulents

Flora Details				
S. No	Botanical name	English name	Family	Habit
138	Sansevieria species	Snake plant	Asparagaceae	Shrubs
139	Sansevieria 'Zeylandica'	Snake plant	Asparagaceae	succulent
140	Santalum album	Sandal wood	Santalaceae	Tree
141	Sapindus mukorossi	Soap nut	Sapindaceae	Tree
142	Saraca indica	Ashoka tree	Fabaceae	Tree
143	Spathodea campanulate	African tulip tree	Bignoniaceae	Tree
144	Stachystarpheta jamaicensis purple form	Purple Porterweed	Verbenaceae	Shrubs
145	Heliconia brasiliensis	Bird of paradise	Heliconiaceae	Shrubs
146	Tabernaemontana coronaria	India Carnation	Apocynaceae	Shrubs
147	Tabernaemontana corymbose	Moonbean	Apocynaceae	Shrubs
148	Tamarindus indica	Indian date	Fabaceae	Tree
149	Tecoma stans	Yellow bells	Bignoniaceae	Shrubs
150	Tecomaria capensis	cape honeysuckle	Bignoniaceae	Shrubs
151	Tecomella undulata	Indian weeping	Bignoniaceae	Tree
152	Tectona grandis	Teak tree	Lamiaceae	Shrubs
153	Terminalia belerica	Bahera / Belliric myrobalan	Combretaceae	Tree
154	Terminalia catappa	Indian almond	Combretaceae	Tree
155	Terminalia chebula	Indian gall nut	Combretaceae	Tree
156	Terminalia arjuna	White Marudah	Combretaceae	Tree
157	Thespesia populnea	Umbrella tree	Malvaceae	Tree
158	Thevetia nereifolia	Yellow oleander	Apocynaceae	Shrubs
159	Vinca rosea	Rose Periwinkle	Apocynaceae	Shrubs
160	Vitex negundo	Vitex	Lamiaceae	Shrubs
161	Washingtonia filifera	Desert fan palm	Arecaceae	Tree
162	Withania somnifera	winter cherry	Solanaceae	Shrubs
163	Ziziphus mauritiana	Indian Jujube / Ber	Rhamnaceae	Tree
164	Salvadora persica	Mustard tree	Salvadoraceae	Shrubs
165	Hymenocallis occidentalis	Spider lily	Amaryllidaceae	Herb
166	Canna indica	Indian-shot	Cannaceae	Herb
167	Cyperus alternifolius	Umbrella grass	Cyperaceae	Herb
168	Dracaena sps.	Dracaena plant	Asparagaceae	Shrubs
169	Dieffenbachia amoena	Dieffenbachia	Araceae	Shrubs
170	Euphorbia pulcherrima	Poinsettia	Euphorbiaceae	Shrubs
171	Kalanchoe bloaafeldiana	Kalanchoe	Crassulaceae	Shrubs
172	Crassula lycopodioides	Club moss crassula	Crassulaceae	Herb
173	Chrysanthemum	Daisy	Asteraceae	Shrubs
174	Pennisetum setaceum	Fountain grass	Poaceae	Herb

