VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SDG-15 Annual Report 2019-20

15 LIFE ON LAND

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.

Vellore Institute of Technology

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Report of VIT-Vellore Campus

GOAL 15: Life on Land…

Protection, restoration and promotion of sustainable use of terrestrial ecosystems, is one of the prime sustainability goals across the world. The second focal area is sustainable management of forests, fighting desertification, reversal of land degradation and stopping biodiversity loss. In these directions following concrete actions have been taken by the Vellore Institute of Technology (VIT) in the recent past namely,

- Species Environmental Niche Distribution Modeling for Panthera Tigris and Royal Bengal Tiger, India, using machine learning algorithms was conducted.
- In VIT's neighbouring state Telangana, the VIT faculty has conducted spatial distribution of land use/ land cover analysis in Hanamkonda taluk as well as in the Chennai region.
- Landscape changes and sustainable development policy in a developing area using the chirrakunta rurban cluster data was studied.
- An Urban land cover mapping and change detection analysis using high-resolution Sentinel-2A data is another research project undertaken by VIT. In another work, remote sensing and GIS techniques were used to assess and predict land-use changes in the local Vellore district, Tamil Nadu, India.
- Estimation of land use and land cover change relationship with Normalized Difference Vegetation Index (NDVI) different method and Land Surface Temperature (LST) was studied. Additionally, a comparative study of NDVI and SAVI vegetation indices in neighbouring Anantapur district semi-arid areas was conducted.
- Another work aims to Identify runoff harvesting sites over the Pennar Basin, Andhra Pradesh using the SCS-CN method.
- Another project focuses on seismic hazard assessment and land use analysis of Mangalore City, Karnataka, India.
- Morphometric analysis for identification of groundwater recharge zones: A case study of the Neyyar river basin was designed.
- Relationship between surface temperature and land cover types using the thermal infrared band and NDVI for local Vellore District, Tamil Nadu, India was extensively studied. Another NDVI based study to assess agriculture biomass and vegetation damage due to the Hudhud cyclone, using Landsat-8 satellite imagery, was conducted to support the local community affected by the cyclone and better manage the damages due to natural disasters.

- An evaluation study of microclimates and assessment of thermal comfort of Panthera leo in the Masai Mara National Reserve, Kenya was conducted.
- Flood forecasting model: A Semi-distributed Flood Forecasting Model for the Nagavali River using space inputs was developed. In another project, a novel coastal reservoir strategy to enhance India's freshwater storage by impounding river floodwaters was conducted.
- Analysis of Ocean colour monitor data: Distributed computing model of multispectral time series data analysis for chlorophyll concentration determination using ocean colour monitor-2 data.
- As coconut is a high volume local produce in the southern India region, techno-economic assessment of coconut biodiesel as a potential alternative fuel for compression ignition engines is one of the innovative projects undertaken by VIT faculty.
- A study of Crop phenology and soil moisture applications of SCATSAT-1 was conducted.
- Identification of dengue risk zone using a geo-medical study on Madurai city was designed and executed.
- Investment in agro photovoltaics: Efficient solutions from Switzerland is currently being studied.
- Another case study involved the Impact assessment of watershed management on land use/land cover change using RS and GIS.
- Advanced computational techniques like Genetic algorithm-based feature selection, for classification of land cover changes using combined LANDSAT and ENVISAT images, was conducted. We also developed a soft computation model for the identification of landslide factors.
- Trophic transfer potential of two different crystalline phases of TiO<inf>2</inf> NPs from Chlorella sp. to Ceriodaphnia dubia.
- Gene-centric metagenome analysis reveals the diversity of Pseudomonas aeruginosa biofilm gene orthologs in the freshwater ecosystem.
- Several computational models were developed namely a) for assessment of carbon storage and erosion using invest model in Visakhapatnam district, Andhra Pradesh b) for comparison and extraction of a watershed using Arcswat and Arc hydro from high-resolution digital elevation model c) for trajectory study of urban growth and its socioeconomic impact on a rapidly emerging megacity.

