CSIR – National Environmental Engineering Research Institute
Nehru Marg, Nagpur – 440020.

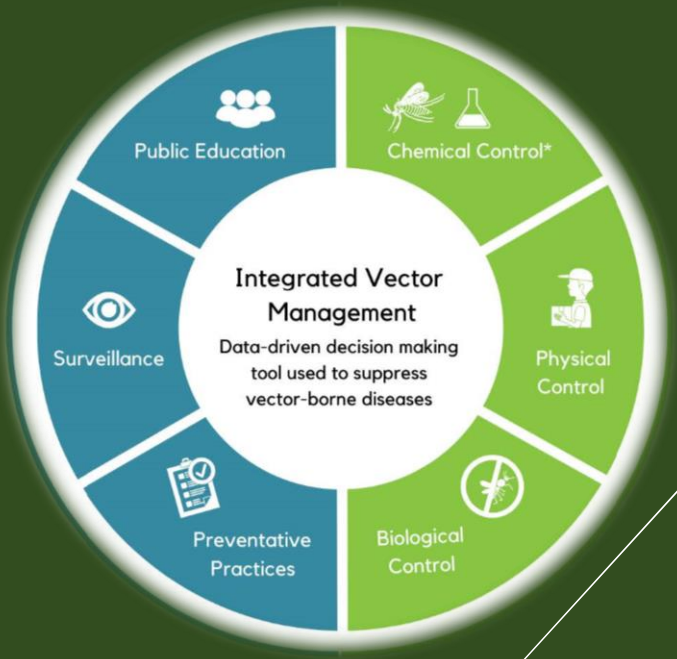
3rd Training Programme Report

(States: Arunachal Pradesh, Andaman & Nicobar Islands, Manipur, Nagaland and Rajasthan)

on

Online Training of Trainers (ToTs) and pilot testing of modules to promote non-POPs alternatives based Integrated Vector Pest Management

Date: 20/09/21 to 01/10/2021
Time: 2.30 to 5.30 PM



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List of Abbreviations

BCC	Behaviour Change Communication
Bti	*Bacillus thuringiensis var. israelensis*
CCHF	Crimean-Congo Haemorrhagic Fever
CPCB	Central Pollution Control Board
CSIR	Council of Scientific & Industrial Research
DDT	Dichlorodiphenyltrichloroethane
EC	Emulsifiable Concentrate
FFS	Farmer Field School
GEF	Global Environment Facility
GoI	Government of India
HIL	Hindustan Insecticide Limited
ICMR	Indian Council of Medical Research
IEC	Information Education and Communication
IGRs	Insect Growth Regulators
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
IVPM	Integrated Vector and Pest Management
JE	Japanese Encephalitis
KFD	Kyasanur Forest Disease
LLINs	Long Lasting Insecticidal Nets
MoCF	Ministry of Chemicals and Fertilizers
MoEFCC	Ministry of Environment Forests and Climate Change
MoEFCC	Ministry of Environment, Forest and Climate Change
NEERI	National Environmental Engineering Research Institute
NIP	National Implementation Plan
NVBDCP	National Vector Borne Disease Control Programme
POPs	Persistent Organic Pollutants
RMRIMS	Rajendra Memorial Research Institute of Medical Sciences
RNA	Ribonucleic Acid
RPU	Rational Pesticide Use
SC POPs	Stockholm Convention on Persistent Organic Pollutants
SIT	Sterile Insect Techniques
UNEP	United Nations Environment Programme
VBD	Vector-Borne Disease
WDP	Water Dispersible Powder
WHO	World Health Organization
WP	Wettable Powder
ZIKV	Zika Virus

1. Introduction

Stockholm Convention (SC) is an international treaty works for the protection of human health and environment from harmful Persistent Organic Pollutants (POPs). The Government of India (GoI) signed the Stockholm Convention on POPs and the Ministry of Environment, Forests and Climate Change (MoEFCC) was assigned as the National Focal Point. India has committed to fulfilling its obligations under the Convention, prepared its National Implementation Plan (NIP) and submitted it to the Secretariat of the Stockholm Convention on 21st April 2011. India assured in the NIP, that the development and promotion of non-POPs alternatives to DDT is one of the top priorities that require immediate action. Accordingly, the project entitled "**Development and promotion of non-POPs alternatives to DDT**" was jointly developed by United Nations Environment Programme (UNEP) and United Nations Industrial Development Organization (UNIDO). The project was approved by Global Environmental Facility (GEF) in April 2015 with two GEF implementing agencies *i.e.,* United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP), which are responsible for supporting delivery of specific project components. Following are the major project components to be implemented under the project:

I. Legislation, policy framework and institutional capacity (UNEP)
II. Alternatives to vector control (UNIDO)
III. Promotion and propagation of new cultivars of Neem (UNIDO)
IV. Development and Promotion of Integrated Vector Pest Management (IVPM)
V. Monitoring and evaluation of results (UNIDO / UNEP)

For components I and IV, MoEFCC has nominated Central Pollution Control Board (CPCB) as a national Executing Agency to look after a partial execution of the project. As per the project document, the other part will be executed by the UNEP Law Division. The components of UNEP prescribe broadly Legislative framework and development, and pilot application of a set of Guidelines for Integrated Vector and Pest Management. UNIDO is working on the development of non-POPs alternatives to DDT viz. Long-Lasting Insecticidal Nets (LLIN), Neem based insecticides, *Bti* based pesticides under its two components.

The Global Environment Facility (GEF) was established to tackle our planet's most pressing environmental problems. The GEF supports countries to build capacity for the implementation of the Stockholm Convention through introduction and demonstration of viable, cost-effective and sustainable alternatives to eliminate dependency on DDT and other POPs chemicals.

The United Nations Environment Programme (UNEP) is the voice for the environment and the primary driving force for international activities related to the sound management of chemicals in the United Nations system. The UNEP promotes chemical safety by providing policy advice, technical guidance and capacity building to the developing countries. UNEP Chemicals Branch has the leadership of the Global Alliance for the Development and Deployment of Alternatives to DDT. As such, UNEP is a well-placed partner with other organizations to phase out current use and avoid future practices of DDT use in India.

The Directorate of NVBDCP, central agency responsible for guidelines, policy for prevention and control of vector-borne diseases in India has been implementing the Integrated Vector Pest

Management (IVPM) strategy for effective management of vectors. It recommends Indoor Residual Spray (IRS) and Insecticide Treated Bed Nets (ITNs)/Long lasting Insecticide Net (LLIN) for vector control in rural areas and anti-larval measures in urban areas.

IVPM is a tool for managing vector population to reduce or interrupt transmission of disease. IVPM is a way forward to improve cost-effectiveness, ecological soundness and sustainability of disease vector control. It emphasizes that the insecticides used in the programme must have negligible adverse human health effects, must be effective against the target species, must have minimal effect on non-target species and natural environment and their use must take into account the need to prevent the development of resistance. Key stakeholders involved in the project are the three Ministries viz. Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Chemicals and Fertilizers (MoCF), and Ministry of Health and Family Welfare (MoHF&W) whose mandates and roles are given below:

The Ministry of Environment, Forests and Climate Change (MoEFCC) is the nodal ministry for planning, promoting and coordinating environmental programmes including the management of chemical disasters in India. The Ministry is mandated to protect the land, air and water systems and is responsible for the prevention and control of pollution including hazardous substances. MoEFCC is the GEF and Stockholm Convention focal point in the country, which coordinates activities and cooperation between relevant stakeholders of the NIP.

The Ministry of Chemicals and Fertilizers (MoCF) is mandated to control the production and scaling up of alternatives to chemical pesticides. The Department of Chemicals and Petrochemicals of MoCF is entrusted with the responsibility of policy, planning, development and regulations of chemicals and petrochemicals. The public sector named HIL under the MoCF is involved in the production, scaling up and setting up of the facility for industrial production of the alternatives, viz. production of synthetic pyrethroids, production of Long-Lasting Insecticidal Nets (LLINs), neem-based botanical pesticides and *Bti*-based biopesticides.

The MoHF&W mainly performs advisory role for matters related to public health including vector control programme in the country. The Ministry is responsible for the application, assessment and adoption of alternatives in public health activities; the State Health Departments coordinate and implement the project activities at the respective state level for the evaluation and assessment of newer alternatives to DDT in the field on the target pest; the National Vector Borne Disease Control Programme (NVBDCP), National Institute of Malaria Research (NIMR) and the National Centre for Disease Control (NCDC) undertake activities at the national level and make recommendations on the newer alternatives for adoption at the country level.

The Central Pollution Control Board (CPCB) provides technical services to the Ministry of Environment, Forests and Climate Change of the provisions of the Environment (Protection) Act, 1986. Principal functions of the CPCB are a) to promote cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution and b) to improve the quality of air and to prevent, control or abate air pollution in the country. The

United Nations Environment programme (UNEP) identified CPCB as executing agency for the project.

National Environmental Engineering Research Institute (NEERI), Nagpur is a constituent of Council of Scientific & Industrial Research (CSIR), New Delhi and has a nationwide presence with its five zonal laboratories at Chennai, Delhi, Hyderabad, Kolkata and Mumbai. NEERI is engaged in the research and development of better and scientific solid waste management practices, for more than four decades. It has research and development thrust areas viz. Environmental Health and Environmental Impact & Risk Assessment, etc. As CSIR-NEERI is endorsed as a Stockholm Convention Regional Centre (SCRC) on Persistent Organic Pollutants (POPs), it has been identified for implementing the components IV and V of the project. Accordingly, CPCB, the executing agency (EA) sub-contracted the project to the CSIR-NEERI, Nagpur.

2. Training Objectives

At the end of the training programme, the participants should be trained to:

- Describe the vectors and their role in Vector-Borne Diseases, the basic information about vector-borne diseases, how vector-borne diseases are transmitted, transmission cycle for respective vector-borne diseases and global distribution as well as the burden of the diseases in India.
- Define the vector, describe the morphological characteristics of adult and immature stages of mosquitoes and about the biology and ecology of vectors.
- Promotions and development of locally safe, effective, affordable and environmentally sound alternatives to DDT, Environment management methods for vector control: Biological control methods, Genetic control methods, Control of vectors by chemical, non-chemical methods, Natural and conventional vector control management strategies.
- Learn the role of Integrated Vector and Pest Management (IVPM), describe different control measures used to control vectors and pests, learn organization and management of IVM in different sectors including FFS and how IVM improves the awareness in the community through BCC.

3. Training Programme

This online training programme was conducted for 10 days for a period from 20/09/2021 to 01/10/2021, the total number of the training sessions were 10 and each session has 3 or 6 training parts. 74 participants from the three selected states including SPOs, DMOs, Zonal Entomologists, M&E Consultants, consultants IEC/BCC, entomologist IDSP and DVBDC participated in the training programme. Dr. L. J. Kanhekar coordinated all the training sessions and Dr. Gujju Gandhi welcomed all the speakers/training experts. The training content covered from Training module-1: DDT and Vector-borne disease, Training module-2: Vector morphology and bionomics, Training module-3: Alternatives to DDT in vector control management and Training module-4: Integrated vector and pest management developed by CSIR-NEERI under the project “Development and promotion of non-POPs alternatives to DDT”.

Training Module-1
DDT and Vector Borne Diseases

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT

(GEF Project ID: 4612)

Training Programme on

Integrated Vector Pest Management (IVPM)

Executed by

Central Pollution Control Board (CPCB)
Ministry of Environment, Forest and Climate Change
(MoEFCC)

Developed by

CSIR- National Environmental Engineering Research Institute, Nehru Marg, Nagpur- 440 020, India

2020

Cover page of Training Module-1

Training Module-2
Vector Morphology and Bionomics

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT

(GEF Project ID: 4612)

Training Programme on

Integrated Vector Pest Management (IVPM)

Executed by

Central Pollution Control Board (CPCB)
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Cover page of Training Module-2

Training Module-3
Alternatives to DDT in Vector Control Management

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT

(GEF Project ID: 4612)

Training Programme on

Integrated Vector Pest Management (IVPM)

Executed by

Central Pollution Control Board (CPCB)
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Cover page of Training Module-3

Training Module-4
Integrated Vector and Pest Management

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT

(GEF Project ID: 4612)

Training Programme on

Integrated Vector Pest Management (IVPM)

Executed by

Central Pollution Control Board (CPCB)
Ministry of Environment, Forest and Climate Change
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2020

Cover page of Training Module-4

4. Training Schedule

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Training of Trainers (TOT) and pilot testing of modules to promote non-POPs alternatives based Integrated Vector and Pest Management

Time Table: 10 days online Training Programme to SPO/Entomologists, VBD Consultants and DMOs from Arunachal Pradesh (22), Andaman & Nicobar Islands (5), Manipur (18), Nagaland (16) and Rajasthan (13)

Time	Topic (Lecture discussion)	Faculty
Day 1 (Monday) 20/09/2021		
All Participant Trainees are requested to join by 02.20 PM for attendance daily		
1430-1500	**Inaugural Function** **Welcome Address** : **Dr. S. Chandrasekhar**, Director, CSIR-NEERI **About the program** : **Dr. A. N. Vaidya**, Coordinator, Stockholm Convention Regional Centre, CSIR-NEERI **Address by** : **Dr. Jitendra Sharma**, Programme Management Officer, UNEP, Geneva **Chief Guest** : **Dr. Sujeet Kumar Singh**, Director, NCDC, Delhi **Vote of Thanks** : **Dr. A. Ramesh Kumar**, Sr. Scientist, CSIR-NEERI	
1500-1530	Introduction to DDT and its use in Vector Control	Dr A Ramesh Kumar/ All participant
1530-1600	Introduction to vector borne diseases: Malaria	Dr R S Sharma / All participant
1600-1630	Leishmaniasis (Kala-azar)	Dr Vijay Kumar/ All participant
1630-1700	Introduction to vector borne diseases: Dengue Chikungunya and Zika	Dr Kalpana Baruah/ All participant
1700-1730	Introduction to vector borne diseases: Plague	Dr N Balakrishnan/ All participant
Day 2 (Tuesday) 21/09/2021		
1430-1505	Introduction to vector borne disease: Japanese Encephalitis	Dr P T Joshi/ All participant
1505-1540	Introduction to vector borne diseases: Lymphatic Filariasis	Dr. P K Srivastava / All participant
1540-1615	Introduction to vector borne disease: Scrub Typhus	Dr T Ratna Joseph / All participant
1615-1650	Introduction to Crimean Congo Hemorrhagic Fever	Dr. K. Regu / All participant

1650-1730	Introduction to Kyasanur Forest Disease	Dr N Balakrishnan / All participant
Day 3 (Wednesday) 22/09/2021		
1430-1510	Morphology of vector mosquito	Dr L J Kanhekar/ All participant
1510-1550	Bionomics of vector mosquitoes	Dr / All participant
1550-1630	Morphology and Bionomics of sandflies	Dr Vijay Kumar / All participant
1630-1710	Morphology and bionomics of flies and fleas	Dr Amit Katewa / All participant
1710-1730	Feedback	Dr L J Kanhekar/ All Participants
Day 4 (Thursday) 23/09/2021		
1430-1520	Morphology and bionomics of Ticks and mites	Dr T Ratna Joseph / All participant
1520-1620	Entomological surveillance of VBDs	Dr Himmat Singh/ All participant
1620-1720	Alternatives to DDT in Vector Control Management – Conventional Methods & Environmental Management	Dr R S Sharma / All participant
1720-1730	Feedback from SPOs	Dr L J Kanhekar
Day 5 (Friday) 24/09/2021		
1430-1515	Entomological parameters and its importance Dr Himmat Singh/ All participant	
1515-1615	Vector control measures/ management: Biological and Genetic	Dr T Ratna Joseph / All participant
1615-1700	Vector control measures/ management: Chemical	Dr P. K. Srivastava / All participant
1700-1730	Neem derived products for vector control	Dr Y P Ramdev/ All participant
Day 6 (Monday) 27/09/2021		
1430-1515	NVBDCP Recommended Insecticide: Larval Source Management and Adult Vector Control	Dr K. Baruah/ All participant
1515-1600	Equipment for larviciding and adulticiding	Dr P. K. Srivastava / All participant
1600-1645	Integrated Vector Pest Management: IVM	Dr R S Sharma / All participant
1645-1730	IVPM: Behavior Change Communication	Dr P T Joshi/ All participant
Day 7 (Tuesday) 28/09/2021		
1430-1515	Integrated Vector Pest Management: IPM	Dr P. K. Srivastava / All participant