Flora Details				
S. No	Botanical name	English name	Family	Habit
175	Pennisetum setaceum "Rubramn"	Fountain grass	Poaceae	Grass Plant
176	Gaillardia grandiflora	Blanket flower	Asteraceae	Herb
177	Mirabilis jalapa	Four-o'clock plant	Nyctaginaceae	Herb
178	Tagetes erecta	African marigold	Asteraceae	Herb
179	Calotropis gigantea	Crown flower	Apocynaceae	Shrubs
180	Datura stramonium	Thorn apple	Solanaceae	Herb
181	Desmostachya bipinnata	Halfa grass	Poaceae	Grass Plant
182	Portulaca grandiflora	Sun plant / office time	Portulacaceae	Herb
183	Pyrostegia venusta	trumpet creeper / flame vine	Bignoniaceae	Woody Vine
184	Clerodendrum splendens	flaming glorybower	Lamiaceae	Shrubs
185	Ipomoea batatas	Ornamental sweet potato vine	Convolvulacea e	Herb
186	Wedelia trilobata	Yellow Creeping Daisy	Asteraceae	Herb
187	Ocimum gratissimum	East Indian basil	Lamiaceae	Herb
188	Licuala grandis	Ruffled Fan palm, Grandis palm	Arecaceae	Tree
189	Livistona rotundifolia	Foot stool palm	Arecaceae	Tree
190	Pseuderanthemum atropurpureum 'Variegatum'	False Eranthemum	Acanthaceae	Shrubs
191	Pseuderanthemum atropurpureum "Tonga"	Purple False Plant	Acanthaceae	Shrubs
192	Furcraea gigantea 'striata'	Giant false agave	Asparagaceae	Herb
193	Agave atrovirens	Pulque Agave	Agavaceae	succulent
194	Crinum asiaticum	Asiatic Poison Lily	Amaryllidaceae	Herb
195	Crinum powellii album	Crinum Lily	Amaryllidaceae	Bulbous perennial
196	Aglaonema Pseudobracteatum	Chinese Evergreen	Araceae	Herb
197	Alocasia macrorhiza	Elephant's ear	Araceae	Herb
198	Epipremnum pinnatum	Centipede tongavine	Araceae	Climber
199	Pedilanthus tithymaloides	Zigzig plant	Euphorbiaceae	Shrubs
200	Mimosa pudica	Sensitive plant / touch me not	Fabaceae	Herb
201	Dracaena reflexa	Song of india	Asparagaceae	Shrubs
202	Beaucarnea recurvata	Ponytail palm / Nolina / Elephant's foot	Asparagaceae	succulent
203	Bismarckia nobilis	Majestic fan palm	Arecaceae	Tree
204	Rosa centifolia (Sps.)	Rose	Rosaceae	Shrubs
205	Jasminum	Pearl jasmin	Oleaceae	Shrubs

Flora Details				
S. No	Botanical name	English name	Family	Habit
206	<i>Cynodon dactylon</i>	Bermuda grass	Poaceae	Grass
207	<i>Monstera deliciosa</i>	Monstera	Araceae	Climber
208	<i>Adenocalymma allica</i>	Garlic climber	Bignoniaceae	Climber
209	<i>Campsis grandiflora</i>	Tricoma	Bignoniaceae	Climber
210	<i>Hiptage benghalensis</i>	Madhvilata	Malpighiaceae	Shrubs
211	<i>Jaminum auriculatum</i>	Peart Jasmin	Oleaceae	Shrubs
212	<i>Petrea Volubilis</i>	Purple Wreath	Verbenaceae	Woody Vine
213	<i>Vernonia elaeagnifolia</i>	Varnonia	Asteraceae	Shrubs
214	<i>Canna indica</i>	Indian Shot	Cannaceae	Herb
215	<i>Thumbergia erecta</i>	Blue Puved mint	Acanthaceae	shrub
216	<i>Asystacia chelonoidg</i>	Asystacia	Acanthaceae	Herb
217	<i>Barleria Cristata rosea</i>	Philippine violet	Acanthaceae	shrub
218	<i>Elettaria Cardamomum</i>	Lesser cardamom	Zingiberaceae	Herb
219	<i>Musa Paradisiaca</i>	Banana	Musaceae	Herb
220	<i>Bismarckia Nobilis</i>	Silver bismarkia palm	Arecaceae	Tree
221	<i>Livistona Chinensis</i>	Chinese fun Plam	Arecaceae	Tree
222	<i>Prichardia Pasifica</i>	Fiji fan palm	Arecaceae	Tree
223	<i>Howela Forsteriana</i>	Paradise Palm	Arecaceae	Tree
224	<i>Livistona Rotundifolia</i>	Table Palm	Arecaceae	Tree
225	<i>Phyllanthus nivosus</i>	Snow bush	Phyllanthaceae	shrub
226	<i>Pleomele angustifolia</i>	Narrowleaf False Dracaena	Asparagaceae	shrub
227	<i>Buchloe dactyloides</i>	buffalo grass	Poaceae	Grass
228	<i>Pleamele reflexa variegata</i>	Song of india	Asparagaceae	shrub
229	<i>Musssaenda Frondosa</i>	Pink Musaenda, Flag Bush	Rubiaceae	shrub
230	<i>Ruellia rosea</i>		Acanthaceae	Herb
231	<i>Echites caryophyllata</i>	Roxburgh	Apocynaceae	Woody Vine
232	<i>Alteonanthera versicolor</i>	Alternanthera, copper	Amaranthaceae	Herb
233	<i>Solidago canadensis</i>	Golden rod	Asteraceae	Herb
234	<i>Justicia carnea</i>	Plume flower, flamingo flower, pink jacobinia	Acanthaceae	shrub
235	<i>Melaleuca Bracteata</i>	Golden bottle brush	Myrtaceae	shrub
236	<i>Dendrolobium umbellatum</i>	Discodium	Fabaceae	shrub
237	<i>Cordyline terminalis mahatma plant</i>	Draceana mahatma	Asparagaceae	shrub
238	<i>Syzygium Campanulatum</i>	cristina ficus	Myrtaceae	Tree
239	<i>Clerodendrum aboricola</i>	Aboli plants	Lamiaceae	shrub