- One of the projects was focused on the fusion of thermal and RGB images for border security surveillance.
- Study and evaluation of carbon sequestration using remote sensing and GIS: A review on various techniques.
- Antibiotic potency of extract from Streptomyces isolated from terrestrial soil of Amirthi forest, India.
- Toxicity, accumulation, and trophic transfer of chemically and biologically synthesized nano zero-valent iron in a two-species freshwater food chain was conducted.
- No effort can be complete if we do not support and increase awareness in the local community. As we are located in a region where silk weaving is one of the major industries. A study was directed towards studying the silk weavers' problems linking to water, air pollution and soil conservation. The major objectives of the study were to understand the demographic profile and silk related factors of the respondents from the study area and to know about their environmental awareness and responsibilities among silk weavers in the study area.

The following specific initiatives are executed during 2019 -2020:

Farmers Attachment Programme (FAP)

Faculty from the School of Agriculture organising Farmers Attachment Programme (FAP)
The objective of the programme: (1) To inculcate the real-life experience of farming from the farmers among the students. (2) To provide a platform for farmers to share their field problems with the experts in VAIAL to avail timely solutions.

Practice: Every 123 students from the third year B.Sc. Agri is attached to a farmer. The student will interact with the farmer and learn farming-related issues. The student in the field or from the farmer's interaction identifies the farmer's problem which is reported to the expert in VAIAL. The subject matter expert provides the solution back to the students, who in turn deliver the solution to the farmer within 72 hrs of reporting the problem.

Context: The students act as a link between farmers and subject matter experts, to deliver field-level solutions for farmers' problems

Training programs & Workshops

Workshops in the fields such as Drones in Agriculture, 2D Resistivity Imaging A Plausible solution for Engineering and geological problems, Serological and PCR based detection of Plant viruses, Precision Agriculture Technologies and Challenges and, Quality assurance and testing of tissue culture plants were conducted to

Training programs such as Coconut based integrated farming system, Agripreneurship, AgriExpo, 3738 farmers were benefitted through these events.

Funded Projects

Balaji Poly Packs funded 26,00,000INR for the project titled "Mulching sheet application for crop improvement and water conservation in arecanut".

MANAGE funded 12,25,000 INR for the project titled "Agri-Clinics and Agri-Business Centres (AC&ABC) Scheme".

Organic Farming:

To maintain soil health, VIT - VAIAL farms use organic inputs rather than applying any inorganic fertilizers like urea for growing plants.

The following organic farm inputs for the cultivation of Paddy, Millets, Pulses, Oilseeds, Vegetables and Bananas are used.

Manures & Fertilizers:

(1) Deoiled cakes: Neem cake, Pungal cake, Castor cake; (2) Vermicompost; (3) Farm Yard Manure; (4) Humic acid & Seaweed extract

Bioinputs:

(1) Biofertilizers (Liquid & Carrier formulation): Azospirillum, Azotobacter, Rhizobium, Phosphorous solubilizing bacteria, Potash Mobilizer, VAM, Azolla; (2) BioControl Agents (Liquid & Carrier formulation): Pseudomonas fluorescens, Trichoderma viride, Bacillus subtilis

Plant-based pesticide: Azadirachtin - 0.03% (VIJAY NEEM)

Notable Publications:

1. Assessing groundwater quality for drinking water supply using hybrid fuzzy-GIS-based water quality index https://www.sciencedirect.com/science/article/pii/S0043135420304048

2. Eco-corona formation lessens the toxic effects of polystyrene nanoplastics towards marine microalgae chlorella sp., https://www.sciencedirect.com/science/article/abs/pii/S0013935120307374

3. Comparative physiological and proteomic analysis deciphering tolerance and homeostatic signaling pathways in Chrysanthemum under drought stress, https://onlinelibrary.wiley.com/doi/abs/10.1111/ppl.13142
4. Ethylene regulates sulfur acquistion by regulating the expression of sulfate transporter genes in oilseed rape, https://onlinelibrary.wiley.com/doi/abs/10.1111/ppl.13157
5. Enhanced bioleaching of copper from circuit boards of computer waste by Acidithiobacillus ferrooxidans, https://link.springer.com/article/10.1007%2Fs10311-019-00911-y
6. Silicon and salinity: cross-talk in crop mediated stress tolerance mechanisms, https://www.frontiersin.org/articles/10.3389/fpls.2019.01429/full
7. Gene network mediated by WRKY13 to regulate resistance against sheath infecting fungi in rice (Oryza sativa L.), https://www.sciencedirect.com/science/article/abs/pii/S0168945218307507?via%3Dihub

VIT mission is to work extensively in the current SDG and is ever looking for making a difference and devise ways for judicial use of natural resources.