1515-1600	IVPM: Vector management through Farmer Field School approach	Dr R S Sharma/ All participant
1600-1645	Epidemiological surveillance and parameters	Dr T Ratna Joseph / All participant
1645-1730	Planning and implementation of IVPM	Dr R S Sharma/ All participant
Day 8 (Wednesday) 29/09/2021		
1430-1500	Monitoring and evaluation of IVPM	Dr Amit Katewa / All participant
1500-1615	Pilot testing Module – 1 input from participant trainees	Dr R S Sharma/ Dr L J Kanhekar/Participants
1615-1730	Pilot testing Module – 2 inputs from participant trainees	Dr Amit Katewa/ Dr L J Kanhekar/Participants
Day 9 (Thursday) 30/09/2021		
1430-1600	Pilot testing Module – 3 inputs from participant trainees	Dr T Ratna Joseph / Dr L J Kanhekar/Participants
1600-1730	Pilot testing Module – 4 inputs from participant trainees	Dr R S Sharma/ Dr L J Kanhekar/Participants
Day 10 (Friday) 1/10/2021		
1430-1530	Lecture/Discussion on FAQs materials	Dr T Ratna Joseph / Dr Gujju Gandhi/ All Participant
1530-1630	Lecture/Discussion on IEC materials	Dr Amit Katewa / Dr P T Joshi /All Participant
1630-1715	Feedback from Participant trainees & instructions	Dr L J Kanhekar/ Dr Gujju Gandhi
1715-1730	**Virtual Valedictory session**	Dr Ramesh Kumar/ Dr L J Kanhekar /

(Dr L J Kanhekar)
Project Consultant & Training Coordinator
CSIR-NEERI, Nagpur

Copy to: 1. **All Participant Trainees**

2. **State Programme Officers** of Arunachal Pradesh, Andaman & Nicobar Islands, Manipur, Nagaland and Rajasthan

5. Training programme Inaugural Function

Dr. A. Ramesh Kumar, Senior Scientist, CSIR-NEERI introduced the online training programme and explained the objectives of the same. He welcomed all the expert members and the participants. Dr. A. N. Vaidya, Coordinator Stockholm Convention Regional Centre (SCRC), CSIR-NEERI, briefed regarding Stockholm Convention and Regional Centre (Asia) for Stockholm Convention, CSIR-NEERI. He deliberated about the Persistent Organic Pollutants (POPs) and DDT. Dr. Jitendra Sharma Programme Management Officer, UNEP, Geneva; gave an introduction about the project 'Development and Promotion of Non-POPs Alternatives to DDT in vector control management. He explained the project objectives, the role of CSIR-NEERI in the project and importance of the project. He stated contribution of UNEP in the activities carried out in India. He also explained legal perspectives of DDT production and usage worldwide and in the nation.

Dr. Sujeet Kumar Singh, Director NCDC was the chief guest for the programme. He congratulated the NEERI staff for the development of four training modules and the IEC material and successfully organisation of previous two online training programmes with participant trainees from various states. He made a point that currently we are focused on the COVID-19 pandemic, but along with this, VBDs are also on the rise. He also spoke about the currently ongoing Dengue epidemic and Zika outbreak in Kerala and Rajasthan. He highlighted that people do not have the competency and they are not aware of the basics like larval breeding sites, vector identification, their biting patterns, etc. This training programme will help people to gain basic as well as advanced entomological knowledge and help them to combat VBDs (Fig. 1). Dr. A. Ramesh Kumar proposed the vote of thanks and suggested to the participants that this training programme should be an interactive one, and at the end of the programme, participants must fill the feedback forms provided to them.

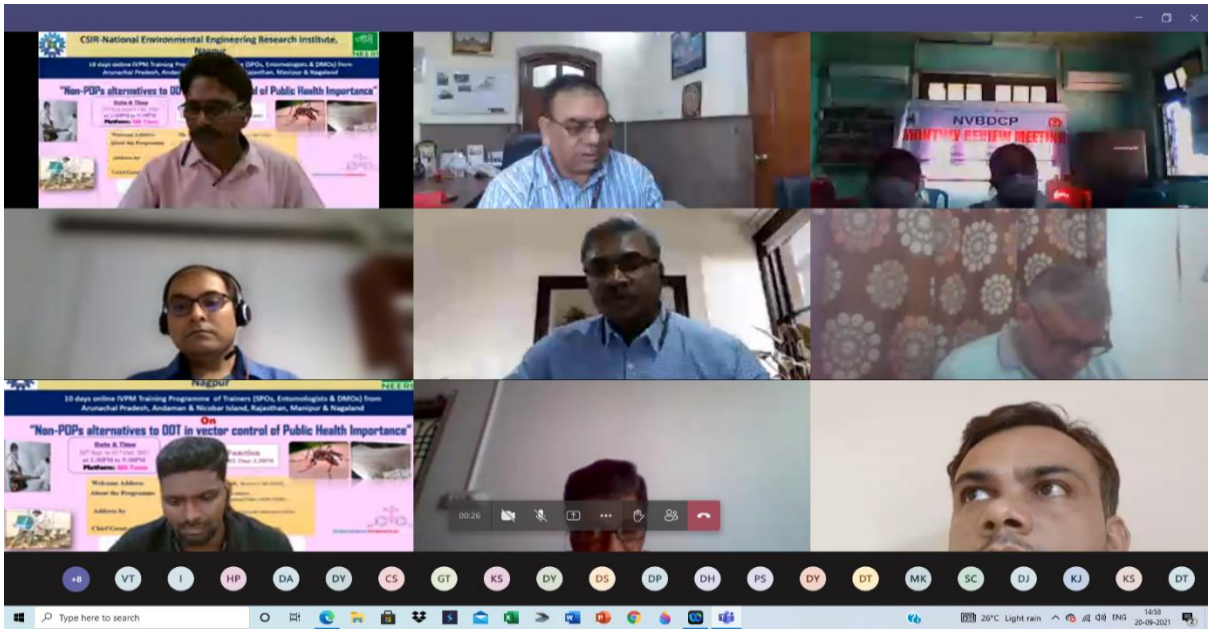

Figure – 1: Screenshot of Inaugural function

6. Training sessions

The total training sessions were 10, each session covered 3 or 6 parts and each part was conducted for approximately 1 hour, the time was managed depending on a questionary discussion at the end of the session. Every session was conducted in the afternoon from 2.30 pm to 5.30 pm.

6.1. Training session-1 (Monday) 20/09/2021

Training part - 1: Introduction to DDT and its use in vector control

The first lecture of the day was deliberated by Dr. A. Ramesh Kumar (Fig. 2). He started with an introduction to DDT and its use in vector control management. He stated the different properties of DDT and the reason for it being persistent. He explained the history and use of DDT with a year-wise supply of DDT in Indian states along with a brief introduction to POPs. He also talked about WHO action plan for a reduction in the use of DDT for disease control. A point was made that the main objective of the project is capacity building. He concluded his deliberation with a brief introduction to the project 'Development and Promotion of Non-POPs Alternatives to DDT in vector control management, and CSIR-NEERI's role in the same.

A question was asked by one of the participants Mrs. Sujalata Devi that how to dispose of expired DDT? To which Dr. P.K. Srivastava and Dr. R. S. Sharma answered that as DDT is supplied only according to state's requirement of DDT and within the permissible limits and needs of the respective state. Therefore, DDT should not be kept balance in the first place. If the expired DDT is present, the state SPOs should inform NVBDCP and NVBDCP will guide the states on what action is to be taken according to the national guidelines.

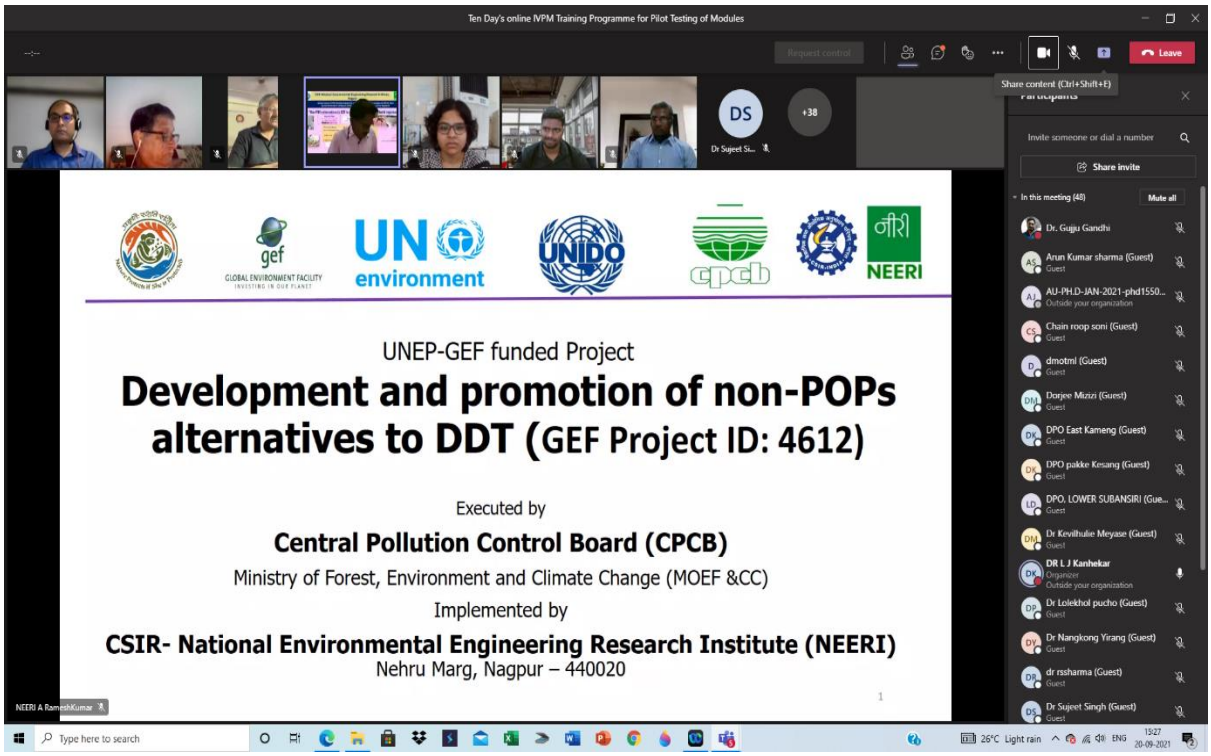

Figure-2: Lecture of Introduction to DDT and its use in vector control management

Dr. L. J. Kanhekar gave a brief introduction to the contents of the four training modules, booklets, FAQs and other IEC material.

Training part – 2: Introduction to vector-borne diseases: Malaria

The next lecture of the day was conducted by Dr. R. S. Sharma. He deliberated on the topic Introduction to vector-borne diseases with a main focus on the disease Malaria (Fig. 3). It was explained that VBDs include diseases caused by other vectors too along with the mosquitoes. He asked a question to the participants about the difference between sporozoites and gametocytes; to make the session interactive (Fig. 3).

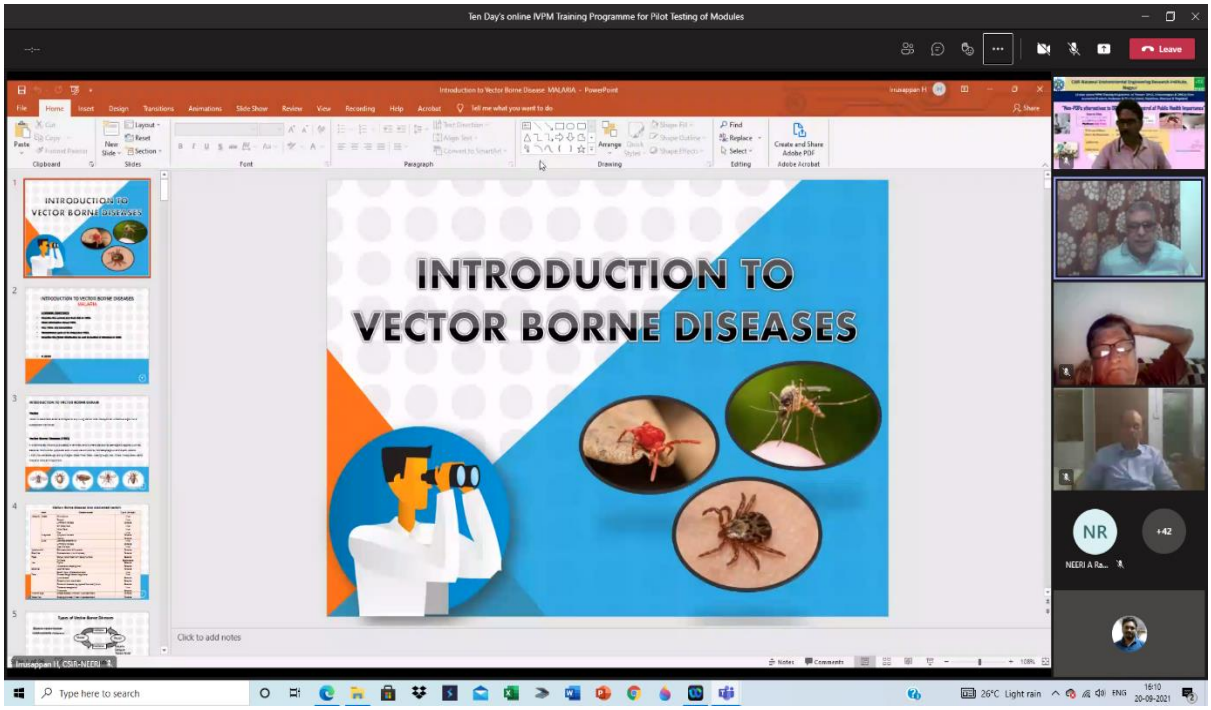

Figure-3: Lecture of Introduction to vector-borne diseases: Malaria

Training part - 3: Leishmaniasis (Kala-azar)

The next session of the training programme was held by Dr. Vijay Kumar. The topic for lecture/ discussion was Leishmaniasis (Kala-azar) (Fig. 4). He gave an introduction to Kala-azar. The causative agents of the disease were explained in detail. The national burden and global burden of the disease were stated. He explained the signs and symptoms of Kala-azar. One of the participants, Mr. Hedungkiebe, DVBO Peren, asked the possible causes of PKDL (Post Kala-azar Dermal Leishmaniasis) to which Dr. Vijay Kumar responded appropriately.

6.2. Training session-2 (Tuesday) 21/09/2021

Training part – 1: Introduction to vector-borne diseases: Japanese Encephalitis

The first session of the day was conducted by Dr. P. T. Joshi on the topic Introduction to vector-borne diseases, with the main focus on the disease Japanese Encephalitis (Fig. 5). He explained about the JE vectors in India. The transmission cycle was diagrammatically explained. Epidemiological patterns of JE in India including endemic and epidemic patterns were

explained. Insight was provided about the diagnosis and treatment. The national and global burden of the disease was explained.

