



Green Skill Development Programme (GSDP)
on
Forest Entomology and Pest Control
Course Completion Report



Organized from 22.11.2019 to 23.12.2019

by

ENVIS Resource Partner

on

Forest Genetic Resources and Tree Improvement
Institute of Forest Genetics and Tree Breeding

(Indian Council of Forestry Research and Education)

Coimbatore

Course Completion Report

A Green Skill Development Programme (GSDP) on “**Forest Entomology and Pest Control**” (level-6) was organized for 27 working days (216 hours) from 22nd November to 23rd December 2019 by the ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at IFGTB, Coimbatore. The training module included theory, field visits, field exercises and assignments.

Inaugural Session

The training programme was inaugurated by Dr S Murugesan, Director, IFGTB. Dr Kannan C.S. Warriar, Scientist F, Coordinator ENVIS & Nodal Officer GSDP presented an overview about IFGTB and various institutes under the Indian Council of Forestry Research & Education (ICFRE). He also explained on GSDP, ENVIS India and the mandate of ENVIS RP at IFGTB.



The technical sessions started with a lecture by Dr Kannan C.S. Warriar, Scientist F and Coordinator ENVIS on “Introduction to Forestry”. In his lecture he covered the basics on forestry and explained the methods in selecting plus trees for improving forest health. He also elaborated on the principles of tree improvement and clonal forestry. While detailing the various methods of vegetative propagation techniques in forestry, the participants were made aware of the pros and cons of operational clonal forestry.



First Week (23.11.2019 to 30.11.2019)

From 23.11.2019 to 30.12.2019 basics of entomology were taught to the trainees. Dr Vinod K.V, Associate Professor, Nirmala College, Muvattupuzha, Kerala delivered a lecture on the World of Insects, collection, preservation and study of insects. In his lecture he explained the role of insects in the forest ecosystem and highlighted that many insects play important roles in the forest ecosystem. Video clips on cicada, termite colonization and looper caterpillar foraging patterns were also screened to make the subject more interesting for the trainees.



Visit to Nurseries

The trainees were taken to various nurseries in the institute and provided an exposure about various trees.

Dr John Prasanth Jacob, Scientist G and Training in-charge gave an overall idea about different forest nurseries.



Lecture on Insect Population Dynamics

Dr J.P.Jacob, Scientist G and Training in-charge delivered a lecture on different insects and their habitat, foraging behaviour of different insect pests, host insect interactions, evolution and co-evolution of insects, biosynthetic pathways, primary and secondary metabolites. Population fluctuation of insects in relation to various biotic and abiotic factors was also discussed.



Visit to TNAU Bee Park

The trainees visited the Bee Park at apiary wing of Tamil Nadu Agricultural University, Coimbatore. Dr P.A. Saravanan, Associate professor explained the prospects of bee keeping; biology and management of stingless honey bee; behaviour of open air nesting honey bees and floral resources for honey bees.



Lecture on Insects & Ecosystems

Dr K.R. Sasidharan, Scientist F, delivered a lecture on Insects and ecosystems. The Concept of ecosystem; insect diversity and their range; Devonian landscape and food habits of insects were explained.



Lecture on Insect population Dynamics

Dr N. Senthil Kumar, Scientist E, delivered a lecture on Insect population dynamics and explained about taxonomy of insects; insect adaptability; insect migration; insect lifecycle; advantages of insect metamorphosis and medicinal use of insects. He also gave an insight on the biopesticides and bioboosters released by IFGTB and Mobile Apps developed by IFGTB ENVIS.



Visit to Various Nurseries

The participants were taken to various nurseries of the Institute and were trained on assessing various pests in tree species. The process of recognition, interpretation and diagnosis of pest and disease problems in tree nurseries and plantations were taught to them. They assessed *Myloccerus* beetles in *Thespesia populnea* and *Syzygium cumini* in the model nursery and Silviculture and Forest Management nursery respectively.



The trainees assessed the occurrences of psyllids in *Lausanne* plants and leaf galls in *Pongamia pinnata* in the vegetative propagation complex and FGRM nursery respectively. Trainees got an overall idea about assessing the pests in various species in both plantations and mother bed chambers.