Report of VIT-Chennai Campus

PREAMBLE

Polluting environment by emission of harmful substances in air, chemical waste and sewages in water, bio and medical waste, usage and improper disposal of masks and gloves due to pandemic etc. exert tremendous effects on lives on land which leads to degradation of environment. These human activities disturb the balance of ecosystem. It's our responsibility to maintain the equilibrium of nature and to promote peaceful life to all living organisms in the earth, and also to provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

CONSERVATION OF ENVIRONMENT

VIT made a self-inquiry on environmental quality of the campus with the following objectives

- To establish a baseline of existing environmental conditions with focus on natural and physical environment
- To understand the current practices of sustainability with regard to the use of water and energy, generation of wastes, purchase of goods, transportation, etc.
- To promote environmental awareness through participatory auditing process
- To create document of baseline data of good practices and provide future strategies and action plans towards improving environmental quality for future.

Environmental law has been included in the curriculum of B Tech programme. They understand and appreciate the changes and reforms take place at international level towards environment protection and also practical understanding on how pollution control board, National Bio diversity authority and other environmental related authorities work. Water pollution & Marine Environment, Air Pollution, Noise Pollution & Climate Change, Environmental Protection, Forests and Wild Life, Biodiversity & Wetlands, Contemporary environmental concerns, Environment and Good Governance has been included in the curriculum under Environmental law. Various lectures, seminars, symposiums have been organised for the awareness of protecting environment.

SUSTAINABLE USE OF NATURAL RESOURCES

The Institute has controls to reduce the absolute amount of waste that it produces from staff offices. The recyclable such as papers, plastics, glasses and metals are segregated from source itself. Separate bins with different colour coding are provided for collection of these. The segregated wastes are being sent to the recyclers. All organic waste; green wastes are composted in the campus and the unrecycled cardboard send to the recyclers. The food waste collected from the kitchen are sent to the nearby villages for cattle feed. The bio medical waste collected from the campus is being collected and disposed through the authorized Bio medical waste vendor as per the Bio-Medical Waste Management Rules, 2016. The hazardous waste such as used oil collected from the DG sets, Discarded cotton waste, filters are collected and segregated and disposed through the authorized vendor as per the Hazardous and Other Wastes (Management and Transboundary Movement) Amendment Rules, 2016.Through these activities, the environment pollutions are minimised to protect the land and ecosystem. The students, faculty and staff will produce the best outcomes to raise awareness and help push the environmentally friendly agenda ahead of the campus.

Sewage Treatment Facility (STP) at VIT Chennai

RESEARCH ON SUSTAINABLE DEVELOPMENT

Various national and international conferences on Energy and Environment: Global Challenges, International Conference on Multidisciplinary Approaches to Island Studies, and International Conference on Urban agriculture land, food, people agriculture and city were conducted. To understand and study about the biodiversity and ecosystems, various guest lectures were arranged. Field visits in Arignar Anna Zoological Park, Chennai, Guindy National Park, Chennai, Vedanthangal Bird Sanctuary Kanchipuram were arranged. “A fuzzy inference system-an estimation of the quality of river water in Tamil Nadu” has been carried out by the researchers and published. As a part of the programme, Landscape changes and sustainable development was studied in Pallikaranai wetland area in Chennai. Faculty attended various national webinar including "Effectiveness of Environmental Laws and Implementations in Celebrating Biodiversity”.

Rain Water harvesting pond

Green belt development at campus

VIT NSS volunteers cleaned the village pond in and around Kayar village in Thiruporur Taluk, Kanchipuram District, Tamilnadu State, India on 16/10/2019 by removing plastic and polythene wastes, dead plants and weeds

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