

GREEN AUDIT 2020-21

SN COLLEGE, CHERTHALA

EXECUTIVE SUMMARY

SN College, Cherthala established by the Sree Narayana Trust in the year 1964. It is situated very close to the costal line of Kerala in S N Puram of Mararikulam North Panchayath in Alappuzha district. It is about 7 kms away from Cherthala town situated along the NH-47. The college is facing its first green audit. It has 1686 students, 75 faculty members and 25 non-teaching staff. The green audit was undertaken by Heartian Green Audit Team of Sacred Heart College, (Autonomous), Thevara in January 2021. The audit team consists of experts from various field including botany for green audit, chemistry for water audit, physics for energy audit. Expertise in different fields is necessary to assess various criteria of green audit process.

The audit period was for two years ie. 2020 and 2021. The audit team verified necessary documents on green practices

related to bio-diversity, plant diversity in the campus, green initiatives, nature related programs, energy management, water resource management, waste management, carbon footprint, vegetable and agriculture farming in the campus, sustainability aspects, cleanliness, etc. which had been prepared through participatory processes involving students and staff of the institute.

The audit observed the following:

- Efforts taken towards green campus is promising.*
- The process includes sustainable management.*
- Well documented data records and monitoring system in place.*
- Involvement of direct and indirect stakeholders, viz., teaching and nonteaching staff, students, etc. in greening the campus is promising.*
- Knowledge on the importance of green practices among the staff and students are appreciable.*

The audit pose some suggestions and future action plans to be implemented in the campus including:

- A detailed green campus policy that include practices for sustainability in the campus shall be formulated and published in the website.*
- Enhance solar energy systems and biogas to reduce the usage of conventional energy shall be planned to be introduced.*
- Student projects and assignments shall be included with green campus initiatives, energy management, agriculture, etc. shall be included.*
- Utilize the vacant space for planting more saplings.*
- Annual internal audit involving critical evaluation of all concerned aspects has to be introduced.*

We truly hope that this audit will provide a solid platform to plot various strengths and weakness of green management in SN College Cherthala Campus that helps the institute to develop better management plan.

Heartian Audit Team

20-05-2022





Thevara

Date: 20-05-2022

CERTIFICATE

This is to certify that the Green Audit Report of Sree Narayana College Cherthala is prepared by conducting original study. Further, it states that all the baseline data was collected and compiled by the internal Green Audit team of SN College, Cherthala and submitted to us. The facts and credentials of the baseline data used in the study had been personally verified and evaluated by the Heartian Green Audit Team at times. The data and any of the contents used in the certificate are original in nature and are collected exclusively for the audit process. Photographs used in the report are either taken directly by the audit team or are given by the internal audit team.

Heartian Green Audit Team

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2. Dr. Giby Kuriakose (Coordinator) 
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3. Dr. Mathew George (Energy Management Expert) 
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Chapter – 1

Introduction

Green Audit

Educational institutes, especially those deliver subjects related to environment, ecology, energy, water qualities, etc., have the potential to play a leading role in making themselves as a role model to mitigate climate change at local level. The Green audit process began in the 1970s in the USA with an intention of identifying the activities of greening, energy and water management that are carried out in an institute or company. The process was initiated to address the growing concern of changing climate and related aspects that became a large concern all around the world. The book 'Silent Spring, published by Rachel Carson in the year 1962 raised concerns and overwhelming interests on environment and related aspects. This paved way for several movements, programs and activities that lead to reduce the effect of pollution and related activities.

Green auditing is considered to be a measure to enhance the social commitments to compensate the global climate change and local needs by identifying the range of environmental impacts and assess the compliance of the operations on the development and regular activities within an organization. The audit may also assess the compatibility of the operations within an organization or a company with existing laws and regulations. The audit and activities included in the process consider and assess the fulfilment of expectations of the management and stakeholders. The possible implications of programs and activities would be evaluated by considering the utilitarian values of natural resources and energy. Thereby, the process enables the management of the institute to understand the effect of pollution and unwanted activities due to various operations within the organization. The audit also seeks to identify possible means and methods to save investments, enhance work quality, improve health and safety of their employees, reduce liabilities and reduce the rate of environmental pollution. A continuous process of such audit might result in maintaining the quality of these aspects within the premises of any organization. It also proclaims the role that an

-individual in the mentioned activates to play to reduce the effect of pollution, waste generation, carbon emission, etc.

Most institutions, industries and government and non-government bodies and other institutions conduct green audit aiming:

- To ensure that the performance of the institution, with respect to environmental activities they are involved in, is in compliance with existing laws and regulations.
- To check the functionality and their operating success including water supply, energy related matters and other similar matters that are related to green operations in the campus
- To formulate or update the institution's environmental policy, if warranted.
- To measure the environmental impact of operational process related to green activities in the campus.
- To measure the performance of each green related operations and actions in the campus.
- To generate a database of green activities for continuous monitoring to assess the success of each of them.
- To enhance usage of resources and energy with maximum potential.
- To identify future potential liabilities.
- To align the institution's developmental and day to day activities with the stated vision, mission, strategies, etc.
- To identify possible ways to reduce expenditure and running costs on equipments, appliances, etc. or try enhance revenue income.
- To improve efficiency of process and materials, and in response to stakeholder requests for increased disclosure.

The process of green audit based on operational activities within an institution happens not necessarily based on laws and regulations. It might be largely based on awareness and concerns on environmental performances within and outside the institute's

premises. Further, the activities might be in align with the vision and mission of the institute that further strengthens the fact regarding social responsibilities of the organization. Several institutions that conducted green audits in the recent past has realized the importance of the same as they could easily manage their operational costs and provide good atmosphere to their stakeholders. The green audit also provides opportunities to identify full range of operations within an organization, the impacts of maintaining and functioning of its operational goods and services, the actual source of raw materials for different activities within the organization, the costs of operations of its offices, functional units, and other facilities. It also provide chances to understand the relationship with employees, material suppliers, stakeholders, etc. The recommendations, findings and suggestions that emerge during green audit would certainly help the management of the institute to set up future action plan that best suit to them.

General steps involved in Green Audit

- a) Discussion between auditee and auditing team.
- b) Discussion with the stakeholders
- c) Systematic and exhaustive data collection.
- d) Evidence based documentation of activities.
- e) Regular monitoring.
- f) Provide standards and methods for improvement by establishing cost effective green action plan.

Chapter – 2

S N College, Cherthala – A Historical Account

Brief History

Sree Narayana College Cherthala was established by Sree Narayana Trust in the year 1964. The college is an aided institution in Kerala. The college is recognised by the UGC, India and accredited with A grade by NAAC, India. The Cherthala SNDP union joined hands with S N Trusts and its members to establish this college. The institute holds the mantras of Sree Narayana Guru “Educate that you may be free” and “Enlightenment through education”. It started as a junior college. The college has now become a senior college offering courses in 12 undergraduate programs and six post graduate programs. The college is affiliated to the University of Kerala, Thiruvananthapuram. The sanctioned student capacity of the college is 1308 with 73 teaching and 36 non-teaching staff members.



Figure – 1. Map image showing the green campus of SN College, Cherthala.

Geography

The College is situated in S N Puram of Mararikulam North Panchayath in Alappuzha district. Its locational coordinates are 9°37'19"N 76°19'51"E. The college is situated close to the sea level with an altitude of 2m MSL. The locality comes under the coastal region of Kerala, which has the geographical features of coastal plains with sandy alluvial soil.

