

3.3.1 Institution has created an eco system for innovations including Incubation centre and other initiatives for creation and transfer of knowledge.

Response:

The University has created a good ecosystem for proliferation of research mainly associated with Chemical and Biological Sciences

Research on soil of Darjeeling and adjoining area

The origin of the Himalayas is a geological surprise that originated about 70 million years ago with the Indo-Australian plate occurring at the bottom of the Eurasian plate causing the end of Tethys Sea. The soft sedimentary soil of the Tethys Sea folded and rose upward to form the mighty Himalayas while parts of northern plains adjacent to the foot hill areas formed the 'Terai' region. Darjeeling and Sikkim hills, a part of eastern Himalayas is globally important for its biodiversity manifested by its topographic complexity, altitudinal and climatic variations. Credited with plantations producing the best quality tea, Darjeeling-Sikkim shares political boundaries with countries viz. - Nepal, Tibet, Bhutan and Bangladesh.

Soil of this region has been reported to be of alluvial type and is formed from the mixing of sand and salty loam. It is a well-known fact that physical and chemical properties of soil influence its characteristics affecting the type of plants growing in it; hence, the knowledge of soil property is considered very important. Standing crops and vegetation too influence soil quality; therefore, study on soil nutrition and microbial dynamics is of paramount importance.

Some researches on the soil of Darjeeling Himalayas, the Terai and Dooars region were conducted in Department of Tea Science, University of North Bengal.

- A comprehensive study on nutritional status of soil in tea plantations of the region and other notable forest plantations were conducted to determine the nutritional status of the soil. This research helped in ascertaining the amount of necessary fertilizers required to be added for mitigating the deficiency if any.
- Organised tea plantations in India were initiated by the British. Thereafter, there has been a steady increase in the production over the years since its day of first cultivation, which is mainly due to extensive planting, improved technology, nutrition and fertility management, introduction of high yielding clones and longer pruning cycle. These factors, on the other hand, have encouraged biotic stresses like insect pests and diseases that limit the productivity of this crop. And thus, tea garden soils are highly polluted with chemical pesticides. It has led to a global concern for environmental pollution as well as harmful side effects created by their excessive use in tea. The pesticides applied to tea bushes not only affect the pests, but also hinder the essential microflora of the soil that helps in nutrient recycling, solubilisation and uptake of nutrients by the plant. The pesticide tolerance ability of soil microbes were ascertained by a research team of Department of Tea Science. Around ten potential isolates with plant growth promoting activity has been experimented.

Encapsulated plant growth promoting bacteria has been returned to field for studying their properties

- Concentration of heavy metals in soil of this region is comparatively high due to geological and anthropogenic reasons. Some heavy metal tolerant bacteria capable of bioremediation of toxic heavy metals have been worked out. Presently the team is conducting research on the mechanism of bioremediation.
- The Indo-Bhutan border Bhutan hills has numerous minerals including copper, dolomite, quartzite, limestone, gypsum, coal, marble slate and graphite as mineral deposits. More or less 13.5 billion ton dolomite reserved in Bhutan is a vital export commodity from Bhutan to India. Mining effluents and dolomite debris flow down with rivers and contaminate the soil and water further leaving its adverse sign on the most important cash crop of Dooars. Unscientific mining techniques and disregard towards environment and local population near the Bhutan border has not only cost damage to agriculture and wild life but also is creating problem for tea plantation by changing the soil profile, thus killing the production significantly. Research is in progress to overcome the stress by dissemination of soil bacteria with tolerance and bioremediation potential.

The Department has organized different programmes on Tea Cultivation and Manufacturing for the benefit of the small growers of North Bengal. These small scale producers are members of the unorganized group of Tea-farmers. Besides these, the Department of Tea Science has also organized plant tissue culture programme for encouraging entrepreneurs.

Green additives for lubricating oil - Drive towards innovation of eco-friend technology

The increasing focus towards diminishing the impact on environment has driven efforts to develop new, environmentally benign lubricating oil additives. Keeping this view in mind department of chemistry has prepared a host of additives based on vegetable oils like sunflower oil (SFO), soybean oil (SBO), castor oil etc. and has evaluated their excellent performances in field application.

Using the natural resources around, department has developed bioactive products based on naturally occurring plant extracted compounds with proven anti-cancer, anti-diabetic, anti-leukemic etc activities -

A step towards sustainable chemistry.

Research in the Department of Pharmaceutical Technology is also following the eco-friendly protocols for Drug development and in the related innovative work involving their PG and Research Scholar students.

Centre for Floriculture and Agro-business Management (COFAM) under the administrative control of Department of Biotechnology, is another innovative hub where knowledge associated with new cultivation techniques of values of flowers and fruits are shared with the marginal farmers. COFAM has developed a Research Park/Innovation Park for development of Horticulture, since 2006.

The Department of Botany conserves more than 100 local rice varieties and 200 breeding lines including one Wild rice (*Oryza rufipogon*). The Department maintains a rich medicinal plant garden which serves not only as an important repository but also caters to College students for knowledge built-up and researchers from in-house Departments as well as from other nearby Institutions.

Utilizing the natural resources, Dept of Botany including the Biswa Bangla Genome Centre is utilizing the total reservoir on the earth comprising Agricultural and forest product in a sustainable way, so that the basic reservoir should not be erased out

Department of Life Long learning and Extension (DLLE) is also involved generating awareness among marginal and poor sections of the society by organizing workshops on basic sciences like Health and Nutrition, disaster management etc for them in regular intervals throughout the years.

Apart from these, the department of Biotechnology, Microbiology, USIC, CIRM, Centre for Disaster Management, Centre of innovative studies organized various programmes related to innovation, creation and transfer of knowledge through workshops, seminars and sharing their facilities with other academic and professional institutions. The university has already submitted data in these regards for Atal Ranking of Institutions on Innovation Achievements (ARIIA) - 2019-20.

Inside the University Campus, we have Akshaya Kumar Maitreya Heritage Museum. The Museum is now the repository of the culture of the people of the northern districts of West Bengal. It is the most useful representative of the material culture of the region.