Lecture on Butterflies

Dr K.R. Sasidharan, Scientist F, delivered a lecture on Butterflies as indicators and their conservation. He also gave an insight on stages in the metamorphosis of butterflies.



Lecture on Biological Control

Dr S. Jeyaraj Nelson, Professor, Entomology, Tamil Nadu Agricultural University, Coimbatore delivered a lecture on Natural Enemies of Insect Pests and Biological Control.



Research article entitled “Natural Enemies of Pests and Biological Control” was distributed to the trainees.

Visit to Corcyra (Rice Moth) lab

The trainees were taken to Corcyra lab at TNAU, Coimbatore to get experience on the mass production of bio-control agents. Dr S Jeyaraj Nelson, Professor, Entomology and his team explained about the mass production of Trichogramma egg parasite, standard operating procedures of various equipment like semi-automatic Corcyra rearing cages and ovens and demonstrated how to prepare feeding material for the hosts.



The trainees visited entomology screen house and examined the metabolite profiling of *Beauveria bassiana* under enriched growth conditions and efficacy.



Visit to Entomology Lab

The trainees were taken to Agricultural Entomology lab at TNAU, Coimbatore to learn the prevention, suppression, and eradication of pests using natural enemies.



Visit to Sericulture Department

A field trip to District Sericulture Centre, Coimbatore was organized to give an exposure on “Sericulture”. Ms Chandini, Senior Technical Assistant and her team from Sericulture department explained exposition of agriculture field of Mulberry; life cycle of *Bombyx mori*; equipment used in rearing silkworms; cost effective methods and material required to establish sericulture.



Mr Soundarajan, Grainage Inspector explained the overall process of selection and storage of cocoons in sericulture. He also gave an insight in to the funding and compensation provided to farmers/owners by Government to establish sericulture farm.



Visit to a Farmer's Sericulture Field

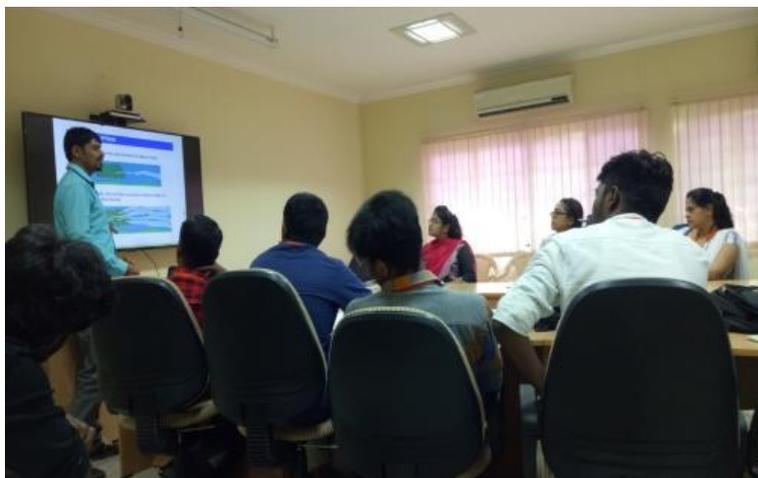
The trainees were taken to a farmer's field at Thondamuthur, near Coimbatore to know, learn and visualize the sericulture practices (especially mulberry plantation). Mr Prakateeswaran, Junior Inspector, Sericulture Department guided the trainees to gather knowledge on several technologies that are practiced in adopting mulberry plantation and silkworm rearing in the field.



Second week (2.12.2019 to 07.12.2019)

Lecture on Pheromones in Pest Management

Dr M. Prasanth from National Bureau of Agricultural Insect Resources, Bengaluru delivered a lecture on Pheromones in insect pest management. He explained about how plant volatiles are used by herbivorous insects to find their host plants and also by the natural enemies to find their prey.



Dr J.P. Jacob, Scientist G & Training in-charge delivered a lecture on Insect pests of forest nurseries. He elaborated on the pest complex associated with economically important tree species in nurseries.



Visit to Chemistry & Bio-prospecting Lab

The trainees were taken to Chemistry & Bio-prospecting lab at the institute, Dr. N. Senthil Kumar, Scientist E explained about the various bio-prospecting practices carried out in the laboratory. Dr S. Sethuvasan, Research Associate gave an overall idea about the basics of bio-pesticides formulation methods, pest control and instrumentation. Trainees were guided to extract oil from seeds of *Simarouba glauca* for using it as a plant based pesticide.