General Information

The vision of the institute is to achieve the high ideals of Sree Narayana Guru who exhorted to 'strive for the welfare of all without any discrimination on the basis of caste, creed or religion'. It also envisage to realise the great preaching "One caste, One religion, One god for man" of Guru, "Liberate oneself through education". It also aims to mould generations in order to free them from casteism, bigotry, sectarianism and exploitation. The mission of the institute includes socio-economic progress, political development, moral, social and intellectual awakening of each student as well.

Of the Twelve departments, one department (Department of Zoology) is recognized as research Centre by the University of Kerala. The college has almost 1686 students on its rolls in various programmes with girls forming almost 70% of the total students. There are 77 teachers including guest faculty under various disciplines and 29 non-teaching staffs in the college. 34 of the permanent faculty hold PhD, which constitutes 61% of the total permanent faculty. More than 64 % of the members of different faculties are women.

The college has also been awarded a letter of appreciation from Centre for Environment and Development, Government of India, taking into consideration the

-excellent performance of the college in executing the URJAKIRAN (Energy Conservation Awareness Campaign) Program.

Additional skill acquisition program (ASAP), Scholar Support program (SSP), Walk with a Scholar (WWS), Young innovators programs, ENCON Club, Science club and several department wise associations and other clubs ensures the extracurricular enrichment of students in the campus. The aforementioned clubs and associations reach the local community and other stakeholders by their regular extension activities.

There is one air conditioned and well-furnished conference halls, one auditorium of ample space, one seminar hall, three computer labs, one smart class room, one language lab, about 183 computers with internet access, 22 photocopying machines, 15 DLP Projectors and so on.

A dedicated and well equipped IQAC cell monitors, leads and controls the activities that enable the campus to run along the forerunners of similar institutes in Kerala. The IQAC is well connected with the college management, administrative office, different departments, clubs and all extra-curricular activities. It also act as a mediator in organizing several activities in the campus. Systematic documentation of activities and academics is a characteristic feature of the IQAC cell. IQAC also identifies the gap areas and timely interventions are made to fill the gap without making any drastic effect due to the gap.

Previous Green Audit

This is the first green audit of the campus. However, the IQAC, since its inception, in collaboration with departments of Zoology, Botany, Chemistry and Physics had conducted informal internal audits. These audits were mostly on the activities of various clubs and associations.

Role of Management in Green Management

The part played by the college management in bringing the campus to a green one is adorable.

The following were the initiatives by the college authorities in green management:

1. The IQAC evaluates developmental and functional activities and makes recommendations for improvement of the green aspects.
2. The implementation of these recommendations are undergoing on a time bound manner.
3. Clubs that are related to green activities are encouraged to conduct programs in and around the campus.
4. The management is keen on the social commitments and tries to reach out to the general public through staff and students.
5. The support and part played by management is vital in the green campus related activities.

Chapter – 3

Audit Preparations

Management

The SN College management was very keen in taking up the recommendation of conducting a green audit by an external agency. In the light of this, the college management approached Sacred Heart College, which has a consultancy wing offering green audit of institutions. The Principal of Sacred Heart College who is the convenor of the **Heartian Green Audit Team** agreed to conduct the green audit of S N College, Cherthala. After this, there was a preliminary visit to the campus to set up different criteria and questions that are necessary for an updated green audit.

The following were different criteria set forth for the present green audit.

- a) Green Practices
- b) Water Management
- c) Energy Management
- d) Waste Management
- e) Carbon Footprint

A detailed questionnaire for each aforementioned criteria was prepared based on the campus visit and thorough discussion with various stakeholders. The audit team in discussion with the IQAC has identified a team including teachers, non-teaching staff and students of various departments. The team has collected information that is addressed in the questionnaire.

Teaching Staff and Students

The following table illustrate the details of internal audit team involved at various levels of this audit process;

Sl. No.	Name	Designation	Part Played	Audit Involved
1	Dr. Sasikala V	Asst. Prof. in Physics	Guidance & Supervision	Energy Audit & Carbon Footprint
2	Harikrishnan N S	UG Student	Data Collection	Energy Audit
3	Neeraja Shaji	UG Student	Data Collection	Energy Audit
4	Gopika V	UG Student	Data Collection	Energy Audit
5	Arya Anilkumar	UG Student	Data Collection	Energy Audit
6	Kallyani C	UG Student	Data Collection	Energy Audit
7	Harikrishnan S	UG Student	Data Collection	Carbon foot print
8	Arathi K	UG Student	Data Collection	Carbon foot print
9	Aswin K S	UG Student	Data Collection	Carbon foot print
10	Adarsh Jeevan	UG Student	Data Collection	Carbon foot print
11	Kiran Gireesh	UG Student	Data Collection	Carbon foot print
12	Dr. Dhanya Viswam	Asst. Prof. in Chemistry	Supervision and data compilation	Water Audit
13	Ms. Shaija P B	Chemistry	data compilation	Water Audit
14	Ms. Vishnu Priya S	Faculty on contract (Chemistry)	Supervision and data compilation	Water Audit
15	Aiswarya P V	UG Student	Data Collection	Water Audit
16	Kiran N B	UG Student	Data Collection	Water Audit
17	Arjun B	UG Student	Data Collection	Water Audit
18	Aparna K A	UG Student	Data Collection	Water Audit
19	Abhinav P B	UG Student	Data Collection	Water Audit
20	Gowri Suresh	UG Student	Data Collection	Water Audit
21	Maneesha M	UG Student	Data Collection	Water Audit
22	Dr. Sreeja Krishnan	Asst. Prof. in Botany	Herbs identification	Green Audit
23	Ms. Dhanya D S	Asst. Prof. in Botany	Herbs identification	Green Audit
24	Dr. Sheeja George E	Asst. Prof. in Botany	Tree identification	Green Audit
25	Ms. Bhanupriya S	Asst. Prof. in Botany	Tree identification	Green Audit
26	Dr. Anitha Chandran	Asst. Prof. in Botany	Shrubs identification	Green Audit
27	Dr. Dhanya C	Asst. Prof. in Botany	Shrubs identification	Green Audit
28	Aiswarya P	P G Student	Collection of Plants	Green Audit
29	Aiswarya P	P G Student	Collection of Plants	Green Audit

30	Akhila V S	P G Student	Collection of Plants	Green Audit
31	Aksitha Surendran	P G Student	Collection of Plants	Green Audit
32	Anu Babu	P G Student	Collection of Plants	Green Audit
33	Athira Prasad	P G Student	Collection of Plants	Green Audit
34	Hemanth Babu	P G Student	Collection of Plants	Green Audit
35	Jini Sebastian	P G Student	Collection of Plants	Green Audit
36	Manjima A M	P G Student	Collection of Plants	Green Audit
37	Meenu Parvathy	P G Student	Collection of Plants	Green Audit
38	Mehasina	P G Student	Collection of Plants	Green Audit
39	Mithra A K	P G Student	Collection of Plants	Green Audit
40	Padma R	P G Student	Collection of Plants	Green Audit
41	Raveena Radha Krishnan	P G Student	Collection of Plants	Green Audit
42	Shamna Mol S	P G Student	Collection of Plants	Green Audit
43	Sreelakshmi K	P G Student	Collection of Plants	Green Audit
44	Abhiremya M	P G Student	Collection of Plants	Green Audit
45	Aiswarya	P G Student	Collection of Plants	Green Audit
46	Anagha Priya	P G Student	Collection of Plants	Green Audit
47	Ashna Basheer	P G Student	Collection of Plants	Green Audit
48	Gopika G	P G Student	Collection of Plants	Green Audit
49	Manjima K M	P G Student	Collection of Plants	Green Audit
50	Navami Raj K N	P G Student	Collection of Plants	Green Audit
51	Nimisha Thilakan	P G Student	Collection of Plants	Green Audit
52	Parvathy S M	P G Student	Collection of Plants	Green Audit
53	Ponnu Manikuttan	P G Student	Collection of Plants	Green Audit
54	Ramji Raj R	P G Student	Collection of Plants	Green Audit