Flora Details				
S. No	Botanical name	English name	Family	Habit
240	Silver yucca	Filamentosa Yucca	Asparagaceae	shrub
241	Pandanus	Kewda	Pandanaceae	shrub
242	Cerbera odollam rubra	Red Pong Pong tree	Apocynaceae	Tree
243	Capparis decidua	Bare caper, caper berry, leafless caper-bush	Capparaceae	shrub
244	Gymnosporia montana	Mountain spike thorn	Celastraceae	shrub
245	Hyphaene indica	Ravan tad plant	Arecaceae	Tree
246	Axonopus Affinis	Carpet lawn	Poaceae	Grass
247	Codiaeum variegatum	Croton	Euphorbiaceae	shrub
248	Dracaena fragrans	Corn plant	Asparagaceae	shrub
249	Dracaena trifasciata	snake plant	Asparagaceae	Herb
250	Rondeletia	Panama Rose	Rubiaceae	shrub
251	Jatropha Podagrica	Buddha Belly Plant	Euphorbiaceae	shrub
252	Jatropha	Ratanjot	Euphorbiaceae	shrub
253	Jatropha gossypifolia	bellyache bush	Euphorbiaceae	shrub
254	Pink Ravenia	Limonia	Rutaceae	shrub
255	Bambusa Vulgaris	Golden bamboo	Poaceae	Grass
256	Bambusa Ventricosa	Buddhas belly bamboo	Poaceae	Grass
257	Galphimia gracilis	shower-of-gold	Malpighiaceae	shrub
258	Raselia	kudrum	Apiaceae	Herb
259	Veitchia Merreilii Golden	Golden Veitchia palm	Arecaceae	Herb
260	Areca catechu linn	Sopari palm	Arecaceae	Tree
261	Hyophorbe indica	Sampion palm	Arecaceae	Tree
262	Furcaria	Giant Cabuya, Green-aloe or Mauritius-hemp	Asphodelaceae	shrub
263	Euphorbia milli	Crown-of-thorns	Euphorbiaceae	shrub
264	Cyrtostachys renda	Red palm	Arecaceae	Tree
265	Dypsis decaryi	Triangular palm	Arecaceae	Tree
266	Borassus flabellifer	Tadi palm	Arecaceae	Tree
267	Ficus Microcarpa "Golden"	Golden ficus	Moraceae	Tree
268	Ficus benjamina	Black ficus	Moraceae	Tree
269	Ficus variegata blume	Variegated ficus	Moraceae	Tree
270	Ziziphus mauritiana	Indian apple	Rhamnaceae	shrub

According to data provided by the IPR. The institute has 270 types of spices.