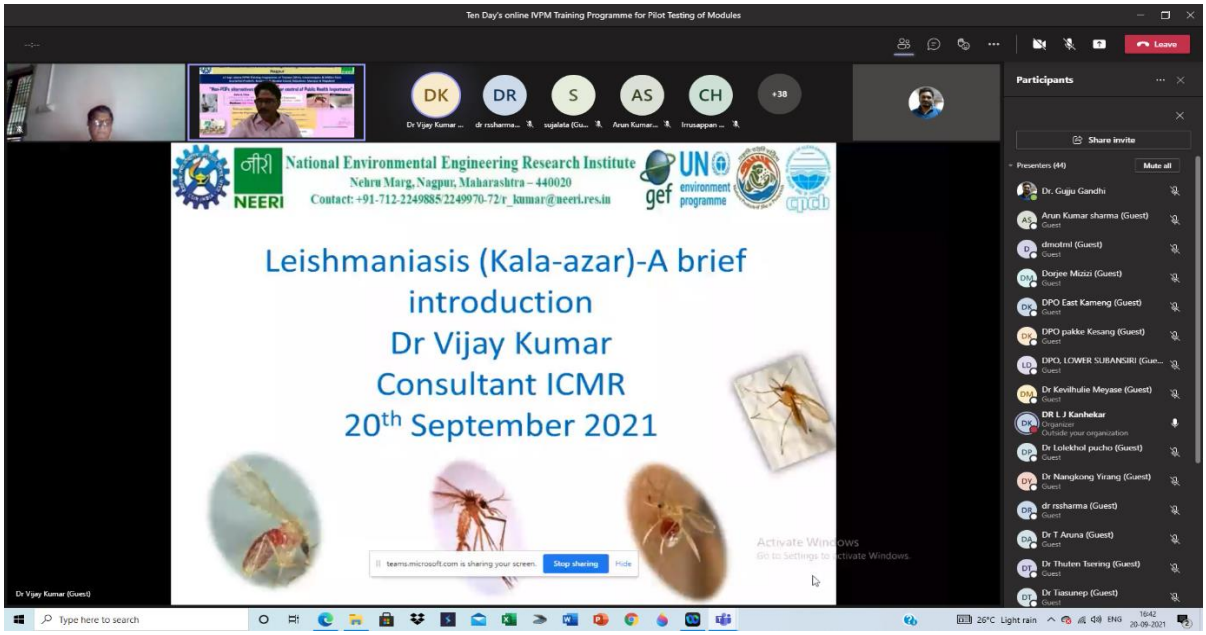

Figure-4: Lecture of Introduction to vector borne diseases: Leishmaniasis (Kala Azar)

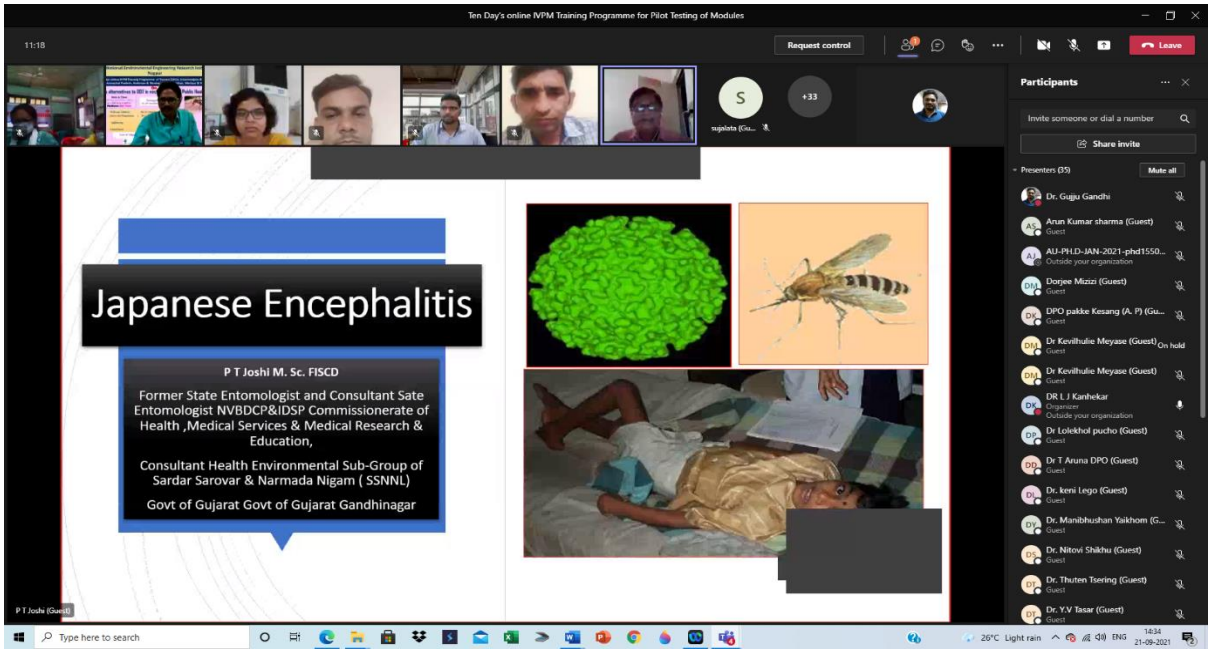

Figure-5: Lecture of Introduction to vector-borne diseases: Japanese Encephalitis

Training part – 2: Introduction to vector-borne diseases: Lymphatic Filariasis

The second lecture of the day was deliberated by Dr. P. K. Srivastava. The topic of discussion was Introduction to vector-borne diseases with the main focus on the disease Filariasis (Fig. 6). Different VBDs and vectors associated with them were stated. The transmission cycle of the disease was discussed. The Global and national burden of the disease was stated. He explained about the Filarial disease manifestations and Elimination strategy: 1997 onwards.

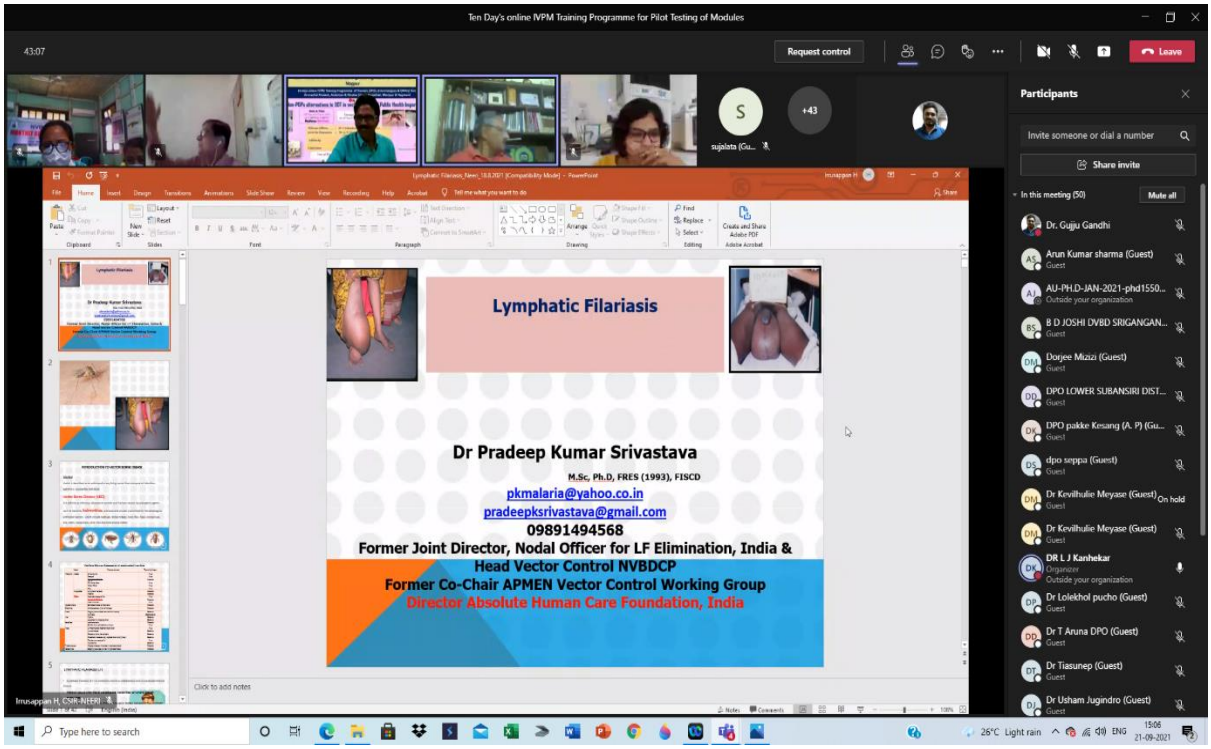

Figure-6: Lecture of Introduction to vector-borne diseases: Lymphatic Filariasis

Training part – 3: Introduction to vector-borne diseases: Scrub Typhus

The third session was coordinated by Dr. Ratna Joseph on the topic Introduction to vector-borne diseases with the main focus on the disease Scrub Typhus (Fig. 7). Causative agents of the disease *i.e.*, the vector and the pathogen were explained. The signs and symptoms of the disease along with the diagnosis and treatment were stated. The mode of transmission of the disease and transmission cycle was given. He stated the national disease burden. Mr. Vizobonuo Sophie asked about the vector control measures for the disease.

Dr. T. Aruna, DPO (Arunachal Pradesh) enquired if Scrub Typhus has any connection with the cardamon fields, to which Dr. Balakrishnan answered that mites may breed in the fallen leaves in humid conditions, thus providing a conductive environment for vectors. Dr. Aruna also asked for the probable reasons for failures in treatment, to which the expert replied that antibiotics prove to be an effective treatment but lack of diagnosis leads to an increase in cases. Mr. Gairanlung Taimei asked whom to approach for the Scrub Typhus diagnostic kits supply. The answer was given that NCDC must be approached for the same.

Training part – 4: Introduction to Crimean Congo Haemorrhagic Fever

The fourth lecture of the day was deliberated by Dr. K. Regu on the topic of Introduction to vector-borne diseases with the main focus on the disease Crimean Congo Haemorrhagic Fever (CCHF) (Fig. 8). He gave a brief introduction to global CCHF outbreaks. The mode of transmission and the transmission cycle of the disease were explained with the focus on an animal to human as well as the human-to-human cycles. The tick life cycle including two host ticks was explained. He threw light on clinical manifestations, diagnosis and treatment of the disease. The health concept of tick control was also explained. Dr. P. T. Joshi shared his

experience of the first-ever CCHF virus isolation in Gujarat. He told that both males, as well as female ticks, serve as the disease vector.

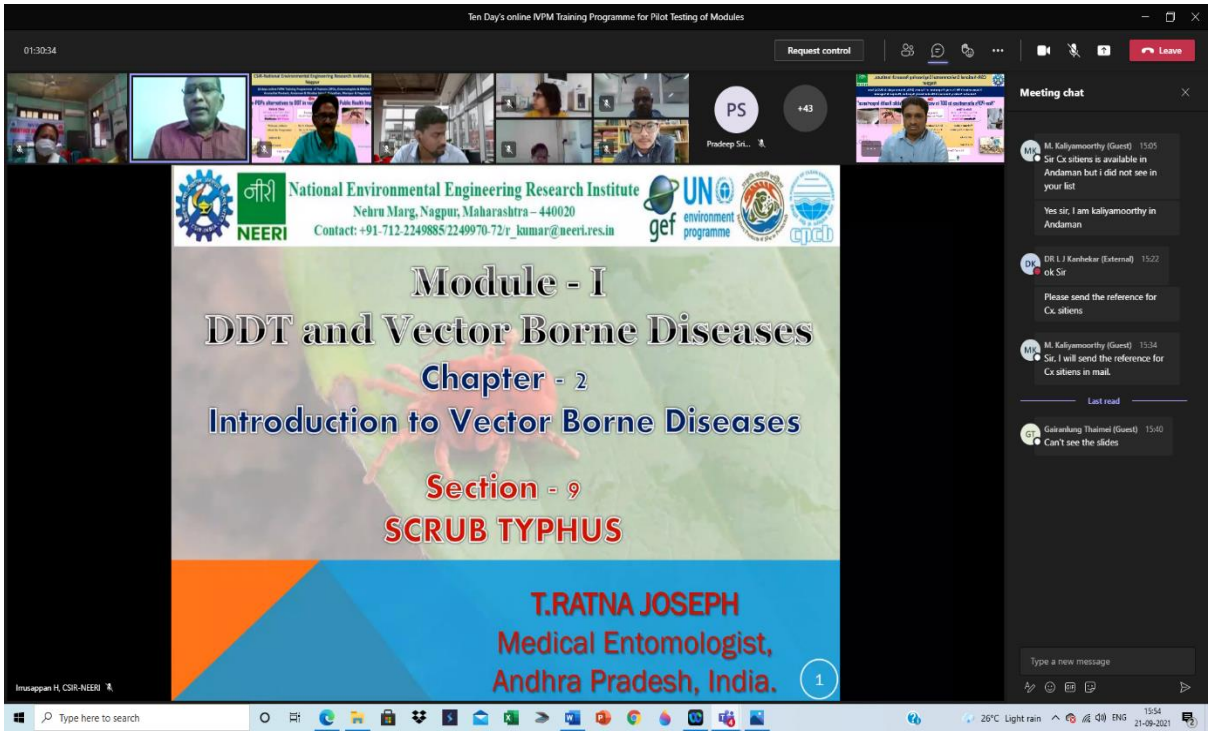

Figure-7: Lecture of Introduction to vector borne diseases: Scrub Typhus

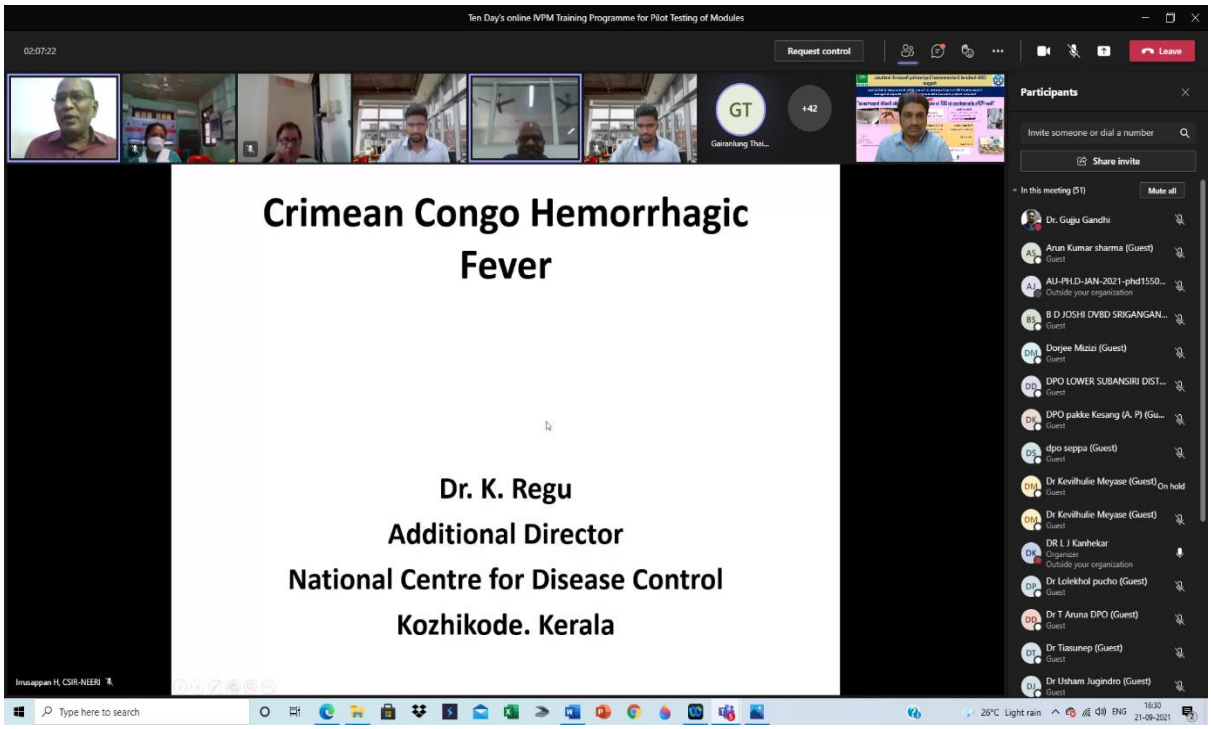

Figure-8: Lecture of Introduction to Crimean Congo Haemorrhagic Fever

Training part – 5: Introduction to Kyasanur Forest Disease and Plague

The fifth and the final session of the day was conducted by Dr. N. Balakrishnan on the topic of Introduction to vector-borne diseases with the main focus on the diseases of Kyasanur Forest Disease (KFD) and Plague (Fig. 9 & 10). It was explained that previously KFD was unique to the state of Karnataka, but only recently it has spread to its neighbouring states. Signs and symptoms along with the clinical manifestations of the disease were described. It was told that KFD is a six-month disease *i.e.*, it is prevalent only from January to June. Virus ecology and KFD vector were described. Epizootiology of KFD in wild monkeys was explained. KFD hot spots were explained. He discussed the preventive measures and KFD vaccine.