55	Reshma S R	P G Student	Collection of Plants	Green Audit
56	Sangeetha K K	P G Student	Collection of Plants	Green Audit
57	Seethalakshmi	P G Student	Collection of Plants	Green Audit
58	Sreedeepta	P G Student	Collection of Plants	Green Audit
59	Vishnu Prabha	P G Student	Collection of Plants	Green Audit
60	Dr.Reshmi V	Asst.Prof. in Zoology	Identification of Fauna	Green Audit
61	Dr.Sangeetha P M	Asst.Prof. in Zoology	Identification of Fauna	Green Audit
62	Ashirvad S	U G Student	Collection	Green Audit
63	Haritha S Hari	U G Student	Collection	Green Audit
64	Vishnu Dilraj V	U G Student	Collection	Green Audit
65	Sradha R Krishna	U G Student	Collection	Green Audit
66	Kavya J	U G Student	Collection	Green Audit
67	Anoop Anil	U G Student	Collection	Green Audit
68	Aparna K R	U G Student	Collection	Green Audit
69	Jayalekshmi L	U G Student	Collection	Green Audit
70	Akhila Baiju	U G Student	Collection	Green Audit
71	Amala Mary G	U G Student	Collection	Green Audit
72	Ardhra S	U G Student	Collection	Green Audit

The Green Audit Process:

1. Selection of area/activities/parts of the campus.
2. Planning of visit to campus to discuss about the audit process.
3. Scope of audit process was identified in consultation with the auditee.
4. A meticulous plan of action was designed.
5. A team consisting of teachers, non-teaching staff and students was constituted with specific tasks and a proper time schedule.
6. Data pertaining to identified parameters for auditing were collected directly through an on-site visit.
7. Available background information on the identified activities and other parameters were collected.
8. The role of each stakeholder in green related activities has been collected.
9. Historical aspects of green activities in the campus including flora, fauna, water usage energy utilization, waste generation, etc. were collected.
10. A questionnaire based on the preliminary visits and other evaluations was communicated to the authorities who are involved in the in house data collection.
11. Data collection based on questionnaire.
12. Visit to the campus by the audit team, consisting of co-ordinator, water and energy experts.
13. Data analysis and evaluation.
14. Discussion on the findings.
15. Report preparation.

Onsite audit activities

1. The preliminary visit and meeting with the campus authorities was the first step between the audit team and auditee.
2. Site inspection for determining parameters for audit.
3. Site visit and evaluation of collected information of the audit team.
4. Meeting with the Principal, IQAC coordinator, teachers, non-teaching staff and students.
5. Meeting with the in house audit team for evaluation and clarifications.

Chapter – 4

Auditing of Green Activities

Inspection

The preliminary visit in connection with the pre-audit process to the campus had identified criteria for audit, parameters to be evaluated and time schedule of green audit of S N College, Cherthala. It included meeting with the Principal, IQAC coordinator, teachers in charge of different green activities of the campus and student volunteers representing different departments, clubs and fora. This enabled the auditing team to gather all necessary preliminary information that is useful in preparing pre auditing questionnaire and data sheets. The on-site audit team collected information based on questionnaire and data sheet.

Questionnaire

The detailed questionnaire (Annexure I, II III & IV) was handled by three different audit teams, green, water and energy. The questionnaire was comprehensive covering qualitative and quantitative dimensions. Information based on the questionnaire was collected by onsite sampling. Information pertaining to green activities, water management, energy management and carbon foot print was analysed under different titles and sub-titles. Finally, the findings are compiled and used for the preparation of the final audit report.

Evaluation of documents and reports

The audit team visited the S N College, Cherthala campus once the answers of the questionnaire is prepared and evaluated documents and reports (departments, clubs and fora) that are necessary for the audit process. This further strengthened the

claims made by the campus authority on green operations in the campus. To generate future action plan, the audit team had a detailed discussion with different in house team in the institute. Based on the findings a concluding discussion session was conducted with the Principal and coordinator of IQAC.

Findings and Analysis

Analysis of Green Practices

Gardens

S N College, Cherthala is one of the premier educational institute with over 60 years enthralling achievements in academics extra-curricular activities. The institute is situated in the coastal area where farming and agriculture and fisheries are being practiced. The major soil type in the area is sandy or loamy. The institute is keen in preserving the local practices and culture by preserving local biodiversity within the campus. The institute took up challenges, even when the soil and climatic features of the area (being in costal line), to maintain greenery in the campus by facilitate and maintain regional flora and fauna. The botanical garden and different concept oriented gardens (medicinal plants and vegetable garden), are ideal for academic practices and awareness while learning, especially for biology students.

The institute consists of various types of gardens including, medicinal plant garden, Flowering plants, fruit yielding plants, vegetable garden, paddy field and Miawaky forest (planted in 2021). Students are actively involved in various activities of gardening, including planting, maintenance, etc. within the campus. Various students utilize the garden and trees as apt place for discussions, combined studies, spending leisure time, aesthetic purposes, etc. Students are learning garden techniques by working in the garden with the help of responsible teachers. They also find garden as a good opportunity to observe and learn nature and natural resources including plants, birds and butterflies. So far, 93 different species of plants have been identified in the campus (Table – 1). Most of the plants were identified by their scientific name, plant family, local/vernacular name and their respective

utilitarian values. *Artocarpus hirsutus*, represented by three individual trees in the campus, is listed as vulnerable in the IUCN threatened plant list.

Table - II Campus Flora

Sl. No.	Scientific name	Family
1	<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae
2	<i>Aristolochia indica</i> L.	Aristolochiaceae
3	<i>Artocarpus heterophyllus</i> Lam.	Moraceae
4	<i>Artocarpus hirsutus</i> Lam.	Moraceae
5	<i>Asparagus racemosus</i> Willd.	Asparagaceae
6	<i>Averrhoa bilimbi</i> L.	Oxalidaceae
7	<i>Azadirachta indica</i> A.Juss.	Meliaceae
8	<i>Biancaea sappan</i> (L.) Tod.	Caesalpiniaceae
9	<i>Boerhaavia diffusa</i> L.	Nictaginaceae
10	<i>Bridelia retusa</i> (L.) A.Juss.	Euphorbiaceae
11	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae
12	<i>Calamus</i> sp.	Areaceae
13	<i>Calotropis gigantea</i> (L.) Dryand.	Asclepiadaceae
14	<i>Canthium angustifolium</i> Roxb.	Rubiaceae
15	<i>Carallia brachiata</i> (Lour.) Merr.	Rhizophoraceae
16	<i>Cassia fistula</i> L.	Caesalpiniaceae
17	<i>Casuarina equisetifolia</i> L.	Casuariaceae
18	<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae
19	<i>Cinnamomum verum</i> J.Presl	Lauraceae
20	<i>Cleome rutidosperma</i> DC.	Capparidaceae
21	<i>Cleome viscosa</i> L.	Capparidaceae
22	<i>Cocos nucifera</i> L.	Areaceae