Bio-Diversity Data Analysis:

1. In **Flora** total 270 types of spices were identified by the institute.
2. Precautions must be taken not only in planting trees but their survival also.
3. Some of the faculty, including students should be given the responsibility for survival of trees.
4. Proper attention needs to be given to those plants which are planted under national drive of tree plantation.

5. Regular watering & taking care of plants are important aspects for survival rate.
6. It is recommended growing trees with medicinal values & that too with fruit bearing trees will not only make the institute campus as pioneer institution but will provide herbal & ayurvedic medicines & fruits to the nearby community as well as their students & staffs.

Oxygen emission and carbon storage capacity of tree

On the basis of

- Age
- Girth

We had conducted survey on 7 trees for calculation of oxygen emission & carbon dioxide absorption.

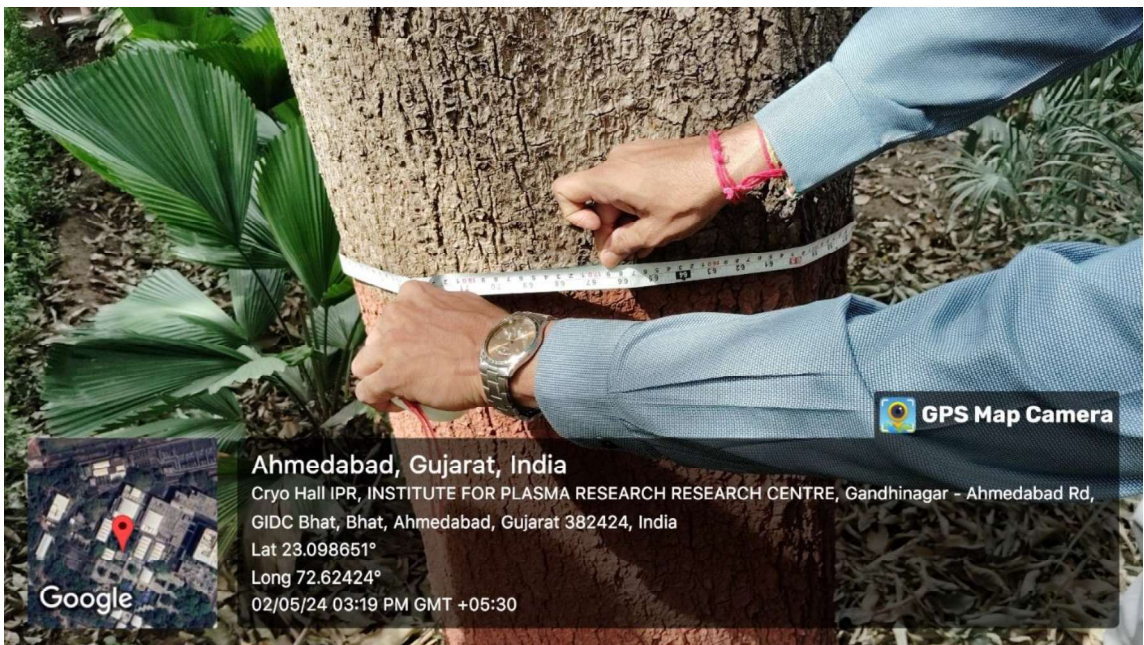
We have taken an online portal for calculating Oxygen Production and Carbon Storage by the trees.

a) Calculation made through **8billiontrees.com**

S. No.	Girth of Trees from 4.5' above Ground Level	No. of Trees	Age of trees (In years Approx.)	Oxygen Produce (In ton)	Carbon Emission (In ton)
1	59" - 74 2/3"	1	60	260	97
2	59" - 74 2/3"	1	68	295	110
3	59" - 74 2/3"	1	72	312	117
4	74 2/3" - 98 1/3"	1	84	664	249
5	74 2/3" - 98 1/3"	1	89	708	265
6	Above 98 1/3"	1	106	1718	644
7	Above 98 1/3"	1	152	2464	924
Total		7		6421	2406

REF: <https://8billiontrees.com/> (<https://8billiontrees.com/carbon-offsets-credits/carbon-offset-tree-planting-calculator-find-how-many-trees-to-plant/>).