Lecture on Disease Symptomatology

Dr A. Karthikeyan, Scientist F delivered a lecture on Disease symptomatology. Significance of plant disease; injury vs disease; disease triangle; symptoms and signs were covered in his lecture. Pictorial examples of some diseases in various species were shown to the trainees.



Lecture on Seed Technology

Dr R Anandalakshmi, Scientist F gave a lecture on seed technology. The process of seed development; structure of the seed; seed production and handling techniques; seed testing and seed labelling were discussed.



Visit to Nursery

The trainees were taken to Silviculture and Forest Management Nursery. Ms K. Sushamani, Chief Technical Officer, Forest Protection Division, explained the process of identifying diseases in the plants. Mr Krishnamoorthy, Junior Research Fellow explained the process of identifying the affected plants. After the lecture, trainees actively identified various affected plants and the causes.



Visit to Seed Processing Centre

The trainees were taken to seed processing centre at IFGTB. Mr C. Rajesh, Technical Officer, explained the stages of seed processing (drying, cleaning, grading, treating, testing and packing) with examples. Mr K. Sureshkumar, Senior Technical officer explained about various techniques used for seed preservation. He also detailed on the process of obtaining seed certification. Mr R. Anand, JRF explained how seed testing, seed filling, seed anatomical studies and seed biochemical parameters were conducted. All the available seeds were shown to the trainees.



Lecture on Insect Pests

A lecture on Insect pests and their management of tree species in Agroforestry was delivered by Dr A. Balu, Scientist G (Retd.) and former Head, Forest Protection Division of IFGTB.



Lecture on Pest Management

Dr. J.P. Jacob, Scientist G & Training in-charge gave a lecture on Integrated Pest Management. He explained pest management system in the context of associated environment and population dynamics which utilizes all the appropriate techniques to minimize the pest population at various levels.



Preparation of Pesticides

The process of preparation of pesticides was taught by Dr J.P. Jacob, Scientist G & Training in-charge in the Entomology Lab. Hands on training was imparted and the trainees prepared one chemical pesticide, two oil based formulations and one soap oil mixture.



The trainees were taken to nursery and exercises to assess the pest populations were given to them. They actively assessed various pests, prepared and sprayed the pesticides wherever required.



Visit to Green Life Bio-tech Lab, Somanur

The trainees were taken to Green Life Bio-tech Lab, Somanur, near Coimbatore. Dr S. Eswaramoorthy, the Founder, and former professor, Sugarcane Breeding Institute explained about the ill effects due to the excessive use of chemical fertilizers, pesticides and weedicides caused to the environment and how they cause adverse effects to all living beings on the earth. The trainees got acquainted with all the equipment in the lab and experienced the preparation of eco-friendly biofertilizers.



Lecture on Pest Management

A lecture on Pest Management Practices was delivered by Dr J.P Jacob, Scientist G & Training in-charge. He explained the mechanism of reducing pest problems by careful manipulation and adoption of selected control measures. He also explained how to prevent the pests and eliminate them after incidence.



Lecture on Microbial Bio-Fertilizer

A lecture on microbial bio-fertilizer technology was delivered by Dr V. Mohan, Scientist G and Head, Forest Protection Division of IFGTB. The concept of how microorganisms in bio fertilizers restore the soil's natural nutrient cycle and build soil organic matter were discussed. The use of Biofertilizers such as Rhizobium, Azotobacter, Azospirillum and Blue Green Algae (BGA) were taught to the trainees.



International Experience

The trainees participated and discussed on the subject Insect Vectors delivered by Dr Foissac Xavier, Agriculturist and Professor, University of Bordeaux, France.



World Soil Day Celebration

The trainees participated in the World Soil Day 2019 awareness programme organized by ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at IFGTB. The primary objective of the observance was to highlight soil's importance on earth and to protect the environment from soil erosion for sustainable future.



Lecture on Insect Gall

A Lecture on insect galls was delivered by Dr J.P Jacob, Scientist G & Training in-charge.