23	<i>Couroupita guianensis</i> Aubl.	Lecythedaceae
24	<i>Crateva religiosa</i> G.Forst.	Capparidaceae
25	<i>Croton hirtus</i> L'Hér.	Euphorbiaceae
26	<i>Cycas revoluta</i> Thunb.	Cycadaceae
27	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae
28	<i>Cyrtostachys renda</i> Blume	Arecaceae
29	<i>Dalbergia latifolia</i> Roxb.	Fabaceae
30	<i>Dalbergia sissoo</i> DC.	Fabaceae
31	<i>Datura metel</i> L.	Solanaceae
32	<i>Dioscorea esculenta</i> (Lour.) Burkill.	Dioscoriaceae
33	<i>Euterpe oleracea</i> Mart.	Arecaceae
34	<i>Ficus benjamina</i> L.	Moraceae
35	<i>Ficus glomerata</i> Roxb.	Moraceae
36	<i>Ficus pumila</i> L.	Moraceae
37	<i>Ficus tsjahela</i> Burm. f.	Moraceae
38	<i>Garcinia cambogia</i> (Gaertn.) Desr.	Clusiaceae
39	<i>Garcinia mangostana</i> L.	Clusiaceae
40	<i>Gmelina arborea</i> Roxb.	Verbenaceae
41	<i>Guazuma ulmifolia</i> Lam.	Sterculiaceae
42	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Rubiaceae
43	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	Apocynaceae
44	<i>Hibiscus sabdariffa</i> L.	Malvaceae
45	<i>Hugonia mystax</i> Cav.	Linaceae
46	<i>Ixora coccinia</i> L.	Rubiaceae
47	<i>Lagerstroemia speciosa</i> (L.) Pers	Combretaceae
48	<i>Lannea coromandelica</i> (Houtt.) Merr.	Anacardiaceae
49	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae

50	<i>Madhuca longifolia</i> (J.Koenig ex L.) J.F.Machr.	Sapotaceae
51	<i>Mangifera indica</i> L.	Anacardiaceae
52	<i>Manilkara zapota</i> (L.) P.Royen	Sapotaceae
53	<i>Microstachys chamaelea</i> (L.) Müll.Arg.	Euphorbiaceae
54	<i>Millingtonia hortensis</i> L. f.	Bignoniaceae
55	<i>Mimosa pudica</i> L.	Mimosaceae
56	<i>Mimusops elengi</i> L.	Sapotaceae
57	<i>Morus alba</i> L.	Moraceae
58	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae
59	<i>Musa paradisiaca</i> L.	Musaceae
60	<i>Nephelium lappaceum</i> L.	Sapindaceae
61	<i>Nerium oleander</i> L.	Apocynaceae
62	<i>Oldenlandia corymbosa</i> L.	Rubiaceae
63	<i>Pajanelia longifolia</i> (Willd.) K.Schum.	Verbenaceae
64	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Euphorbiaceae
65	<i>Phyllanthus emblica</i> L.	Euphorbiaceae
66	<i>Piper longum</i> L.	Piperaceae
67	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Anonaceae
68	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae
69	<i>Premna serratifolia</i> L.	Verbenaceae
70	<i>Prosopis chinensis</i> Benth.	Fabaceae
71	<i>Psidium guajava</i> L.	Myrtaceae
72	<i>Pterocarpus marsupium</i> Roxb.	Fabaceae
73	<i>Pyrrosia heterophylla</i> (L.) M.G. Price	Polypodiaceae
74	<i>Roystonea regia</i> (Kunth) O.F.Cook	Arecaceae
75	<i>Samanea saman</i> (Jacq.) Merr.	Mimosaceae
76	<i>Saraca asoca</i> (Roxb.) Willd.	Caesalpiniaceae

77	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Caesalpinaceae
78	<i>Sida acuta</i> Burm. f.	Malvaceae
79	<i>Sida rhombifolia</i> L.	Malvaceae
80	<i>Simarouba amara</i> Aubl.	Simaroubaceae
81	<i>Spathodea campanulata</i> P. Beauv.	Bignoniaceae
82	<i>Spermacoce hispida</i> L.	Rubiaceae
83	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae
84	<i>Syzygium jambos</i> (L.) Alston	Myrtaceae
85	<i>Tamarindus indica</i> L.	Fabaceae
86	<i>Tectona grandis</i> L. f.	Verbenaceae
87	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae
88	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae
89	<i>Terminalia catappa</i> L.	Combretaceae
90	<i>Tylophora indica</i> (Burm. f.) Merr.	Apocynaceae
91	<i>Vateria indica</i> L.	Dipterocarpaceae
92	<i>Vitex agnus-castus</i> L.	Verbenaceae
93	<i>Vitex negundo</i> L.	Verbenaceae

Arboretum

S N College, Cherthala is maintaining an arboretum, although the area is scattered in different spots, where natural species of plants are maintained. So far 45 different species of plants have been identified from the arboretum (Table -2). The plant diversity in the arboretum includes star plant species, timber yielding species, medicinal species, fruit yielding species, etc. Few endemic species are also growing in the arboretum as well. The college authority is keen to enrich the arboretum by adding plants of different values. They are planning to introduce and conserve rare, endemic and threatened species that are suitable to the campus soil.

Table 2 List of Plants in the Arboretum

Sl. No	Scientific name	Common Name	Number of Plants
1	<i>Bridelia retusa</i> (L.) A. Juss.	Kaini	2
2	<i>Dalbergia sissoo</i> DC.		1
3	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Manja kadambu	2
4	<i>Vateria indica</i> L.		1
5	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Thaani	3
6	<i>Guazuma ulmifolia</i> Lam.		3
7	<i>Ficus benjamina</i> L.	wheeping fig	2
8	<i>Dalbergia latifolia</i> Roxb.		1
9	<i>Lagerstroemia speciosa</i> (L.) Pers	Manimaruthu	10
10	<i>Ficus tsjahela</i> Burm. f.		2
11	<i>Syzigium cumini</i> (L.) Skeels		1
12	<i>Garcinia mangostana</i> L.		1
13	<i>Spathodea campanulata</i> P. Beauv.	African Tulip Tree	2
14	<i>Millingtonia hortensis</i> L. f.		1
15	<i>Butea monosperma</i> (Lam.) Taub.	Chamatha, Plashu	1
16	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.		2
17	<i>Pterocarpus marsupium</i> Roxb.		1
18	<i>Crateva religiosa</i> G. Forst.		1
19	<i>Ficus glomerata</i> Roxb.		1
20	<i>Vitex negundo</i> L.		2
21	<i>Lannea coromandelica</i> (Houtt.) Merr.	Indian ash tree	1
22	<i>Piper longum</i> L.	Indian long pepper	3
23	<i>Biancaea sappan</i> (L.) Tod.	Indian redwood	2
24	<i>Simarouba amara</i> Aubl.	Lakshmi Taru	2
25	<i>Carallia brachiata</i> (Lour.) Merr.		2
26	<i>Senna siamea</i> (Lam.) H. S. Irwin & Barneby	Cassia tree	2
27	<i>Cinnamomum verum</i> J. Presl	Cinnamon tree	1
28	<i>Mimusops elengi</i> L.	Spanish cherry	1
29	<i>Madhuca longifolia</i> (J. Koenig ex L.) J.F. Macbr.	Butter tree, mahua	1
30	<i>Canthium angustifolium</i> Roxb.		1
31	<i>Azadirachta indica</i> A. Juss.		2
32	<i>Gmelina arborea</i> Roxb.		1
33	<i>Hugonia mystax</i> Cav.		
34	<i>Pongamia pinnata</i> (L.) Pierre		1
35	<i>Tectona grandis</i> L. f.	Teak	1

36	<i>Prosopis chinensis</i> Benth.		2
37	<i>Couroupita guianensis</i> Aubl.	Cannonball Tree	1
38	<i>Alstonia scholaris</i> (L.) R. Br.		2
39	<i>Roystonea regia</i> (Kunth) O.F.Cook	Royal palm	25
40	<i>Euterpe oleracea</i> Mart.	Acai palm	3
41	<i>Cycas revoluta</i> Thunb.		10
42	<i>Samanea saman</i> (Jacq.) Merr.	Rain tree	3
43	<i>Polyalthia longifolia</i> (Sonn.) Thwaites		3
44	<i>Pajanelia longifolia</i> (Willd.) K.Schum.		2
45	<i>Premna serratifolia</i> L.		3

Fruit Yielding Plants

Fruit yielding plants are important garden component nowadays as these plants add natural nutritive food intake. Planting nutritive fruit yielding plants in educational institutes add value and awareness among students and staff about such plants. Nowadays, several oriental fruits are introduced in Kerala. About 21 different fruit yielding species are available in the S N College campus (Table -3). Most of the harvested fruits are utilised by the campus community.