In his next deliberation, he talked about the pathogen and vectors of the Plague. Plague reservoirs and their susceptible hosts were discussed. The causative agent and transmission cycle of the Plague was explained. Types of human Plague were elaborated in detail. He discussed the current status of the disease in India. Mr. Nitovi Shikhu asked whether complete phasing out of DDT is possible; to which Dr. Balakrishnan answered that India is heading towards a complete DDT phase-out and the amount of DDT being used has reduced to a considerable extent from past few years. Ms. Sujalata Devi informed that some cases (2-3) of Scrub Typhus were identified in Manipur; which means that no active cases, but sporadic cases are present in the state of Manipur. Dr. T. Aruna, DPO (Arunachal Pradesh) questioned if there is any correlation between Bamboo flowering and Plague. Dr. Balakrishnan answered that Bamboo flowering occurs once in 250 years, and rodents feed on it thus increasing their fertility. This leads to their population increase and fleas breed on their fur, thus indicating a possible outbreak.

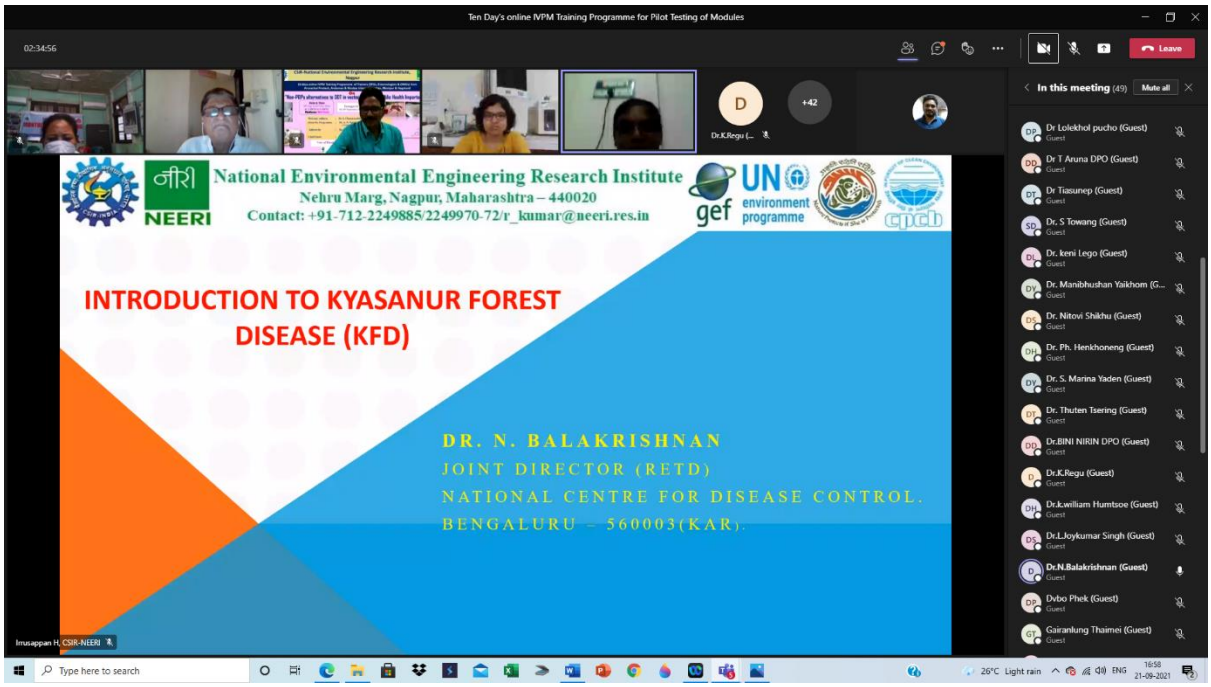

Figure-9: Lecture of Introduction to Kyasanur Forest Disease

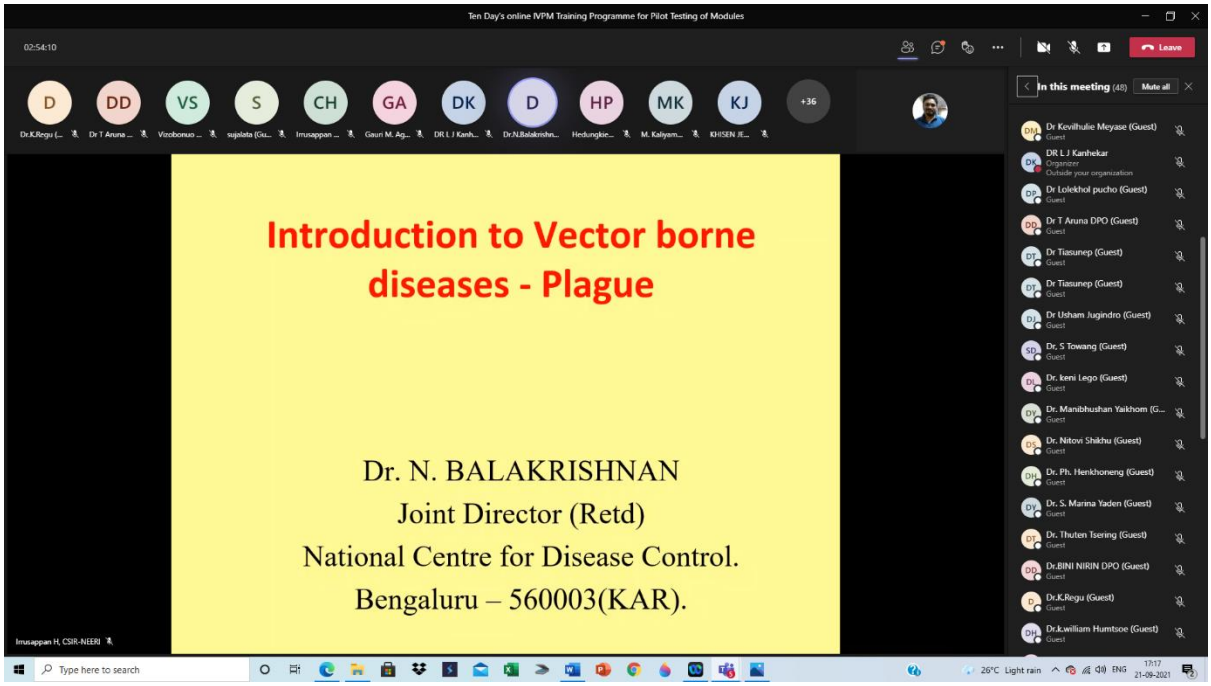

Figure-10: Lecture of Introduction to Plague

6.3. Training session-3 (Wednesday) 22/09/2021

Training part – 1: Introduction to vector-borne diseases: Dengue, Chikungunya and Zika; Morphology of vector mosquitoes

On the third day of the training programme, the first lecture of the day was deliberated by Dr. L.J. Kanhekar on the diseases Dengue, Chikungunya and Zika and Morphology of vector mosquitoes (Fig. 11). The three diseases were explained for their various parameters like the causative agents, signs and symptoms, transmission cycle, and global and national burden. Contents of training module 2 along with its objectives were explained by Dr. Kanhekar. He gave a detailed introduction to the vector mosquitoes. The classification and external morphology of all the vector mosquito species, its importance as disease vectors elaborately explained by Dr. Kanhekar in his lecture.

Dr. Sujalata Devi asked a question that why the term 'biting' is used when the mosquitoes do not have teeth but piercing and sucking parts. Dr. Kanhekar mentioned that the maxilla and mandibles along with other mouthparts help in cutting the skin; therefore, the term 'biting' is used. Dr. R. S. Sharma mentioned that when mosquito behaviour is being discussed, the term bite should be used and when the biting process is being explained, the terms like 'pierce and suck' can be used.

Training part – 2: Bionomics of vector mosquitoes

The second lecture of the day was deliberated by Dr. R. S. Sharma (Fig. 12). His topic was Bionomics of vector mosquitoes. In his lecture, he included different topics like biology and ecology of the vector mosquitoes, mosquito vectors prevalent in India, entomological and environmental factors, etc. Thermophilic and hydrophilic species were explained. Different ecosystems were discussed. Feeding, resting and breeding habitats of the mosquitoes were

discussed. Their genetic identification in different stages was explained. He deliberated about the distribution of malaria vectors in India. Dr. Kanhekar asked the participants from Rajasthan that which vectors play an important role in malaria transmission in Rajasthan. Dr. T. Aruna answered that *An. minimus* and *An. stephensi* are most prevalent.

Figure-11: Lecture of Introduction to vector borne diseases: Dengue, Chikungunya and Zika and Morphology of vector mosquitoes

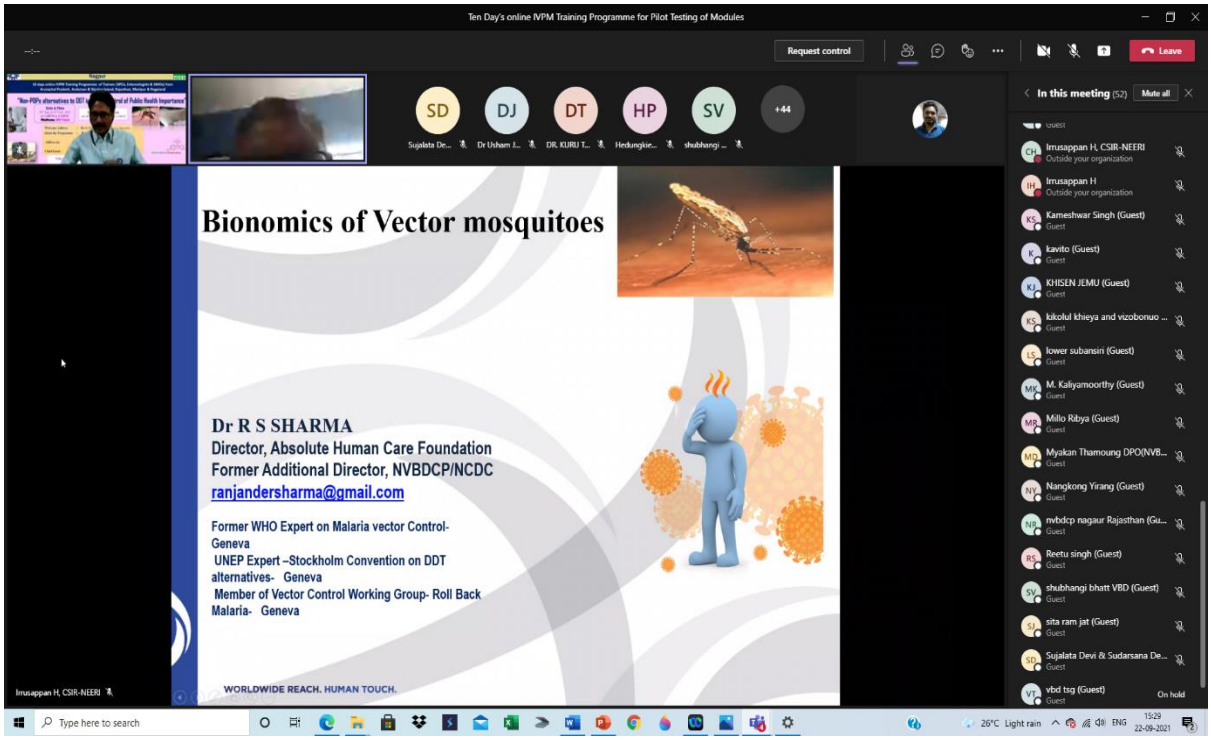

Figure-12: Lecture of Bionomics of vector mosquitoes

Training part – 3: Morphology and Bionomics of sandflies

The third lecture of the day was deliberated by Dr. Vijay Kumar on the topic of Morphology and bionomics of sandflies (Fig. 13). In his lecture, he explained in detail the classification and external morphology of the sandflies. Vector biology and vector ecology of the sandfly was explained. The life cycle of the sandfly including information about egg, larva, pupa and adult sandfly was explained elaborately. The concepts of vector biology and vector ecology were also explained. Ms. Imsubenla mentioned that there are no Kala Azar cases in Nagaland and that sandflies are rarely seen in the state. Dr. Kanhekar gave a pictorial explanation regarding the looks of the sandfly and mentioned that the whole body is hairy. The sitting posture of the sandfly was also explained.