Fischer Herbarium (FRC) Visit

The Trainees were taken to Fischer Herbarium, which is recognized as a National Repository by Government of India. Ms R. Tamilarasi, Chief Technical Officer welcomed the candidates to the Herbarium and explained the basics of Taxonomy. She also explained how Fischer Herbarium was created and the ongoing activities in the Herbarium and gave a brief lecture about the use of Herbarium for Researchers.



Lecture on Biocontrol Agents

A lecture on Biocontrol agents and fungicide was delivered by Dr A. Karthikeyan, Scientist F. He explained the methods of controlling pests such as insects, mites, weeds and plant diseases using other organisms.



Lecture on Chemical Pest Control

A lecture on chemical pest control, assessment and application techniques was delivered by Dr B. Vinothkumar, Associate Professor, TNAU, Coimbatore.



Visit to Pathology Lab

The trainees were taken to the Pathology lab of IFGTB. Ms K. Sushamani, Chief Technical Officer demonstrated the Isolation and Identification of Vesicular-Arbuscular Mycorrhiza (VAM). The genus of VAM spores were determined by microscopic observation.



Pest Assessment

Field practical work on pest assessment was carried out in the nursery to identify the pest problems in teak and ailanthus plantations. The occurrences of *Hyblaea puera*, *Eutectona machaeralis*, Myllocerus beetle, Mealy bugs and aphids were recorded by the trainees and severity on tree species were also identified.



Lecture on Insect Pests

Dr. A. Balu, Former Scientist G, IFGTB delivered a lecture on Insects pests of bamboos and their management. The diversity and characteristics of bamboo insect pests and diseases and their control measures were discussed in his lecture.



Third Week (09.12.2019 to 14.12.2019)

Lecture on Pests and their Damage Economics

Dr J.P. Jacob, Scientist G & Training in-charge delivered a lecture on pests and their damage economics. He explained about Economic Inquiry Level (EIL) which was defined as the lowest population of pests that will cause economic damage. Economic Threshold Level (ETL) refers to the density at which control measures should be determined to prevent an increasing pest population from reaching EIL.



Lecture on Utilization of Microbes

A Lecture on Utilization of Microbes in forestry was delivered by Dr. A. Karthikeyan, Scientist F. The following topics were covered in his lecture:

- Introduction to Microbes
- Contribution of Plant Growth Promoting Microorganisms
- Assimilative versus Dissimilative processes
- Impacts of Microbes on Ecosystems

He stressed that the microbes can do anything they want, wherever they want and without microbes, humans wouldn't be alive.

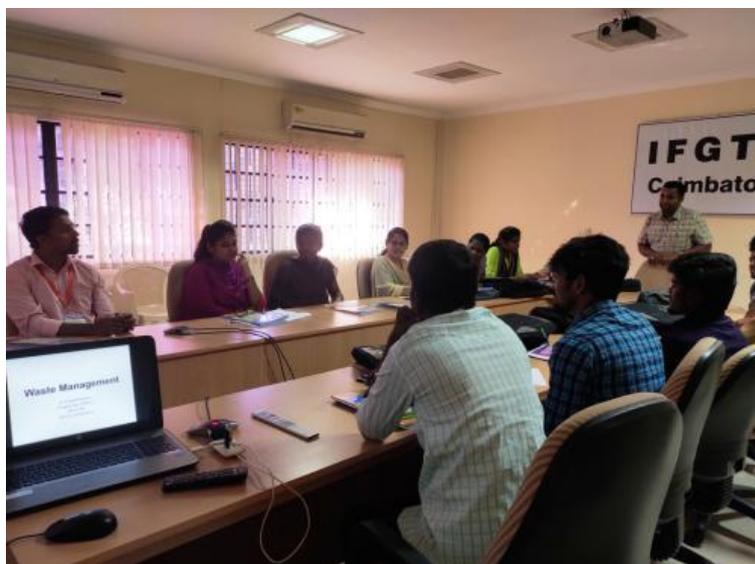
Visit to Gass Museum

The trainees visited the Gass museum, which was established by Horace Archibald Gass, a British Forest Officer, a century back. Dr J.P. Jacob, Scientist G & Training in-charge explained the history of the museum. The entomology section which has over 1,000 insects, with a significant part of the collection being butterflies attracts the trainees. The trainees also experienced the exhibits viz Timber, Non-Timber Forest Products, Wood Crafts, Wildlife, Entomology Mycology, Geology, Ethnology, Arms, Forest Engineering and Environment. This visit has enriched the candidate's knowledge and learning experience.