Table - 3 List of Fruit Yielding Plants

Sl No.	Scientific name	Common Name	Number of Plants
1	<i>Tamarindus indica</i> L.	Vaalan Puli	1
2	<i>Garcinia cambogia</i> (Gaertn.) Desr.	Kudam Puli	1
3	<i>Azadirachta indica</i> A.Juss.	Aarya Veepu	2
4	<i>Mangifera indica</i> L.	Mavu	7
5	<i>Euterpe oleracea</i> Mart.	The açai palm	3
6	<i>Mimusops elengi</i> L.	Elengi	3
7	<i>Manilkara zapota</i> (L.) P.Royen	Sapota	1
8	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Arana Maram	3
9	<i>Terminalia catappa</i> L.	Badam	4

10	<i>Syzygium jambos</i> (L.) Alston	Chamba	3
11	<i>Psidium guajava</i> L.	Guava, Peeramaram	2
12	<i>Nephelium lappaceum</i> L.	Rambuttan	2
13	<i>Hibiscus sabdariffa</i> L.	Panichim Puli	4
14	<i>Cocos nucifera</i> L.	Coconut, Thengu	7
15	<i>Musa paradisiaca</i> L.	Vazha	2
16	<i>Artocarpus heterophyllus</i> Lam.	Plavu	2
17	<i>Averrhoa bilimbi</i> L.	Irumban Puli	1
18	<i>Syzygium cumini</i> (L.) Skeels	Njaval	1
19	<i>Artocarpus hirsutus</i> Lam.	Aanjili	1
20	<i>Garcinia mangostana</i> L.	Mangosteen	1
21	<i>Morus alba</i> L.	Mulberry	1
Total			52

Medicinal Plants

The diversity of medicinal plants in any place, especially in an academic campus is indicative the emphasis that the institute has given towards traditional knowledge and health practices. This would be a platform for awareness, learning, and source for local usage. S N College is maintaining a medicinal plant garden that consists of a good wealth of plant species. The present status of flora that has medicinal importance is representative of regional and local floristic diversity. About 53 plant species were found maintained in the campus including the medicinal plant garden (Table – 4).

Table - 4 Medicinal Plants

Sl.No	Scientific name	Common Name	No. of Plants
1	<i>Phyllanthus amarus</i> Schumach. & Thonn.	<i>Keezharnelli</i>	280
2	<i>Cynodon dactylon</i> (L.) Pers.	<i>Karuka</i>	634
3	<i>Cleome viscosa</i> L.	<i>Kattukaduku</i>	327
4	<i>Pyrrosia heterophylla</i> (L.) M.G. Price		64
5	<i>Aristolochia indica</i> L.	<i>Easwaramooli</i>	4
6	<i>Azadirachta indica</i> A.Juss.	<i>Aaryaveepu</i>	6
7	<i>Asparagus racemosus</i> Willd.	<i>Sathaveri</i>	4
8	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	<i>Naruneendi</i>	39
9	<i>Syzygium cumini</i> (L.) Skeels	<i>Njaval</i>	14
10	<i>Microstachys chamaelea</i> (L.) Müll.Arg.		9
11	<i>Calotropis gigantea</i> (L.) Dryand.	<i>Erukku</i>	24
12	<i>Oldenlandia corymbosa</i> L.	<i>Parpadakapullu</i>	108
13	<i>Mimosa pudica</i> (L.)	<i>Thottavadi</i>	138
14	<i>Leucas aspera</i> (Willd.) Link	<i>Thumba</i>	81
15	<i>Cleome rutidosperma</i> DC.	<i>Kattukaduku</i>	67
16	<i>Croton hirtus</i> L'Hér.		169
17	<i>Catharanthus roseus</i> (L.) G. Don.	<i>Shavam Naari</i>	83
18	<i>Ficus pumila</i> L.		14
19	<i>Dioscorea esculenta</i> (Lour.) Burkill.	<i>Kaachil</i>	6
20	<i>Pterocarpus marsupium</i> Roxb.	<i>Veenga</i>	4
21	<i>Vitex agnus-castus</i> L.	<i>Karinochi</i>	5
22	<i>Tylophora indica</i> (Burm. f.) Merr.		3
23	<i>Cinnamomum verum</i> J.Presl		7
24	<i>Spermacoce hispida</i> L.		68
25	<i>Sida rhombifolia</i> L.	Arrow leaf Sida	46
26	<i>Sida acuta</i> Burm. f.	Common Wire-weed	71
27	<i>Boerhaavia diffusa</i> L.	Red Spiderling	68
28	<i>Cassia fistula</i> L.	Indian Laburnum	3
29	<i>Pongamia pinnata</i> (L.) Pierre	<i>Peenari</i>	8

30	<i>Ixora coccinia</i>	Chethi	32
31	<i>Lagerstroemia speciosa</i> (L.) Pers	Queen Crape Myrtle	8
32	<i>Garcinia cambogia</i> (Gaertn.) Desr.	Kudam Puli	1
33	<i>Mimusops elengi</i> L.	Elengi	6
34	<i>Tamarindus indica</i> L.	Valan Puli	3
35	<i>Hibiscus sabdariffa</i> L.	Panachim Puli	7
36	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	ManjaKadambu	1
37	<i>Vateria indica</i> L.	Vella Pain	2
38	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Thanni	3
39	<i>Butea monosperma</i> (Lam.) Taub.	Chamatha	1
40	<i>Crateva religiosa</i> G.Forst.	Neermathalam	1
41	<i>Vitex negundo</i> L.	Mayilellu	2
42	<i>Lannea coromandelica</i> (Houtt.) Merr.	Kalayam, Kalasam	7
43	<i>Piper longum</i> L.	Kurumulaku	42
45	<i>Carallia brachiata</i> (Lour.) Merr.	Varangu, Vallabham	1
46	<i>Madhuca longifolia</i> (J.Koenig ex L.) J.F.Macbr.	Ilippa	3
47	<i>Biancaea sappan</i> (L.) Tod.	Pathimugam	3
48	<i>Murraya koenigii</i> (L.) Spreng.		1
49	<i>Simarouba amara</i> Aubl.	Lakshmitharu	2
50	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby		2
51	<i>Calamus</i> sp.	Chooral	3
52	<i>Casuarina equisetifolia</i> L.	Horsetail she-oak	1
53	<i>Phyllanthus emblica</i> L.	Amla, Nelli	4
Total			2490

Vegetable Garden

The campus have a dedicated space for cultivating various species of vegetables and paddy. The space for cultivation harbors about 16 species of vegetables and paddy. Specific area for paddy cultivation is done with various experimentation using rain harvested water for irrigation. The vegetables harvested are sell it out among the

-staff and students. A portion is shared among the student volunteers as well. Excess harvest is usually sold out in the local market. This provides ample opportunity to learn techniques involved in agriculture practices and get good amount of motivation for students to try the same in their courtyards. Further, they are using only organic fertilizers in the garden including, cow dung, vermi-compost, compost made out of organic waste from the campus, etc. Only a few fertilizers such as neem cake and organic pesticides are purchased from shops.