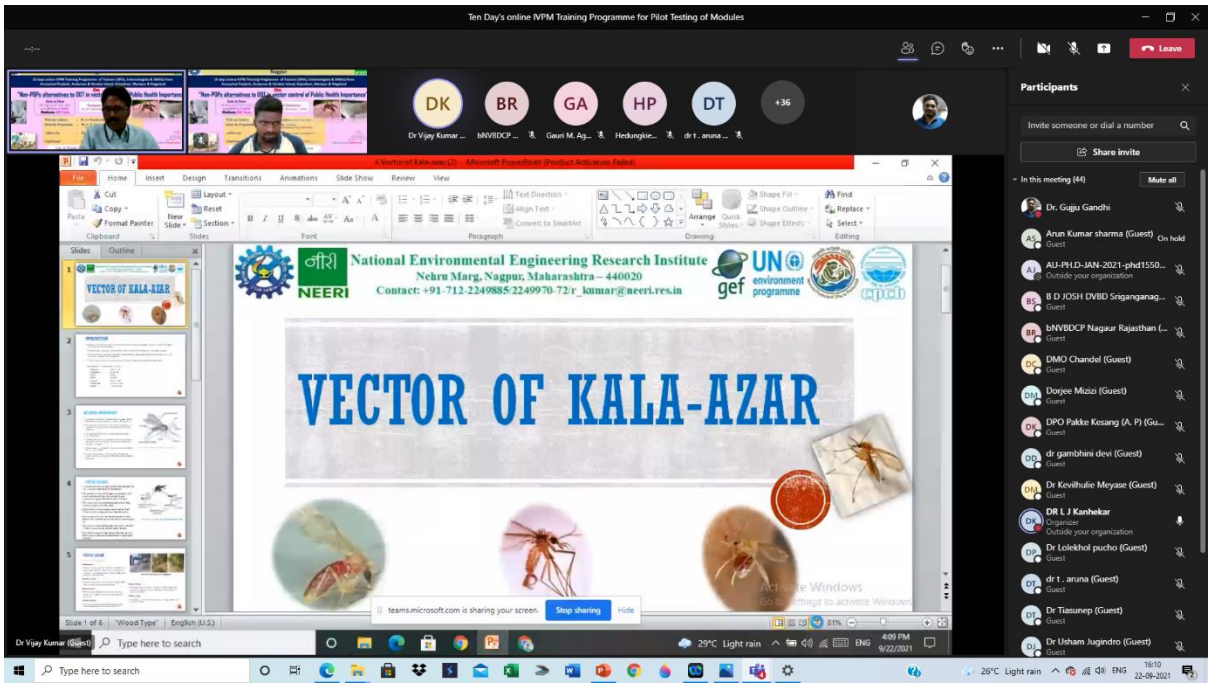

Figure-13: Lecture of Morphology and Bionomics of sandflies

Training part – 4: Morphology and Bionomics of flies and fleas

Dr. Gujju Gandhi and Dr. L. J. Kanhekar deliberated on the topic 'morphology and bionomics of flies and fleas (Fig. 14). Dr. Gandhi started with the introduction of fleas. In the introduction part, he deliberated about the characteristics and distribution of fleas, some of the species specifically occurring in India and the classification of fleas. He talked about fleas concerning Plague. In the morphology part, the head, thorax and abdomen of the fleas were briefly explained. The difference between male and female flea was clearly stated regarding its size, antenna and abdomen. The life cycle of the fleas was explained by Dr. Gandhi along with the different life stages like egg, larva, pupa and adult. The jumping pattern of the fleas was diagrammatically explained. Dr. Kanhekar covered the topic of a housefly. Classification of the housefly was stated. External morphology of the house fly along with a detailed explanation of its wings was given. The life cycle of the housefly including its different life stages like egg, larva, pupa and adult was explained. Breeding places of the housefly along with its pictorial representation was given.

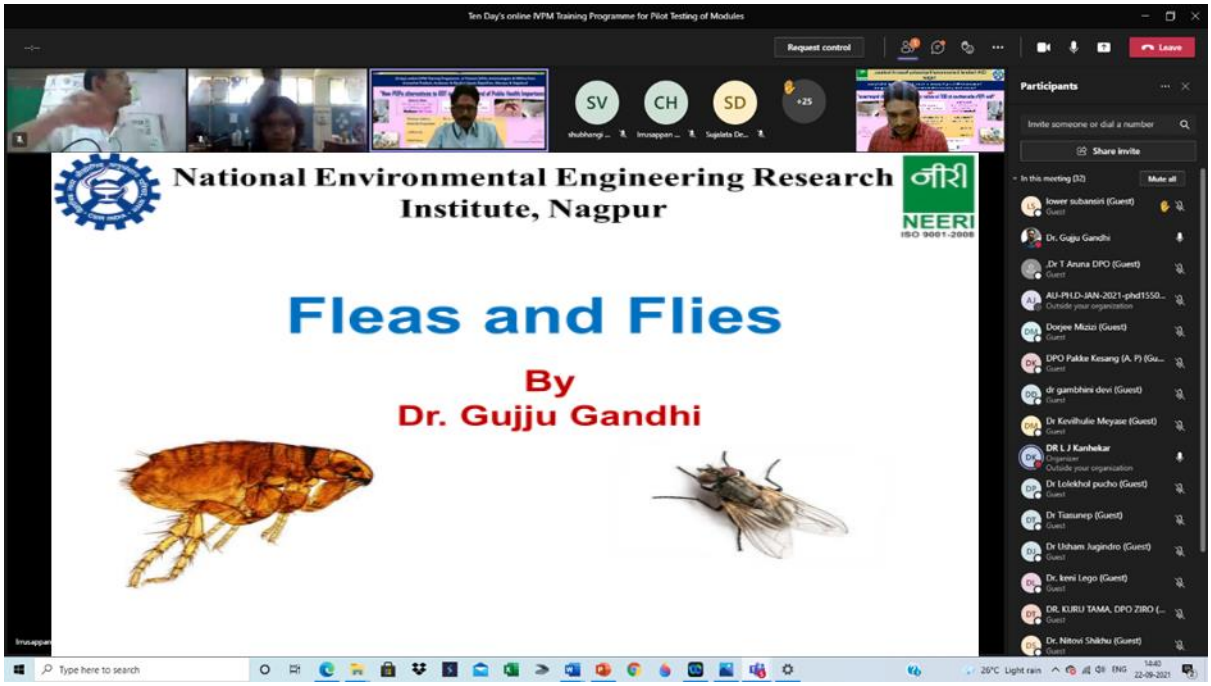

Figure-14: Lecture of Morphology and Bionomics of flies and fleas

Training part – 5: Participants' Feedback

The last and final session of the participants was conducted by Dr. L. J. Kanhekar, wherein he seeked for the questions, queries and suggestions from the participants. Mr. Sitaram Jatt from Jaipur, Rajasthan asked about the conventional methods as well as NVBDCP recommended methods for housefly control. Dr. Kanhekar asked the participants to send their statement of participation in the training along with the feedback forms. He informed the participants that in the further training, the feedback by the participants can be included, thus encouraging them.

6.4. Training session-4 (Thursday) 23/09/2021

Training part – 1: Morphology and Bionomics of ticks and mites

On the 4th day, the first deliberation was by Dr. Ratna Joseph, on the topic of Morphology and bionomics of ticks and mites (Fig. 15). He talked about the non-insect vectors of CCHF, KFD and Scrub Typhus. At the starting of his lecture, he shared his experience of working for one year on the project IOT Entomology wherein a device monitoring insect collection patterns and recording data for mosquito density while sitting at home was set up. Soft ticks and hard ticks along with their similarities and differences were explained. External morphology and biology and ecology of ticks and mites were explained. Mr. Millo Ribya, Assistant Entomologist asked the procedure for collecting mites, while Dr.T. Aruna, DPO (Arunanchal Pradesh) asked whether the mites dwell in salty water. Dr. Joseph replied that the mites rest not in the salty water, but can be present in the vegetation surrounding the salty water or at the beaches. Some personal protection measures too were recommended by Dr. Joseph for protection from the mites.

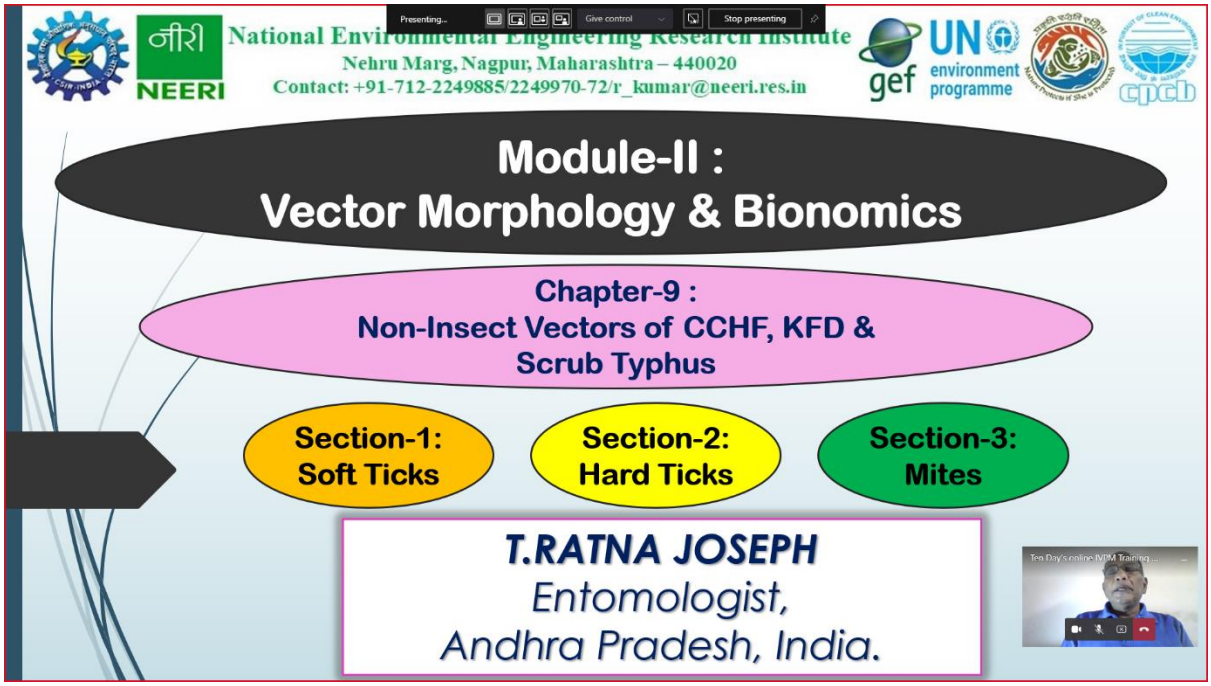

Figure-15: Lecture of Morphology and Bionomics of ticks and mites

Training part – 2: Entomological surveillance of VBDs

The 2nd lecture of the day was deliberated by Dr. Himmat Singh on the topic of Entomological surveillance of vector-borne diseases. The lecture started with the collection methods of adult sandflies. The importance of data selection was stated by Dr. Singh. He made a point that data should be selected according to the study to be undertaken. The concepts of collection of adult mosquitoes, larval collection, the purpose of collection and types of collection including qualitative and quantitative collection were explained. The basis on which collection is to be done was explained. The next topic was types of adult collection, in which he included devices for collection, the process of collection and spray sheet collection including its objectives, the time required and items required (Fig. 16).

In the landing collection part, the principle and objectives of collection and collection methods including human bait collections and animal bait collections were mentioned. In the trap collection part, the principle and objectives of collection and types of traps including fixed traps, portable traps, mechanical devices, funnel traps, exit traps, Magoon traps and veranda traps were mentioned. He also explained the concepts of tent traps, light traps, vehicle-mounted traps, mosquito traps, sticky traps and ovitraps. Brief information about the outdoor collection was given. The main objectives of larval collection and its methods were stated. Dr. L. J. Kanhekar talked about the chigger collection from the rat ear lobes. Sujalata Devi asked whether it is necessary to consider weather conditions for adult vector collection. Dr. Singh answered that yes, it is mandatory and adults are to be collected in their resting hours between 6 to 8 a.m.

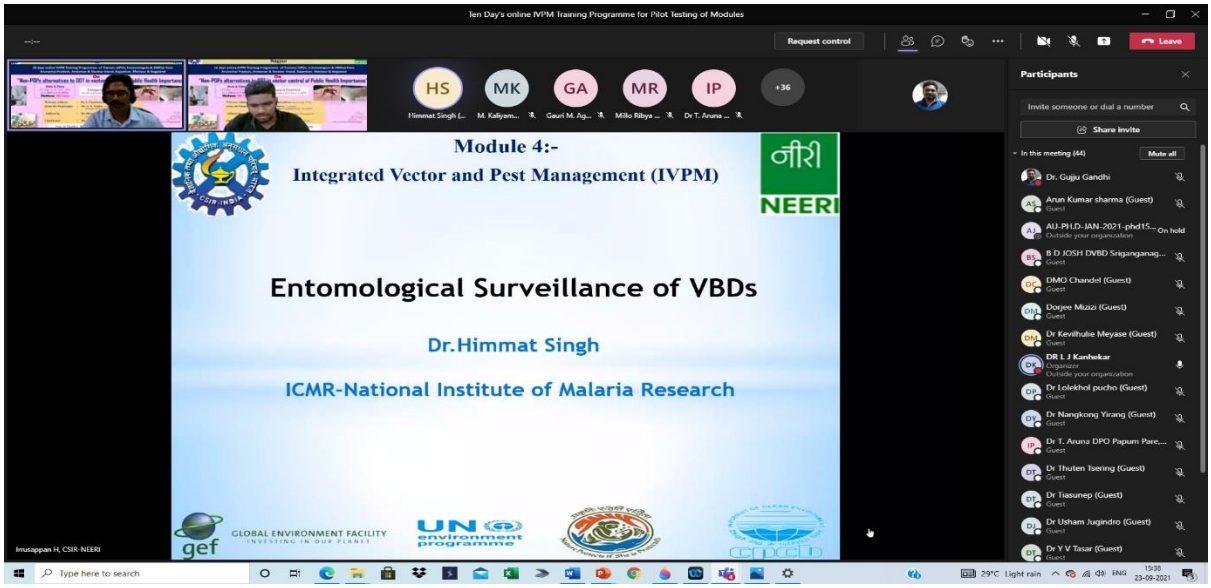

Figure-16: Lecture of Entomological surveillance of VBDs

Training part – 3: Alternatives to DDT in vector control management- conventional methods and environmental management

The third lecture of the day was deliberated by Dr. R. S. Sharma. His topic was Alternatives to DDT in vector control management. He started with an introduction to VBDs and novel vector control tools. NVBDCP recommended methods for vector control management were briefly explained. Some of the conventional and long used methods were talked about. The concept of Environmental management including Environmental manipulation and Environmental modification was explained. The importance of regular water and electricity supply to reduce VBDs was explained (Fig. 17).

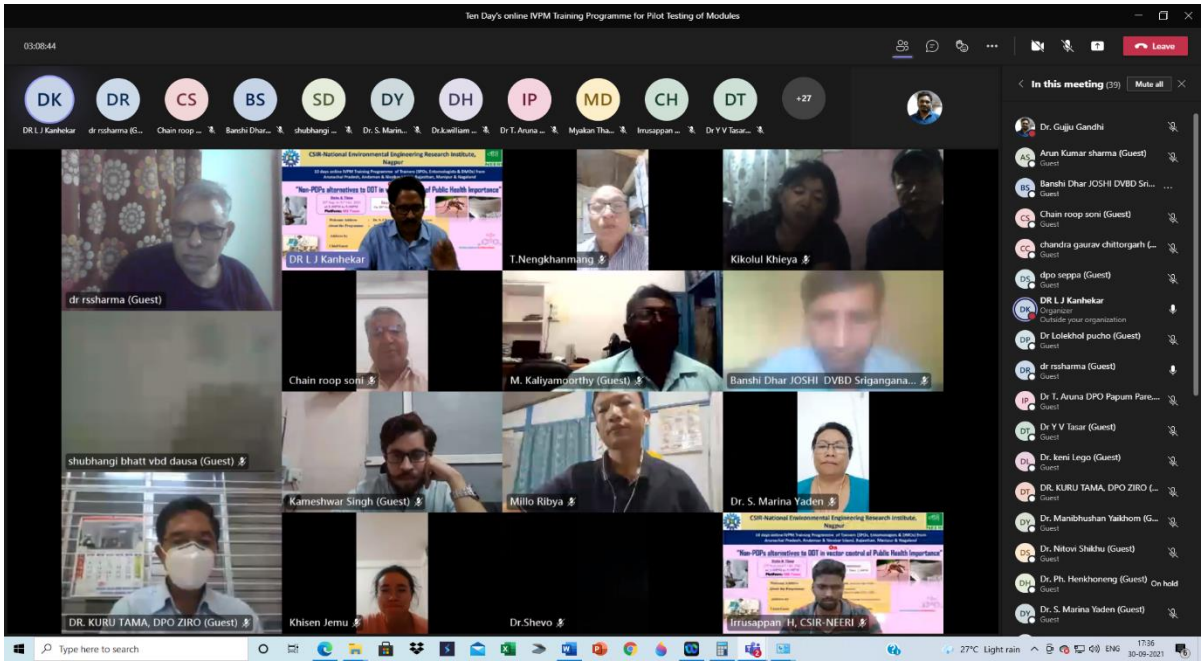

Figure-17: Lecture of Alternatives to DDT in vector control management- conventional methods and environmental management

Training part – 4: Feedback from SPOs

In the final session of the day, Dr. L. J. Kanhekar conducted an interactive feedback session with the state SPOs, experts and all the participants. Dr. Kuru Tama, DPO (Arunanchal Pradesh) asked if all the mosquitoes are killed, won't it lead to ecological imbalance? Dr. Sharma answered that we cannot kill all the mosquitoes as they are one of the most primitive creatures on the earth. Nature always tries to maintain an ecological balance; the problem is an imbalance caused by a greater number of vectors in the form of VBDs. Dr.Nitovi Shikhu asked if we suddenly shift away from DDT, won't the mosquito population increase? Dr. Sharma made everyone understand that vector control and DDT elimination is not that easy and intersectoral collaboration along with community participation is very important for DDT and malaria elimination. Dr. Kanhekar asked the participants to fill the feedback forms (Fig. 18).