Lecture on Cleaner Production and Waste Minimization

Dr S. Vigneswaran, Programme Officer, ENVIS RP, IFGTB delivered a lecture on Cleaner Production and Waste Minimization. He also gave an insight on various tips for preventing the generation of wastes. In addition, short films on waste management were screened to the trainees to give an exposure that how wastes can be converted to useful products.



Observance of International Mountain Day (IMD) 2019

In connection with the observance of International Mountain Day 2019, a lecture on role of mountains in the conservation of Forest Genetic Resources was delivered by Dr Kannan CS Warriar, Scientist F, ENVIS Coordinator and Nodal Officer GSDP. He gave an insight on the significance of mountains. One-tenth of the human population derives their support of living through mountains, he added. He also explained the importance of Western Ghats which is one of the eight hottest hotspots of biological diversity in the world along with Srilanka. Older than the Himalayas, the Western Ghats is the home to at least 325 globally threatened flora and fauna. Thirty-nine World Heritage Sites in the Western Ghats declared by the UNESCO were also detailed. The details are available in the FAO website: <http://www.fao.org/international-mountain-day/imd-around-the-world/news-details/en/c/1257022/>



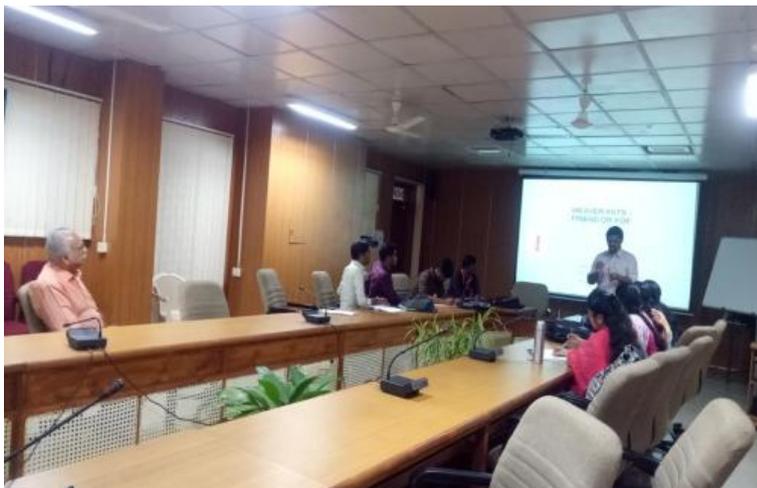
Eco Tour to Western Ghat Region

An eco tour to Sadvayal Forest Area, Western Ghats Region in collaboration with Tamil Nadu Forest Department was also organized on the occasion of IMD 2019. Shri M.R. Arokiyasamy, Range Forest Officer explained the floristic diversity of the forests and the role of Mountains in the well being of wildlife.



Lecture on the Soil and Insects

A lecture on the Soil and Insects was delivered by Dr Sabu K. Thomas, Associate Professor, Zoology, St.Joseph's college, Devagiri Calicut, Kerala. He explained about how do insects shape and interact with soil environments? how do soil insects influence agriculture? and how do can we protect soil-nesting bees for pollination services?



Fourth Week (16.12.2019 to 23.12.2019)

Lecture on Subterranean Pests

A lecture on the subterranean pests was delivered by Dr J.P. Jacob, Scientist G & Training in-charge.



Lecture on Issues in Tissue Culture

Dr Kannan C.S. Warriar, Scientist F, ENVIS Coordinator and Nodal Officer GSDP delivered a lecture on Issues in Tissue Culture. The prospects and problems related to tissue culture were covered in his lecture. Tips to overcome the issues were also discussed.



A group photo of the GSDP team was captured



Plant Quarantine and Phytosanitary Certification

Dr J.P. Jacob, Scientist G and Training in-charge delivered a lecture on Plant Quarantine laws and Phytosanitary measures to be followed for the certification. An overall idea about the laws related for clearance of plants, laws associated with plant products, export/Import and other regulated articles were also discussed. Copies of certificates provided to various agencies were also shown to the trainees.