Table - 5. Vegetables and other Crop Plants

Sl No.	Scientific name	Common Name	Yield (kg) harvest	Area (cents)
1	<i>Oryza sativa</i> L.	Paddy	80	50
2	<i>Zea mays</i> L.	Maize	20	5
3	<i>Abelmoschus esculentus</i> (L.) Moench	Lady's finger	15-20	10
4	<i>Amaranthus viridis</i> L.	Spinach	15	10
5	<i>Momordica charantia</i> L.	Bitter gourd	10	5
6	<i>Trichosanthes cucumerina</i> L.	snake gourd	60	5
7	<i>Luffa acutangula</i> (L.) Roxb.	Ridge gourd	30-35	5
8	<i>Solanum melongena</i> L.	Brinjal	25	5
9	<i>Manihot esculenta</i> Crantz	Cassava	400	30
10	<i>Lycopersicon esculentum</i> Mill.	Tomato	50	10
11	<i>Capsicum annum</i> L.	Green chilly	15	5
12	<i>Pisum sativum</i> L.	Pea	25	10
13	<i>Cucumis sativus</i> L.	Cucumber	40	10
14	<i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai	Water melon	60	5
15	<i>Benincasa hispida</i> (Thunb.) Cogn.	Ash gourd	60	5
16	<i>Cucurbita pepo</i> L.	Pumpkin	70-75	5

17	<i>Arachis hypogaea</i> L.	Ground nut	10	2
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Species planted by students

About 175 individual plants belonging to 21 species are surviving in the campus by students in the campus space of SN College, Cherthala (Table-6). Of which about seven species are planted during 2020-21. Most of the plants that are planted by students are chosen by them and collected from their respective localities. Student-

Table - 6. Planted by students

Sl.No	Scientific name	Common Name	No. of Plants
1	<i>Azadirachta indica</i> A.Juss.	<i>Aarya Veepu</i>	12
2	<i>Asparagus racemosus</i> Willd.	<i>Sathavary</i>	4
4	<i>Calotropis gigantia</i> (L.) Dryand.	<i>Erukku</i>	6
5	<i>Catharanthus roseus</i> (L.) G.Don	<i>Shavam Naari</i>	48
6	<i>Vitex negundo</i> L.	<i>Mayilellu</i>	6
7	<i>Simarouba amara</i> Aubl.	<i>Lakshmitharu</i>	4
8	<i>Garcinia cambogia</i> (Gaertn.) Desr.	<i>Kudampuli</i>	4
9	<i>Nerium oleander</i> L.	<i>Arali</i>	3
10	<i>Cyrtostachys renda</i> Blume		14
11	<i>Piper longum</i> L.	<i>Kurumulaku</i>	20
12	<i>Tylophora indica</i> (Burm. f.) Merr.		8
13	<i>Phyllanthus emblica</i> L.	<i>Nelli</i>	4
14	<i>Saraca asoca</i> (Roxb.) Willd.	<i>Ashokam</i>	5
15	<i>Datura metel</i> L.	<i>Ummam</i>	10
16	<i>Biancaea sappan</i> (L.) Tod.	<i>Chappangam</i>	3
18	<i>Murraya koenigii</i> (L.) Spreng.	<i>Kariveppu</i>	6
19	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	<i>Naruneendi</i>	12
20	<i>Garcinia mangostana</i> L.	<i>Mangostine</i>	4
21	<i>Manilkara zapota</i> (L.) P.Royen	<i>Sapota</i>	2
Total			175

-volunteers including NSS, *Bhumithrasena* club and departments such as botany and zoology are actively involved in planting plants inside the campus. Further, students show keen interest in maintaining the plants that they have planted by irrigating and pruning whenever needed.

Birds, butterflies and other fauna in the campus

Staff and students of *Bhumithrasena* club and department of zoology have so far identified 16 species of birds (Table -7), 12 species of butterflies (Table 8) and about

Table - 7 Birds of the Campus

Sl.No	Scientific name	Common Name	Number/status
1	<i>Alcedo atthis</i>	Common kingfisher	Common
2	<i>Dicrurus macrocercus</i>	Black Drongo	Common
3	<i>Haliastur indus</i>	Brahminy Kite	Very Common
4	<i>Chlidonias hybrida</i>	The whiskered tern	Seasonal
5	<i>Dendrocitta vagabunda</i>	Rufous Treepie	Common
6	<i>Egretta garzetta</i>	Little egret	Seasonal
7	<i>Argya striata</i>	Rufous Babbler	Common
8	<i>Microcarbo niger</i>	Little Cormorant	Common
9	<i>Prinia inornata</i>	Plain Prinia	Seasonal
10	<i>Monticola saxatilis</i>	Rufous-tailed rock Thrush	Seasonal
11	<i>Streptopelia risoria</i>	Barbary dove	Common
12	<i>Corvus culminatus</i>	Jungle crow	Common
13	<i>Corvus splendens</i>	House crow	Very Common
14	<i>Zoothera citrina</i>	Orange headed thrush	Seasonal
15	<i>Acridotheres tristis</i>	Common Myna	Common
16	<i>Pycnonotus jocosus</i>	Red-whiskered bulbul	Common

26 species of other fauna species (Table -9) from the campus. Most of the data are collected during 2020-2021. Of the 16 species of birds recorded from the campus two are very common species, nine are listed as common species and five species are recorded rarely. These five species are apparently seasonal passage migrants.

Table - 8 Butterflies of the Campus

Sl.No	Scientific name	Common Name	Number/status
1	<i>Hesperia comma</i>	Silver spotted skipper	Rare
2	<i>Rathinda amor</i>	Monkey puzzle	Rare
3	<i>Spalgus epius</i>	Apelly	Rare
4	<i>Acraea terpsicore</i>	Tawny coster	Common
5	<i>Hypolimnas misippus</i>	Donaid eggfly	Common
6	<i>Ypthima huebneri</i>	Common four ring	Common
7	<i>Leptosia nina</i>	Psyche	Common
8	<i>Lampides boeticus</i>	Pea blue	Common
9	<i>Cirrochroa thais</i>	Tamil Yeoman	Rare
10	<i>Euerma hecabe</i>	Common grass yellow	Common
11	<i>Euploea core</i>	Common Crow	Common
12	<i>Tirumala limniace</i>	Common Blue Tiger	Common

Of the 12 species of butterflies recorded so far from the campus, eight are found to be common in the campus and four species are recorded occasionally. The data doesn't include abundance. The abundance data might provide a better insight about the status of butterflies in the campus. Not only because of the coastal region but absence of butterfly larval food plants and nectar secreting adult feeding plants might be reasons for less species diversity of butterflies in the campus.