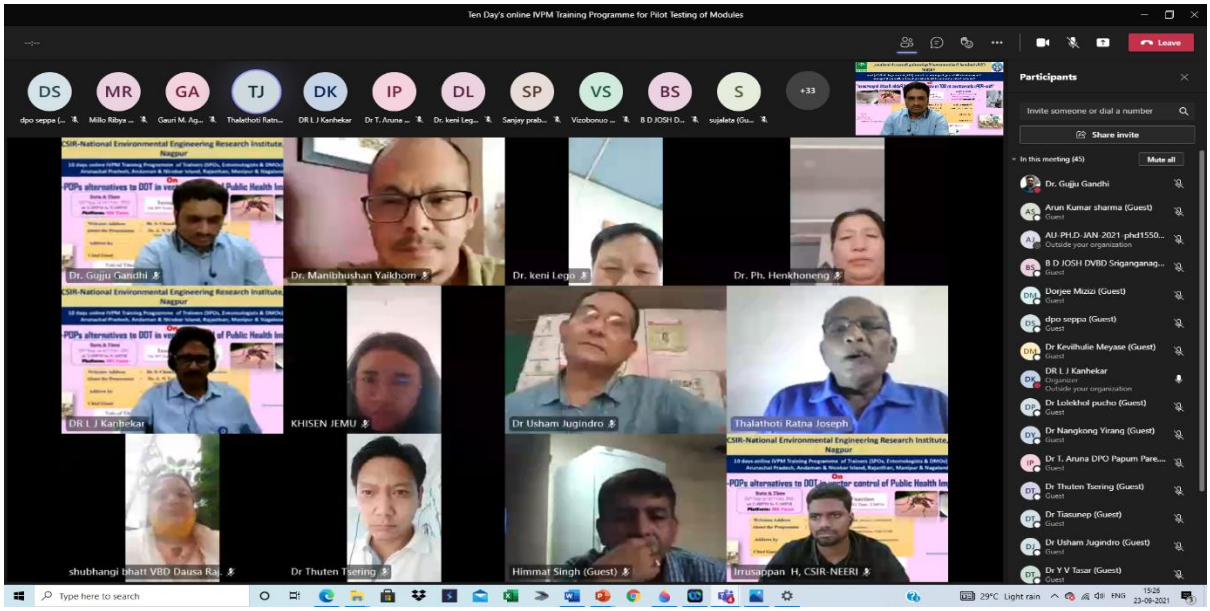

Figure-18: Discussion on Feedback from SPOs

6.5. Training session-5 (Friday) 24/09/2021

Training part – 1: Entomological parameters and its importance

24th September 2021 was the 5th day of the training programme. The first training session was taken by Dr. Himmat Singh (Fig. 19). He deliberated on Entomological parameters and its importance. In the lecture, the importance of the entomological surveillance parameters was explained. He made the participants understand the adult vector parameters used in Malaria control. Entomological indices were briefly explained. A diagrammatic representation of unfed, fully fed, semi gravid and gravid mosquitoes was given. Mosquito life expectancy and longevity were explained. The concepts of parity rates, vectorial capacity and larval survey were elaborated. An entomological survey of Lymphatic Filariasis was discussed. Mr. M. Kaliyamoorthy asked that what is more important, pupal index per house or pupal index per person; to which Dr. Singh answered that pupal index per house is more important and pupal index per person can be calculated on our own too. Ms. Sanju Choudhary asked how to calculate the vector density of the filaria vector? Dr Himmat Singh answered elaborately.

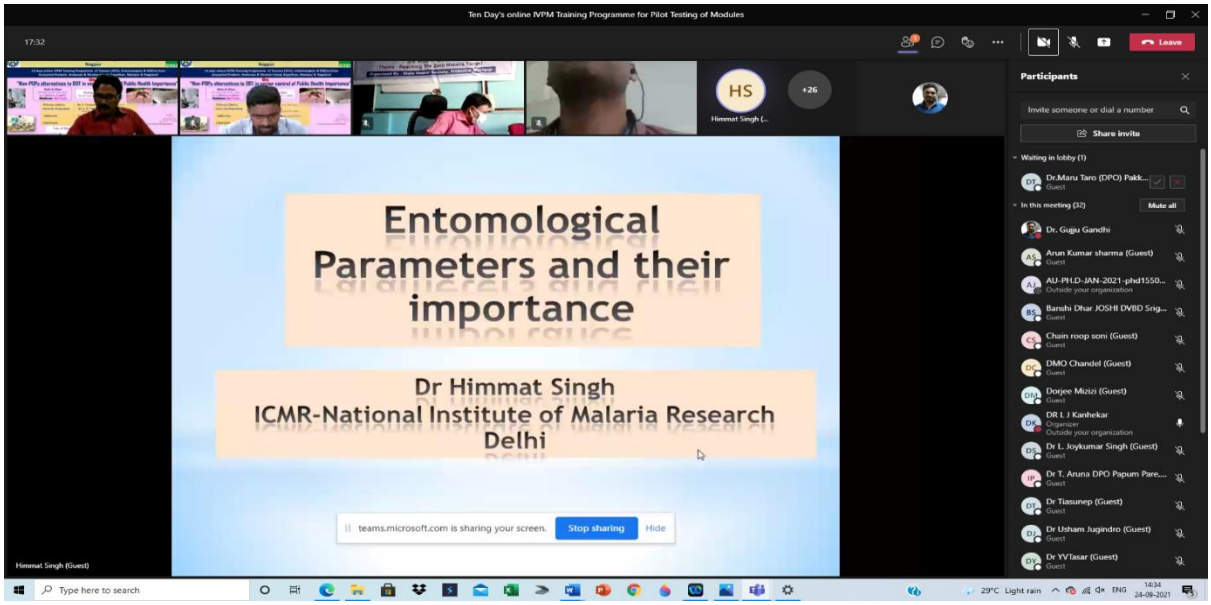

Figure-19: Lecture of Entomological parameters and its importance

Training part – 2: Vector control measures/management: Biological and Genetic

The second lecture was deliberated by Dr. Ratna T. Joseph on the Biological and Genetic vector control measures (Fig. 20). He talked about the advantages of biological control management under biological management. He discussed the desirable attributes of bio-control agents including Predators, Parasites, Parasitoids and Pathogens like Copepods, Nematodes, Flatworms, Fungi, Invertebrate predators, Anuran predators, Bacteria and Larvivorous fishes including Gambusia, Guppy, Tilapia and Carp. The salient features of genetic control were discussed. He explained how the genetic control management systems work. Different types of genetic controls like Sterilization, Irradiation and Gene modifications were discussed. The advantages and disadvantages of genetic control and Genetically Modified Organisms (GMOs) were stated. Mr. M. Kaliyamoorthy (Andaman) questioned about an increase in *Aedes* population despite using *Gambusia*. It was answered that, *Aedes* breeds mostly in manmade containers and *Gambusia* can't thrive in small and manmade containers.

Training part – 3: Vector control measures/management: Chemical

The third session was conducted by Dr. P. K. Srivastava on the topic, 'Chemical vector control measures. Plant products as chemical vector control including Pyrethrum and Neem derived products were discussed. Synthetic chemicals including organic chemicals, like Organochlorines, Organophosphates, Carbamates and Synthetic pyrethroids were discussed. Insect Growth Regulators (IGRs) were discussed under larval source management. He deliberated about the dosages and formulations of different chemical larvicides recommended by NVBDCP. Under The topics like Indoor Residual Spray (IRS), Long Lasting Insecticidal Nets (LLINs), Indoor space spray and outdoor fogging including thermal fog and cold fog were discussed briefly under adult vector control (Fig. 21).

Preparation of ready to use suspensions and applications of insecticides like DDT 50% W.P., Malathion 25% W.P., Deltamethrin 2.5% W.P., Cyfluthrin 10% W.P., Alphacypermethrin 5% W.P., Lambda-cyhalothrin 10% W.P. and Bifenthrin 10% W.P. for IRS, recommended by

NVBDCP were explained. Dr. Srivastava advised changing the images of LSM pump, Indoor space spray and thermal fog. Ms.Sanju Choudhary mentioned that there is kerosene scarcity in Rajasthan and seeked for its alternative in MLOs. Dr. Srivastava added that diesel may be used instead of kerosene oil, though it has not been approved by the programme. Some water-based formulations are also coming up. One more participant asked whether ticks and mites be controlled by wettable powders. It was answered that ticks and mites can't pick up the powder as mosquitoes do, so dust formulations must be used for ticks and mites control. It was also mentioned that any compounds which have not been approved by NVBDCP should strictly not be used.

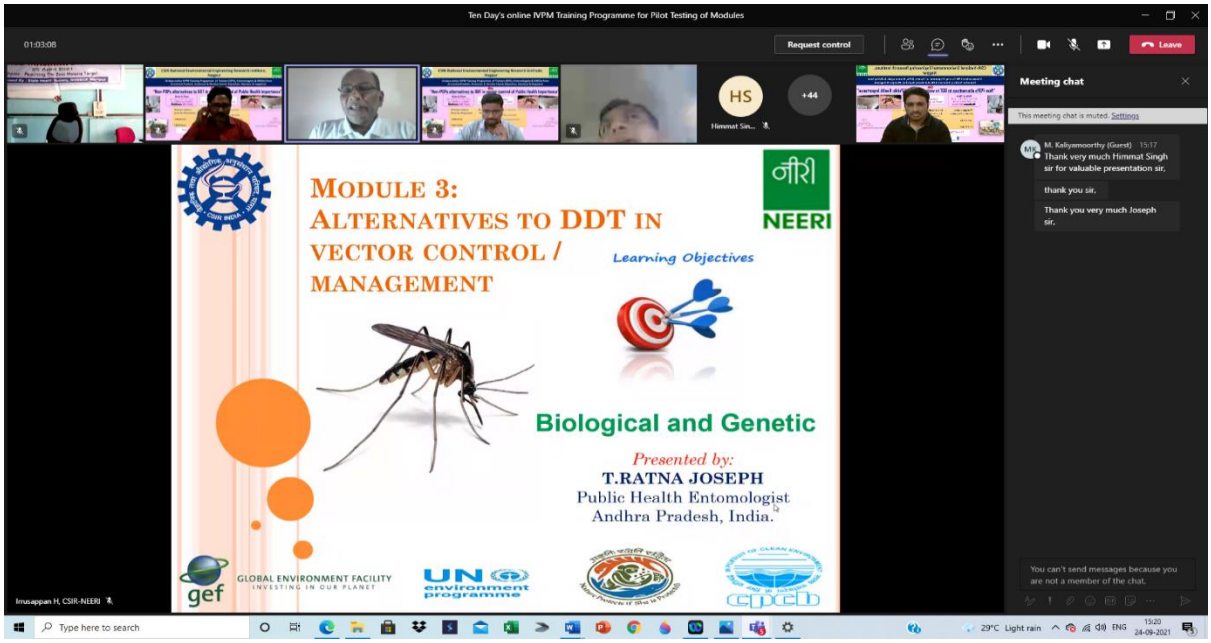

Figure-20: Lecture of Vector control measures/management: Biological and Genetic

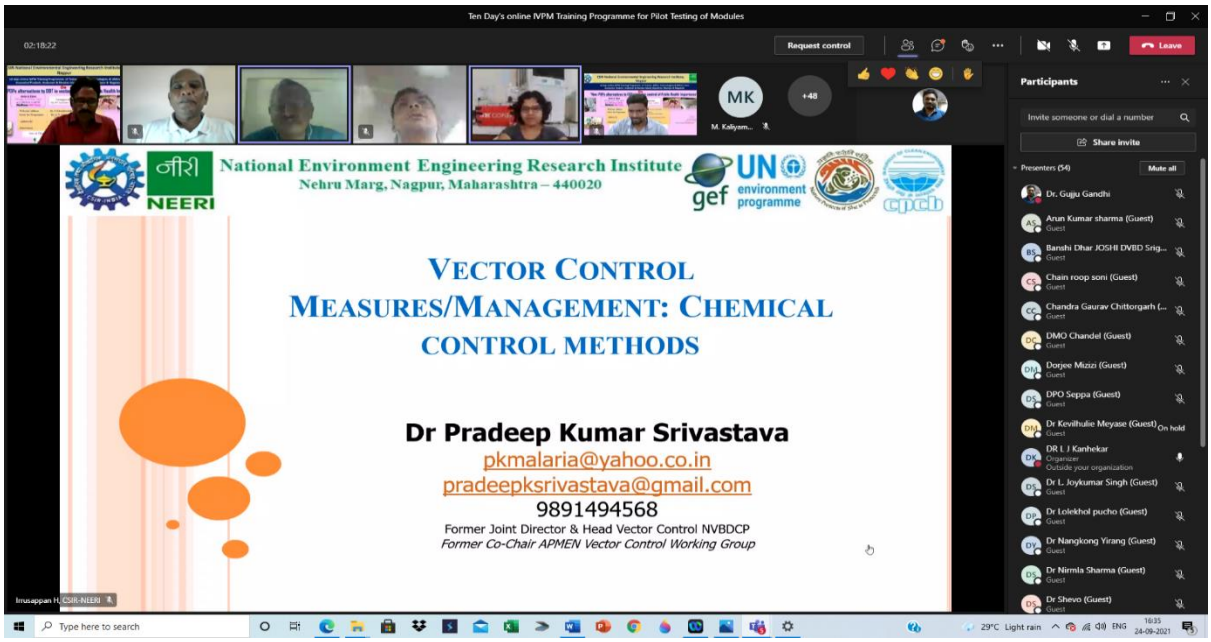

Figure-21: Lecture of Vector control measures/management: Chemical

Training part – 4: Neem derived products for vector control

The final session of the day was coordinated by Dr. Y. P. Ramdev on the topic Neem derived products for vector control. Introduction to Stockholm Convention of POPs and its status of ratification was given. A brief introduction to DDT and its application was given. He talked about the effective application of pesticides. He deliberated about the objectives and priorities of the National Implementation Plan (NIP). The DDT phase-out strategy was discussed. He talked of Neem as a crop protection agent and explained the various uses of Neem in agriculture, cosmetics, medicine and vector control agent (Fig. 22).

The advantages of Neem based pesticides were explained in detail. Dr. Nitovi Shikhu from Nagaland asked whether mosquitoes can develop any resistance against neem. Dr. Ramdev answered that there is a very low possibility of resistance in the case of neem as neem is a mixture of different and more than one compound, and those chemicals have a single compound so the selection pressure is very high leading to the development of resistance. He further asked whether neem is associated with any human health hazards. It was answered that neem products are very safe for humans.