NABARD Initiatives

Dr S. Vigneswaran, Programme Officer delivered a lecture on NABARD and its functions. He explained why NABARD has been established as an apex institution and deliberated about the farm schemes and off farm schemes.

The annual report of the NABARD for the FY 2018-19 was shared to the trainees and various subsidies provided by NABARD were also discussed.



Banking Linkages: UBI, Coimbatore

Banking linkages session was arranged to provide an overall idea about the schemes offered in various banks for becoming an entrepreneur. Dr Rekha R. Warriar, Scientist F & Training in-charge explained about the importance of entrepreneurship development.



Mr Vishnudevan, Deputy Manager, Union Bank of India, Coimbatore delivered a lecture on "Role of Banks on Development of Self Sustain Personals and Groups". He gave an overall idea about the schemes offered by Union Bank of India.

Banking Linkages –SBI, Coimbatore

Ms Ramya, Deputy Manager, State Bank of India, Ganapathy, Coimbatore delivered a lecture on "Role of SBI in building an Entrepreneur". She explained that State Bank of India grants financial assistance to technically qualified, trained and experienced entrepreneurs for setting up new viable industrial projects. Loans are also extended to technocrats who are unable to meet the normal margin requirements under the liberalized schemes. She also briefed that State Bank of India offers business loans to meet the varied needs of large business houses as well as Small and Medium Enterprises (SME).



Visit to Teak Museum, Nilambur

The trainees were taken to the Teak Museum in Nilambur, with the Kerala Forest Research Institute which is the world's first teak museum. The trainees gained knowledge on the teak

plantation activities undertaken 160 years ago. The trainees also visited the butterfly park which provides natural habitat for beautiful flying insects that are getting endangered.

Visit to Rose Garden

The trainees were taken to Rose garden, one of the most famous botanical gardens maintained by the Horticulture Department of Tamil Nadu. Ms. Menaka, Horticulture Officer explained about appropriate basal medium and growth regulators used for culturing rose plants. She highlighted how the stock cultures are maintained explained about various budding methods. Hands-on Training on T-budding (also known as shield budding, a technique of grafting to change varieties of plants) were also given to the trainees.

A visit to insect museum, Tamil Nadu Agricultural University was arranged where the trainees experienced the specimens and models under five categories namely insects and plants, insect biology, diversity of insects, beneficial role of insects and cultural entomology.



In addition to the practical classes, separate field exercises were given to the participants. Assessment & Evaluation was done by an external examiner and an in-house officer. The participants were assessed based on the performance theory, practicals and viva voce examination. All the participants cleared the examinations. Thirteen participants have successfully completed the training programme.

Valedictory function

The valedictory function of the Certificate Course on “Forest Entomology and Pest Control” was held on 23.12.2019. The function began with an Invocation on Nature in Sanskrit by Dr Kannan CS Warriar, Scientist F and Coordinator ENVIS. Dr S. Vigneswaran, Programme Officer, ENVIS welcomed the gathering. Dr J.P. Jacob, Scientist G & Training in-charge presented an elaborate report on the GSDP. Training modules including theory, laboratory exercises, field visits and other research related activities during the course period were explained by him. Dr S. Murugesan, Director, IFGTB in his

special address highlighted that insects are crucial components of many ecosystems, where they perform many important functions like pollination and controls harmful pests. The Director urged the participants to become entrepreneurs and contribute towards maintaining environmental stability and ecological equilibrium. The Director distributed the course completion certificates to the participants and wished all success in their future endeavours. In their feedback, the GSDP participants thanked ENVIS Secretariat, MoEF&CC, GoI for selecting them for the course and explained how the training module improved their skills and knowledge in the field of entomology and pest control in trees. They thanked the facilities provided by the institute and IFGTB ENVIS for meticulously organizing the programme. During his concluding speech, Dr Kannan C.S. Warriar, Scientist F, Co-ordinator ENVIS & Nodal Officer, GSDP highlighted on the various GSDPs being implemented by ENVIS India and thanked ENVIS Secretariat, Ministry of Environment, Forests & Climate Change, GoI for sanctioning the course to IFGTB ENVIS. He expressed gratitude to the Director, Resource persons from various organizations and all the supporting staff for their contribution for successful completion of the course. He also thanked all the ENVIS staff for their involvement.