Other fauna species in the campus including, mammals, other insects, spiders, centipeeds, millipedes, domesticated animals, etc. Data pertaining to other fauna -

Table - 9) Other fauna of the Campus

Sl.No	Scientific name	Common Name	Status
1	<i>Hogna radiata</i>	Wolf spider	Common
2	<i>Menemerus semilimbatus</i>	Big jumping spider	Rare
3	<i>Menemerus bivittatus</i>	Gray wall jumper spider	Common
4	<i>Platycryptus undatus</i>	Tan jumping spider	Rare
5	<i>Plexippus paykulli</i>	Jumping spider	Common
6	<i>Plexippus petersi</i>	Small zebra jumper	Rare
7	<i>Argiope keyserlingi</i>	St. Andrews cross spider	Common
8	<i>Argiope amoena</i>	Zipper spider	Common
9	<i>Hasarius adansoni</i>	Adanson's house jumper	Common
10	<i>Cheiracanthium mildei</i>	Northern yellow sac spider	Common
11	<i>Dolomedes tenebrosus</i>	Dark fishing spider	Common
12	<i>Xenobolus carnifex</i>	Millipede	Common
13	<i>Cornu aspersum</i>	Garden snail	Common
14	<i>Aplocheilus panchax</i>	Blue panchax	Common
15	<i>Paracheirodon innesi</i>	Green carplet	Common
16	<i>Duttaphrynus melanostictus</i>	Asian common toad	Common
17	<i>Calotes versicolor</i>	Common garden lizard	Common
18	<i>Cnemaspis littoralis</i>	Coastal day gecko	Common
19	<i>Canis familiaris</i>	Dog	Common
20	<i>Felis catus</i>	Cat	Common
21	<i>Chamaeleo zeylanicus</i>	Chameleon	Rare
22	<i>Lithobius forficatus</i>	centipede	Common
23	<i>Desmodus rotundus</i>	Common vampire bat	Common
24	<i>Urva edwardsii</i>	Indian grey mongoose	Common
25	<i>Paradoxurus hermaphroditus</i>	Asian palm civet	Common
26	<i>Sciurus</i>	Squirrel	Common

-diversity doesn't possess abundance. However, the species diversity and the qualitative information regarding the status of faunal diversity indicate that the campus is a good ecosystem for various fauna elements.

Best practices in the Garden

- Chemical pesticides and fertilizers are not being used in the garden.
- Organic manures are used as fertilizers in the garden.
- The waste generated in the campus is the major fertiliser used in the garden.
- Yield from vegetable garden is being used by the campus and local community.
- Students are involved in planting and maintaining plants in the gardens
- Students are using the garden for studies (practical- or handson- learning), discussion and recreational activities.

Awareness Programs

Significant and fruitful awareness programs both students and staff of the campus are arranged every year in the campus. However, due to covid-19 pandemic prevented them from organising such activities during the assessment period (2020 and 2021). They also organise programs outside the campus for the local communities.

Major programs conducted in the campus during the last three years are:

Environment Related

1. Observation of Environment Day, Ozone day, Wetland day, etc.
2. Arranging seminars and invited talks on awareness and conservation of nature and natural systems.

Conservation Activities

3. Planting of saplings in the campus, etc.

Best Practices

4. Engaging students in maintaining herbal garden and medicinal garden.

5. Participation of teachers in different training program
6. Bio-gas plant.
7. Gardens are utilised for practical purposes

Some of these activities are year round programs and others are regular year wise or semester wise or any other stipulated time bound programs. This indicates that students and teachers concerned are aware about and involved in green activities in the campus.

Suggestions

1. Being a campus situated close to back waters, a small mangrove representation in the campus would be ideal.
2. For that, identify a place to plant mangrove species.
3. Make regular awareness programs among the students, alumni, parents, local community, etc on greening and conservation of nature, natural resources and sustainable utilisation of natural resources.
4. Name boards with QR codes shall be introduced for all plants in the campus.
5. Organise seminars, invited talks on environment related aspects on a regular basis.
6. Promote planting of indoor plants inside classrooms, staff rooms, office and verandas.
7. Take initiative to start a nature club and plan for trekking, walk through nature trails, discussion forum, etc.
8. Make sure that a permanent gardener to look after the garden related activities.
9. Since the campus is situated in the native place (Kadakkappally) of Sri. Itti Achuthan, who contributed a lot towards the making of *Hortus Malabaricus*, the medicinal plant garden in the campus shall be named after him.
10. Arrange regular monitoring of campus flora and fauna.
11. The botany students may take data on phenology and students from zoology may collect data on plant animal interactions.
12. Introduce nature and environment education in all programs, as far as possible.
13. A file shall be maintained to assess and analyse the usage of garden by different stakeholders.

Chapter – 5

Water Audit

The data pertaining to usage of water in the SN college campus has been collected and analyzed. The major observations by the audit team is summarized as follows;

Findings

The best practice that the audit team observed in the SN college campus regarding water utilization is that there are no damaged taps or water leakage in the water supply system. The main water source used in the college is four bore-wells present in the campus. The water from bore-wells is lifted to overhead tanks using an electric motor. Water is stored in six overhead tanks at the campus which are filled up daily. The existing rainwater harvesting system in the campus strengthens the water supply and enhance water level of wells in the campus through ground water recharging process to some extent.

Table 10 illustrates the storage facilities, source and usage of water in the SN college campus. A total of 35000 liters of water is pumped out from the water sources for usage per day. The total capacity of four overhead water tanks is 10000 liters. Six electric motors are used for pumping water to the overhead water tanks. The capacity of electric motors used in the campus are four 1.5 HP, one each of 3 HP and 1 HP. Daily usage of water in the hostel is estimated to be 12000 liters that is more than 10000 liters when compared to the total water storage capacity by all installed overhead water tanks. This indicates that the electric motor has to work at least six times to fill two tanks every day. There is a dedicated overhead water tank installed for hostel as well. The total daily usage of water in the campus is around 38500 liters.

Table-10: Water audit

Sl.No.	Parameters	Response
1	Sources of water intake	Four bore-wells
2	Methods for storage of water	6 overhead water tanks and Rain water harvesting tank
3	Capacity of the overhead water tanks	One 5000 liters concrete tank, one 3000 liters and two 2000 liters tanks in the Main building. Two 1000 liters tank in hostels
4	Number of electric motors used	4 6 motors (1.5 HP (4 nos.), 3 HP and 1HP (1 each))
5	Quantity of water pumped every day	35000 liters
6	Sources of waste water	Labs, Canteen, drainage water and
7	Number of toilets in the campus and amount of water used per day.	57 toilets and 6000 litres
8	Total number of water taps	154 water taps
9	Number of water taps in the hostels and amount of water used per day	46 water taps and 12000 litres
10	Number of water taps in the canteen and amount of water used per day	7 water taps and 6000 litres
11	Capacity system of rain water harvesting	One, 50000 litres
12	Water used for agriculture	1000 litres
13	Number of water coolers/water purifiers in the campus	One water purifiers
14	Number of damaged taps	Nil
15	Any treatment for the waste water after usage from labs, canteen, etc.	Nil
16	Mode of conveyance of the message of water conservation in the campus	By awareness sessions and display boards

Many water outlets are located across the college campus. 57 toilets, one water purifier, and 154 water taps were found during the assessment. Considering the strength of campus community including staff and students this water utilization is necessary and vital for the everyday operations of the campus. The waste water primarily comes from laboratories, lodging, kitchen and canteen. But sewage

treatment plant isn't introduced within the campus for waste water management. However, the review group did not find any spillage within the taps of washrooms and in other areas. This implies that such things are routinely checked on campus.

Table II: Usage of water

SL.NO.	Activity Sections	Water used per day inliters
1	Hostel	12000
2	Toilets- Campus	6000
3	Cleaning	5000
4	Gardening & agricultural	5000
5	Canteen	6000
6	Laboratories	3500
7	Water coolers	1000
	Total	38500

Suggestions and recommendations

- The rain water from harvesting tank can be used as source of water for laboratory, washing purposes and agriculture.
- A sewage water recycling facility could be installed on campus and it can be utilised for irrigation and gardening purposes.
- The canteen waste can moreover be subjected to aerobic composting by setting-up a composting system in the campus.