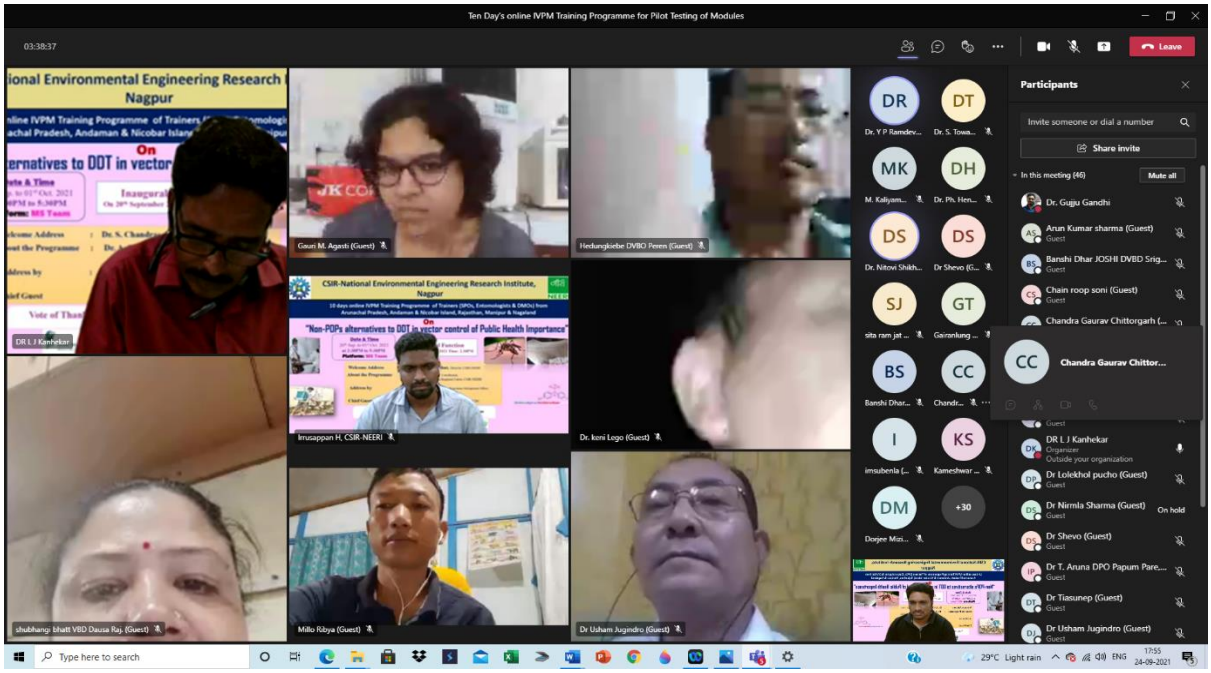

Figure-22: Lecture of Neem derived products for vector control

6.6. Training session – 6 (Monday) 27/09/2021

Training part – 1: NVBDCP Recommended Insecticide: Larval Source Management and Adult Vector Control

The first training of the day was coordinated by Dr. Kalpana Baruah (Fig. 23). The topic of the discussion was NVBDCP recommended insecticides for Larval source management and adult vector control. She started by explaining the concept of Larval Source Management (LSM) and where it is to be performed. The four types of LSM were explained. She emphasized Habitat modification and Habitat manipulation. The use of chemical larvicides and their dosages and formulations recommended by NVBDCP were stated. The use of Mosquito Larvicidal Oil

(MLO) was explained. The concept of Insect Growth Regulators (IGRs) was explained. Different bio-control agents like *Bacillus thuringiensis* var *israelensis* (*Bti*), copepods, nematodes, fungi, flatworms, invertebrate predators, Anuran predators and different larvivorous fishes were explained. Under the adult vector control different chemical adulticides, Indoor Residual Spray (IRS), Indoor space spray, Outdoor fogging, thermal fogs, cold fogs and Long-Lasting Insecticidal Nets (LLINs) were elaborated. NVBDCP recommended formulations, preparations and applications; of different synthetic insecticides for IRS were stated in a tabular form. At the end of the session Dr. Aruna asked *Bti* effect on non-target organisms? Dr. Kalpana Baruah said *Bti* is not affected by non-target organisms.

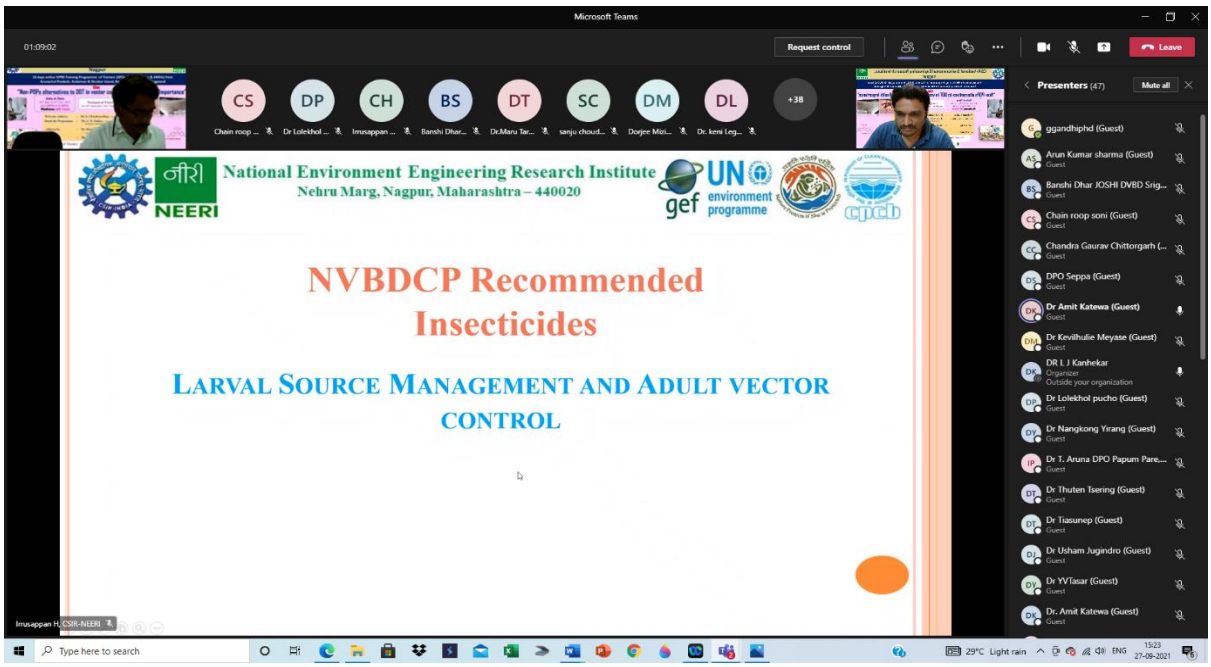

Figure-23: Lecture of VVBDCP Recommended Insecticides

Training part – 2: Equipment for larviciding and adulticiding

The 2nd deliberation lecture of the day was conducted by Dr. P. K. Srivastava on the topic of Equipments used for larviciding and adulticiding. He explained different tools for larval and adult mosquito control like a Knapsack sprayer, a hand compression pump, stirrup pump; different fogging machines like a portable fogging machine, ultra-low volume (ULV), and vehicle-mounted thermal and cold fogging machines. Different types of nozzles used for spraying were explained in detail along with the Control Flow Valves (CFVs). Different sizes of spray particles were diagrammatically explained. Dr. P. K. Srivastava asked participants which nozzle was used for IRS operations; participants told Flat Fan Nozzle. Dr. Kanhekar suggested to refer page number 48-55 chapter 9, where details about Equipment for larviciding and adulticiding are illustrated.

Training part – 3: Integrated Vector Management

The third lecture of the day was deliberated by Dr. R. S. Sharma on the topic Integrated Vector Management (IVM) (Fig. 24). He started with the introduction and learning objectives of Integrated Vector Management. The key elements of IVM were described. The features of Integrated Vector Control Methods and their importance were discussed. The collaboration of various sectors and central as well as state-level was discussed. He explained different types of

Integrated Pest Management. The concept of Behaviour Change Communication (BCC) was explained in detail. The introduction and objectives of Planning and Implementation were taught to the participants. Various methods of mosquito sampling and determinants of local diseases along with the selection of vector control methods were described. Later, he covered the IVM implementation strategy and Monitoring and evaluation portion. Techniques of collection of adult sandflies and mosquito larval collection methods were discussed. Entomological surveys of different VBDs were explained along with their epidemiological parameters. Dr. C. M. Thamoung was asked neem products can be affected by non-target organisms? Dr. R. S. Sharma said the neem products were not affected by non-target organisms and also Dr. Amit Katewa brought to notice that insecticides recommended by NVBDCP should be use in a vector control programme (Fig. 24).

Figure-24: Lecture of Integrated vector management (IVM)

Training part – Behaviour Change Communication (BBC)

The 4th lecture of the day was held by Dr. P. T. Joshi on the topic IVPM: Behaviour Change Communication. He gave a brief introduction to the concept of BCC, its objectives and tools. The concepts of Farmer Field Schools (FFS), Accredited Social Health Activist (ASHA) and Multi-Purpose Health Workers (MPHW) were explained. He explained the breeding places and life cycles of various mosquitoes important as vectors of different vector-borne diseases. He deliberated on awareness about using the Insecticide Treated Nets (ITNs) along with the different ways to prevent mosquito bites (Fig. 25).

6.7. Training session-7 (Tuesday) 28/09/2021

Training part-1: Planning and Implementation of IVPM

The first lecture on training of the day was deliberated by Dr. R. S. Sharma on the Planning and implementation of IVPM. He started with the learning objectives and introduction to the concept of planning and implementation of IVPM. He made the participants understand the

importance of epidemiological assessment and entomological parameters. The IVM implementation strategy was discussed along with the roles of various sectors in the implementation of IVPM. The success story of IVPM in Sri Lanka was given as an example. Then he was continuously deliberated to training part-2: vector management through farmer field school approach. Dr. Kaliyamoorthy from Andaman asked IVM taken through schools and colleges it's become very sensitively effect for vector control? Dr. R. S. Sharma said yes and also a collaboration with the health and education sector mentioned in module number 4.

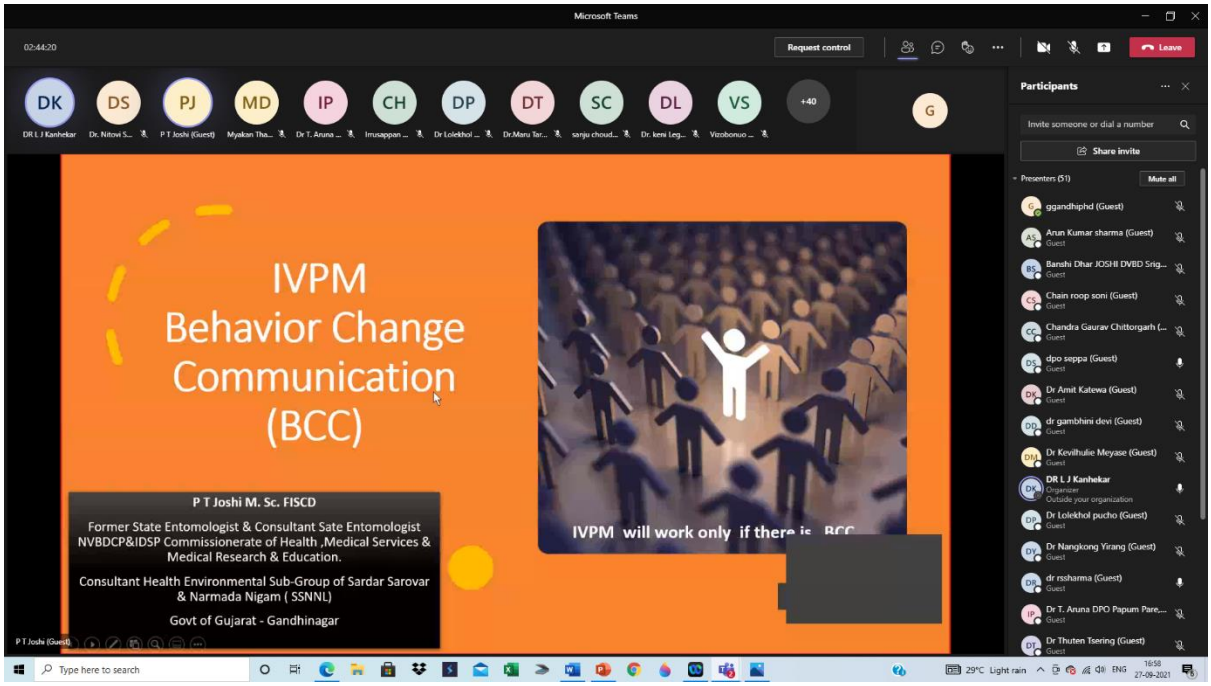

Figure-25: Lecture of Behaviour Change Communication

Training part-2: IVPM: Vector management through Farmer Field School approach:

The 2nd lecture of the day was deliberated by Dr. R. S. Sharma on the training part IVPM: Vector management through Farmer Field School approach. The concept of IVPM briefly introduced to understand FFS. How Farmer Field Schools (FFS) can be used for vector control and the health risks associated with agriculture were discussed. The role of FFS at the field level was explained. He elaborated on the role of health trainers in coordination between IVM and IPM (Fig. 26).

Training part -3: Integrated Pest Management (IPM)

The third lecture of the day was deliberated by Dr. P.K. Srivastava on the topic Integrated Pest Management (IPM). He started with the introduction and learning objectives of Integrated Pest Management. The key elements of IPM were described. The features of Integrated Pest Control Methods and their importance were discussed. The collaboration of various sectors and central as well as state-level was discussed. He explained different types of Integrated Pest Management. The concept of Behaviour Change Communication (BCC) was explained in detail. Pest management through the FFS (Farmer Field Schools) approach was discussed. The introduction and objectives of Planning and Implementation were taught to the participants.

Miss Imsubenla asked what control measure can you suggest for *An. dirus?* Do IRS is used in cattle shed? Dr. Srivastava suggested the Personal Production of vector control especially LLIN during the sleeping and according to 1995 health policy chemical insecticide, IRS should be avoided in the cattle shed.