Also 1 carbon credit = 1 MT of CO₂ capture. (1 tree absorbs 21.77 Kgs of CO₂ annually)



Big Girth trees at IPR Campus

Observation:

We have measured 7 trees girth for sample, and we observed these things:

1. Oxygen generation from 7 trees in a year is **6421** tons approximately.
2. Carbon storage by 7 trees in a year is **2406** tons approximately.

Methodology Of Calculation of Carbon Footprint, Carbon Credit, from trees:

The approximate amount of carbon taken up by the trees will be calculated automatically by a formula that uses the diameter (in forestry, this is called “diameter at breast height”, or DBH.) Measure the circumference of each living tree in your yard at a height of 4.5 feet (4 feet, 6 inches) above the ground level.

Trees are nature’s best carbon capture technology and have been working to clean the air since the first leafy frond appeared on Earth, and research shows that they are one of the best tools the planet

has (at the moment) to help mitigate climate change.

But all trees aren't the same...certain species can store more carbon than others.

As natural carbon sinks (or carbon reservoirs), trees capture carbon dioxide (CO₂) from the atmosphere as they grow, but the amount of CO₂ captured by a tree depends on its size, its age, and other factors, like the tree's species and where it is growing.

The calculator above estimates the average lifetime carbon benefits of any tree, based on its size. And, it shows equivalents, so you can see just how beneficial a tree is to the planet.

It uses the most up-to-date information from academic research and USDA Forest Service 11 databases but doesn't differentiate by species.

Forests are also critical to ecosystems, providing habitat for animals and plants, many of which are vital to survival. Forests also provide a range of environmental services most people take for granted. For example, they absorb storm water and reduce flooding, protect water quality by filtering out pollutants and sediment from waterways, and provide shade to cool the cities.

Calculation of Carbon, a Tree Absorb: DIY Steps

The calculator above will help you determine how many trees one need to plant to offset the carbon footprint. Others can also allow to compare the different types of trees and calculate how much carbon dioxide one's favorite tree can capture in a year.

If one is planting trees to offset his carbon footprint, it helps to know which species absorb the most carbon. Some tree benefits calculators determine which tree species one can grow to contribute the most carbon capture.

Follow these steps:

- Step 1: Determine if one is using the calculator for a single tree or a group of trees to determine how much carbon a tree captures.
- Step 2: Enter the trunk circumference (single tree) or the number of trees, and the approximate age of the tree(s).
- Step 3: View calculation results immediately, including how much oxygen the trees produce, and how much carbon emissions they store.

Price of Carbon Offsets:

The cost of a carbon offset varies widely each year, as the market fluctuates. Likewise, the type of program impacts the cost of the offset and so does the 'amount' of carbon emissions one want to erase. Carbon prices averaged (EUR) 11.40 a ton in 2008, but 90 percent of providers now set their own prices.

Examples of Carbon Offsets

Although there are countless small ways one can personally reduce emissions, the scope of this audit will discuss scalable carbon offsets. The best carbon offset programs are not only for individuals, they're perfect for business carbon offsetting, too!

Note: the first step before you buy carbon offsets is using a carbon footprint calculator to find your precise emissions.

Carbon Offset Tree Planting Projects

While one tree a day falls short of what's needed, the catchy motto "**Planting a tree a day helps keep emissions at bay**" certainly encourages action that can do a whole lot of good. Every little bit counts. Even one tree. In fact, maybe it's time to return to ancient wisdom: An ancient proverb says, "**the best time to plant a tree is twenty years ago. The second-best time is now.**"