- Most of the water is utilized for hand washing. Therefore, introducing pushtaps may be useful to decrease water utilization.
- Drip irrigation method may be installed for gardening and cultivation purposes in the campus.
- Various awareness programmes will be helpful to motivate all the students and staff members for optimized sustainable use of water resources.
- The water storage capacity of the hostel shall be increased by introducing larger tanks.
- A daily account of intake (tank filling) and discharge (utilization) shall be maintained and monitored. This would help taking necessary steps in conservation and proper water management in the campus.

Chapter – 6

Energy Audit

The energy consumption of SN College has been done by a walkthrough energy audit. This involved a careful collection of energy usage data, by assessing the power consumption and usage pattern of all electrical gadgets on campus using a questionnaire. For the study, only electrical equipments were considered and included. Based on the data collected, an estimation of energy consumption was made.

Findings

The total monthly electrical power consumption of SN College, Cherthala campus can be summarised as follows. LED Lamps were consuming about 23.02 % (39573.576 kWh) total energy consumption. Other Lamps used (one LED flood outdoor lamp, two Mercury vapour lamps and two sodium vapour lamps) for lighting in the campus utilize about 0.97 % (1668.744 kWh) total electricity usage. However, a total of 77 fans in the campus consume 64.15 % (110255.618 kWh) of total energy. Inverters used in the campus utilise 2.77% (4712.4 kWh) and other equipments that are in use in the campus consume 9.09 % (15635.2847 kWh) of total energy. The audit revealed that a major share of total energy, ie. 64 % goes for running fans in the campus. About a quarter of the total energy consumption in the campus goes for lighting.

The class rooms, staff rooms and offices were running in the day time. High temperature coupled with high humidity demands more energy to be utilised to run fans and poor natural lighting in most of the class rooms, especially the ground floor requires enough lamps for providing required amount of light.

Table-12. Major Electrical Equipments in the Campus

Equipment	Number	Wattage
Centrifuge machine	1	250
Clinical Centrifuge	1	
Cooler	1	120
Cooling centrifuge	1	
Copier	1	76
CRO	1	
Deepfreezer	1	1060
Dryer	1	1200
DVD Drive	1	25
DVD player	1	25
Freezer	1	1060
FT-IR spectrophotometre	1	200
Function generators	1	
Furnace	1	3500
High vacuum pump	1	750
Incubator	1	3
Inverter	1	1260
LASER source	1	
LED flood outdoor lamp	1	250
LED outdoor Bulbs	1	250
Microphones	1	1
Microprocessor kits 8086	1	
Mixi	1	500
Mixy	1	500
Orbital Shaker	1	735
Overhead projector	1	
Photocopy Machine	1	76
Refrigerator, 50l	1	
Scanner	1	5.5
Sound Enclosure box	1	350
Sound Mixer	1	19
Television	1	56
Treadmill	1	1000

UV-Vis spectrophotometer	1	110
Water filter	1	11
Water Purifier	1	240
Wifi router	1	15
Air Conditioner 1 T	2	2170
Air Conditioner 1.5 T	2	3480
Electric bell	2	4
Exhaust fan	2	60
Grinder	2	1250
Hot plate	2	300
Mercury vapour lamp	2	160
MODEM	2	16
Refrigerator	2	500
RO water purifier	2	72
Sodium vapour lamp	2	70
Wall Fans	2	135
Water bath	2	1512
Electric motor water pump	3	2337
Electronic Weighing Machine	3	600
Hot air oven	3	1600
Printer	3	680
UPS Battery	3	5320
LED bulb	5	151
Fridge	6	900
Projector	6	1200
Camera	8	64
Printer	11	1606
Laptop	12	503
Computer monitor	18	1510
Speaker	25	375
LED Tube	43	440
CFL Tube	47	1316
Ceiling Fan	73	5230
Grand Total	332	47208.5

Other than the electricity from the common power grid, the college uses one generator to meet energy requirements when the power supply interrupts. About 30 liters of diesel has been used per month to run the power generators that accounts for about Rs. 2391 per month.

Steps for energy conservation (Table- 13) including awareness programs and practices are making the campus to save energy to some extent. This can be considered as best practices towards energy management in the campus.

Table-13. Energy Conservation Methods	
2020-2021	2021-2022
Power-off Drive with KSEB	Power consumption awareness programme through Oorja Kiran, and ENCON club activities
Swich-off and unplugging the electrical and electronic devices when unused	Swich-off and unplugging the electrical and electronic devices when unused
Refrigerators were in power-off and unplugged during non-working days of the institution	Refrigerators are in power-off and unplugged condition during non-working days of the institution
Keep the gadgets in standby/ sleep mode when unused	Keep the gadgets in standby/ sleep mode when unused
Quiz Programmes to the students conducted in association with KSEB	Quiz Programmes to the students conducted in association with KSEB
Energy conservation and awareness programmes organized through NSS	Energy conservation and awareness programmes organized through NSS
Earth hour celebrations	By reducing the electric power consumption at the peak hours

Reduce the usage of electricity during peak hours	Time-bounded water pumping to the water-tank for essential needs of students, staffs, hostel, and canteen, irrigation, and watering to the vegetable, Miyawaki forest and campus gardening by the use of properly serviced water lifting electrical motor pump-sets.
Time-bounded borewell water pumping to the water-tank using electrical motor	Replacement of conventional wiring and switches with power-plugs and superb quality optimum wires and cables for electrical connections
Maximise the use of electronic regulators	Maximise the use of electronic regulators
Thermally isolated air-conditioned rooms	Thermally isolated air-conditioned rooms
ACs were set to temperatures between 19°C and 23°C in air-conditioned rooms, and provided proper ventillators and exhaust the possibilities proper air-flow and sunlight into non-ac rooms by maximize the suitable placing of doors and windows	ACs were set to temperatures between 19°C and 23°C in air-conditioned rooms, and provided proper ventillators and exhaust the possibilities proper air-flow and sunlight into non-ac rooms by maximize the suitable placing of doors and windows
Replaced conventional incandescent tubes and bulbs with modern lighting facilities to an extent. Some of those lighting facilities are based on CFL and LED lamping.	Replaced conventional incandescent tubes and bulbs with modern lighting facilities to an extent. Some of those lighting facilities are based on CFL and LED lamping and tending to maximize the benefit of LED lamping.

Activities of ENergy CONservation (ENCON) club including *Oorjakiran* is another best practice to equip students about the energy management. This practice make students to follow steps practiced at their respective homes and future offices or workplaces where they might get placed.

Recommendations

To reduce power consumption, we recommend the following immediate steps:

1. Replace all conventional electric fans with BLDC fans (brushless direct current) progressively. BLDC fans consume only about 1/3rd power when compared to that of conventional induction motor based fans. This will bring in a drastic reduction of the total power consumption of the college thereby facilitating considerable savings in the energy expenditure of the college.
2. Replacing existing induction motor based fans with BLDC fans can bring down the power consumption of fans by more than 60 percent.
3. The above step, combined with the installation of a solar power plant can make the college, completely independent of KSEB power. Both of these steps will also enable the college to be more carbon neutral.
4. Provide proper air circulation by utilizing maximum ventilation inside offices, staff rooms and class rooms.
5. Make sure of timely proper maintenance and repair of electrical equipments for making judicious power consumption.
6. In addition to the above steps, the audit recommend to progressively replace all existing non LED lamps with LED lamps.
7. Complete replacement of old electrical wiring and cables with the best quality wiring accessories based on novel technologies would make the campus energy efficient.
8. Keep a distance of one feet from ceiling to motor of fans as well as the use of electronic regulators in connection with ceiling fans.

9. Try to explore to adopt effective utilization of non-conventional energy resources.
10. An internal audit may be conducted to identify possible leakage of energy and implement possible energy saving strategies on the campus.