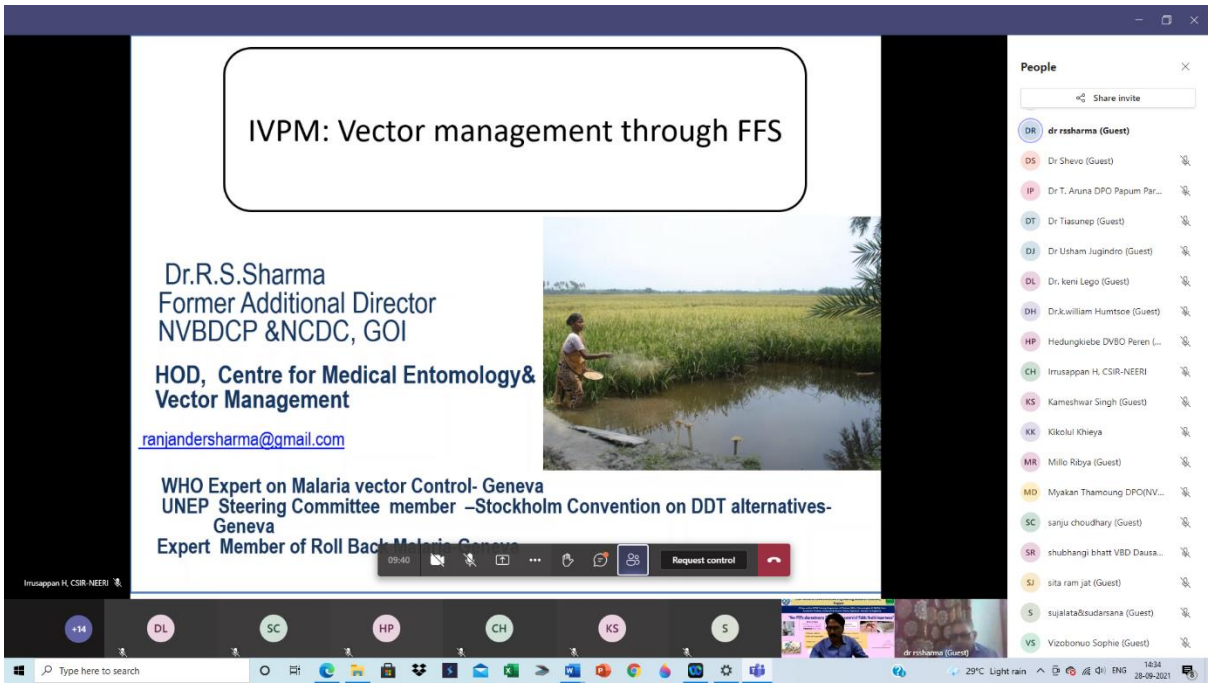

Figure-26: Lecture of Vector management through FFS

Training part – 4: Epidemiological surveillance and parameters

The fourth and last lecture of the day was deliberated by Dr. Ratna Joseph on the topic of Epidemiological surveillance parameters. He started with the introduction to the term 'Epidemiology' and its definition. He talked about the epidemiological assessment techniques and an epidemiological triad of VBDs. Different epidemiological surveillance methods like incidence, prevalence along with its types, ABER, API, A*f*I, SPR, S*f*R were discussed. Parameters of Malaria, LF and other VBDs were given. Dr. Henkhoneng Mate asked what are fogging procedure is for the JE outbreak? Dr. Srivastava suggested to follow NVBDCP guidelines.

6.8. Training session-8 (Wednesday) 29/09/2021

Training part – 1: Monitoring and evaluation of IVPM

This training session was conducted by Dr. Amit Katewa on the training topic Monitoring and Evaluation of IVPM (Fig. 27). An introduction to the methods of monitoring and evaluation, their outcome indicators, entomological parameters and epidemiological surveillance was given. The organization and management of IVPM, its structure within the health sectors and the indicators to monitor were explained. Entomological surveillance including adult surveillance, collection of adult mosquitoes, collection of adult sandflies and larval collection methods were explained. Insecticide resistance monitoring through various susceptibility tests was explained. Entomological surveillance techniques for different VBDs were elaborated.

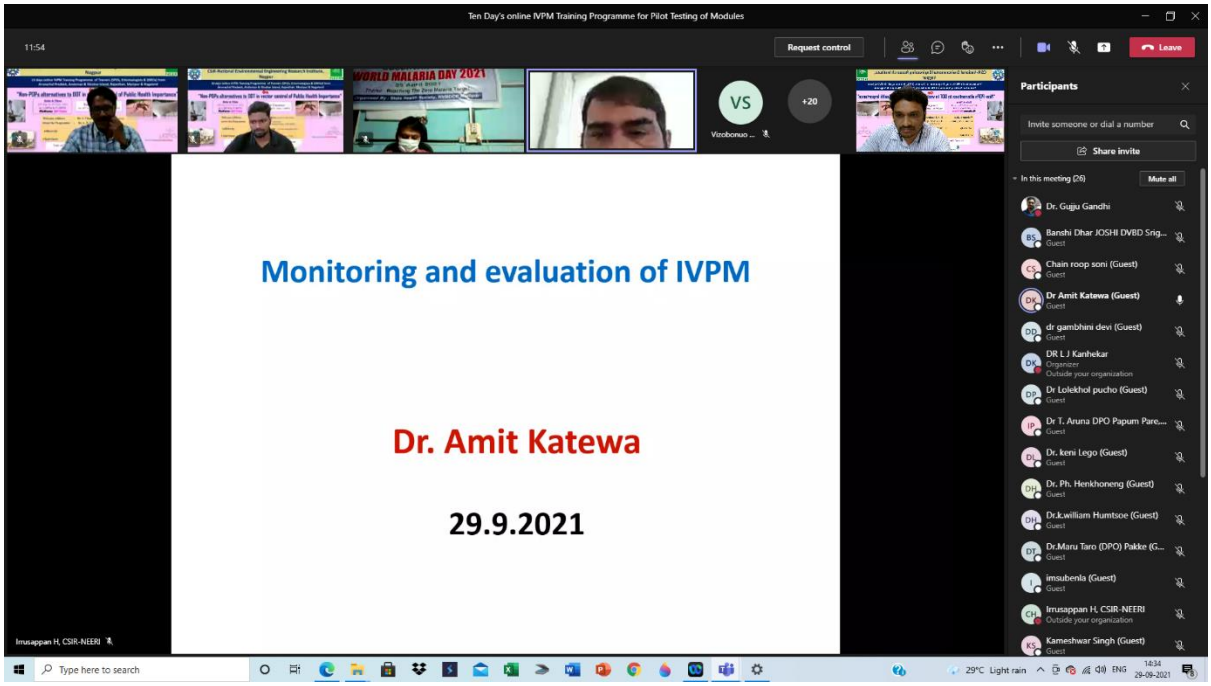

Figure-27: Lecture of Monitoring and evaluation of IVPM

Training part – 2: Pilot testing module -1 & 2 input from participant trainees

This part training session was conducted by Dr. R. S. Sharma and Dr. Amit Katewa, in which he had an interaction with the participants, the SPOs and VBD consultants to know their observations, suggestions and queries regarding the training modules – 1 & 2 chapter wise and the ongoing vector control methods in the respective States. SPO of Manipur suggested to include some portions for 'endemic and epidemic management in the training modules. Amitabha De, SPO of Andaman Nicobar gave positive comments on the modules such as it was very useful for our regular work and also useful for monitoring and evaluation programmes followed by Arunachal Pradesh, Nagaland and Rajasthan.

Dr. T. Aruna suggested to include a flow chart of steps for monitoring evaluation in the training modules. Mrs H. Sudersana Devi asks to include JE diagnosis procedure in training module one. Mrs Vizobonuo Sophie suggested to include a different chart for vector bionomics in the training module-2. Ritu Singh suggested to include a comparative chart for all vector morphology and bionomics and also suggested to make it more simplified in the malaria transmission. Sanjay Prabhakar wants to include control measures of rodents.

6.9. Training session – 9 (Thursday) 30/09/2021

Training part – 1: Pilot testing Modules - 3 inputs from participant trainees

Dr. Ratna Joseph coordinated the next session in which inputs regarding modules 3 and 4 were expected from the participants (Fig. 28). He explained that the main focus of the modules is on the phasing out of DDT and not the medical aspects of the VBDs like signs, symptoms, diagnosis and treatment. He briefed about all the contents covered in module no. 3 and 4 and also stated that the reviews can be critical and of focused agenda. Dr. Kaliyamoorthy, from Andaman, mentioned that the basic as well as the technical level has been covered in the

modules and also wanted to suggest to include photograph of the biocontrol agent and NIMR abbreviation. Mr. Bhansidhar gave comments on larvivores fish development procedure to include in the training module, Dr. Ratna Joseph said that procedure already mentions in module no.3. Miss Khisen Jemu said training module 3 is very informative for an alternative to DDT and she wants to include a plant picture of plant-based vector control method chapter in module - 3. All the participants stated that even the community doesn't want to use DDT and needs alternatives to DDT.

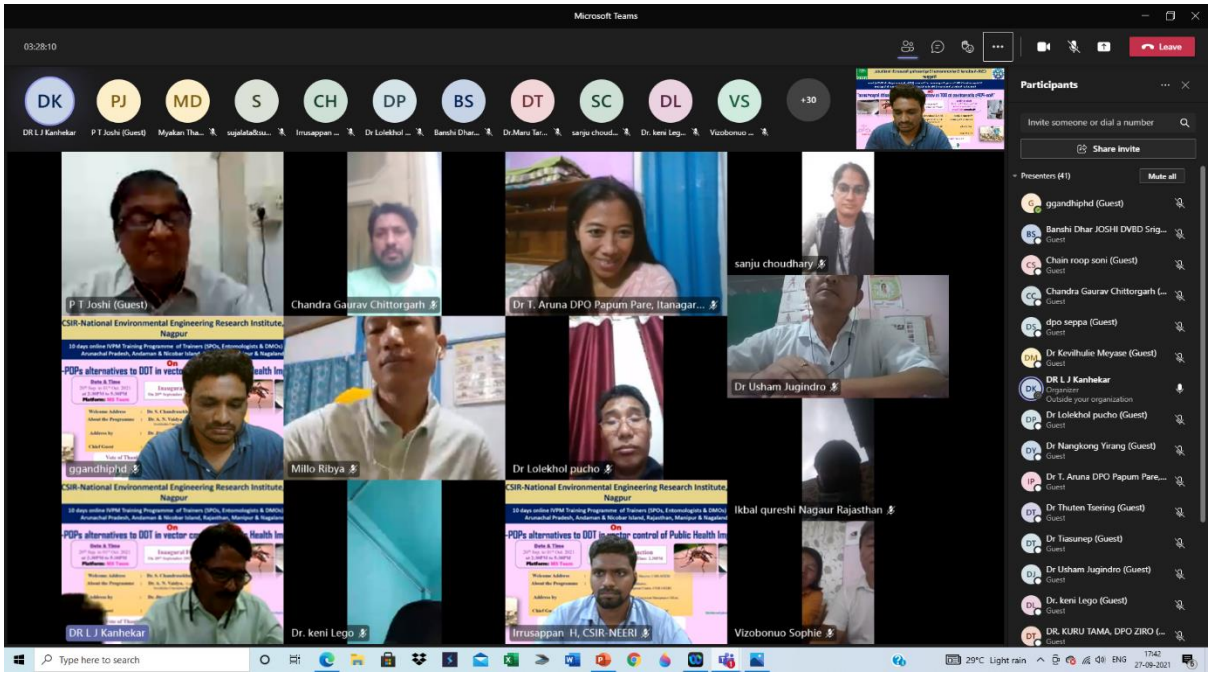

Figure-28: Discussion part of Pilot testing Modules - 3 inputs from participant trainees

Training part – 2: Pilot testing Modules - 4 inputs from participant trainees

Introduction to the contents of Module no. 4 was given by Dr. Amit Katewa. He stated that this module is very important from the operational point of view and he explained chapter wise. Then he was kept open suggestions and comments for participants. Dr. T. Aruna from Arunachal Pradesh suggested to add blood smear procedure in the malaria epidemiological parameter chapter in the training module-4. She also commented on the NVBDCP recommended insecticide. Dr. S. Marina mentioned module-4 is very useful and deliberately for those who are working in the VBDs control programme. Dr. C. M. Thamoung from Arunachala Pradesh said, the training module-4 is very useful for us and especially organization and management and intersectoral collaboration were mentioned. Dr. Nengkhanmang from Manipur requested to make it final version of training module-4 because she wants to use it in the regular practice of the vector control programme.

6.10. Training session – 10 (Friday) 01/10/2021

Training part: Lecture /Discussion on FAQs & IEC materials

Dr. Amit Katewa and Dr. Ratna Joseph conducted this training part discussion on the FAQs and the IEC material prepared by the NEERI team. Dr. Joseph explained that the FAQs are

general questions providing the basic introduction to the subject for common people and people outside the health departments. Participant trainees seek clarifications from the experts regarding the topics like guidelines for usage of LLIN and personal protection. Mrs. Vizobonuo Sophie asked what is the imported case of malaria, Dr. Ratna Joseph explained imported malaria case is an infection in which the infection was acquired outside the area in which it is diagnosed. Dr. Amit Katewa suggested translating the IEC material into local languages so that it will be easy for common people to understand, these suggestions were mentioned in the last training programme also. The most of participant trainees did not mention any negative comments but appreciated the efforts and found satisfied with FAQs and IEC materials (Fig. 29).

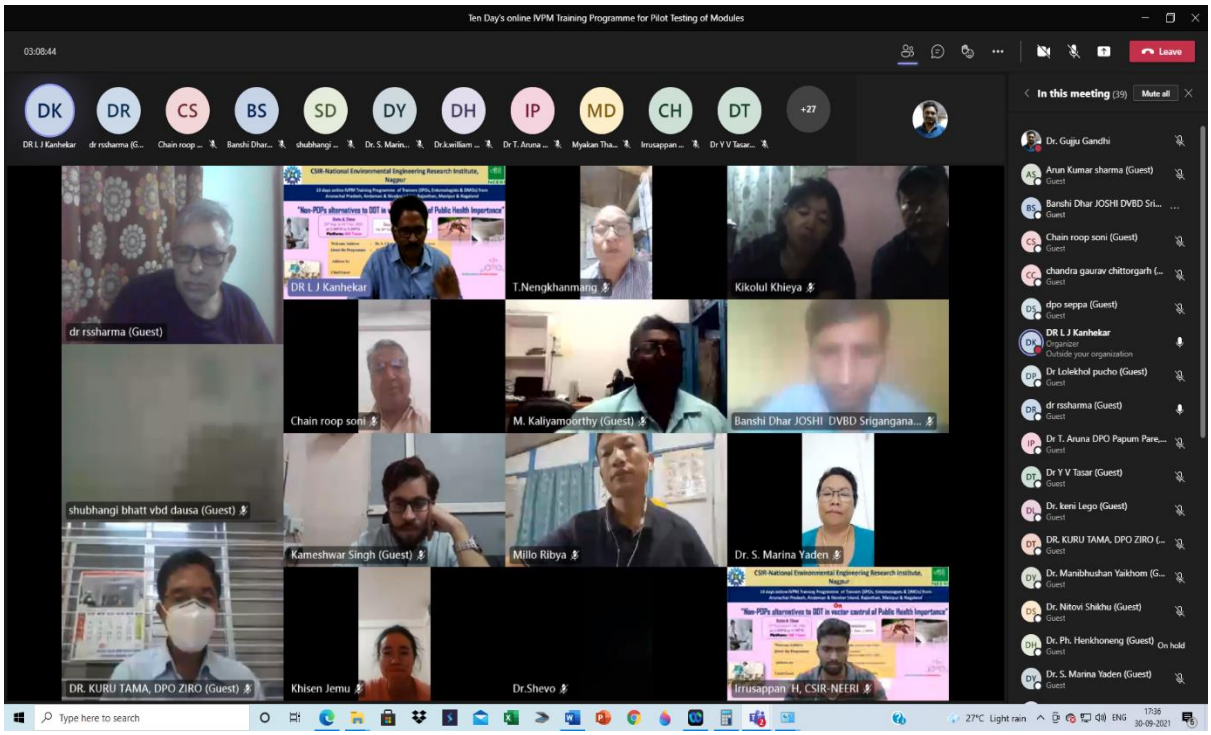

Figure-29: Lecture /Discussion on FAQs & IEC materials

7.0. Feedback from Participant trainees & instructions

Dr. L. J. Kanhekar highlighted the importance of participants' feedback on the training programme conducted and requested the participants to fill the feedback forms A and B along with the Statement of participation form. Dr. Gujju Gandhi explained the procedure of filling and sending the feedback forms through e-mail and by post (Fig. 30).

8.0. Virtual Valedictory Session

At the end of the training programme, Dr. M. P. Patil, Chief Scientist, CSIR-NEERI delivered virtual valedictory speech and thanked all SPOs and trainees for active participation. He also requested to all participants to go through the training modules and email to CSIR-NEERI team regarding their suggestions and changes to be incorporated in the modules.

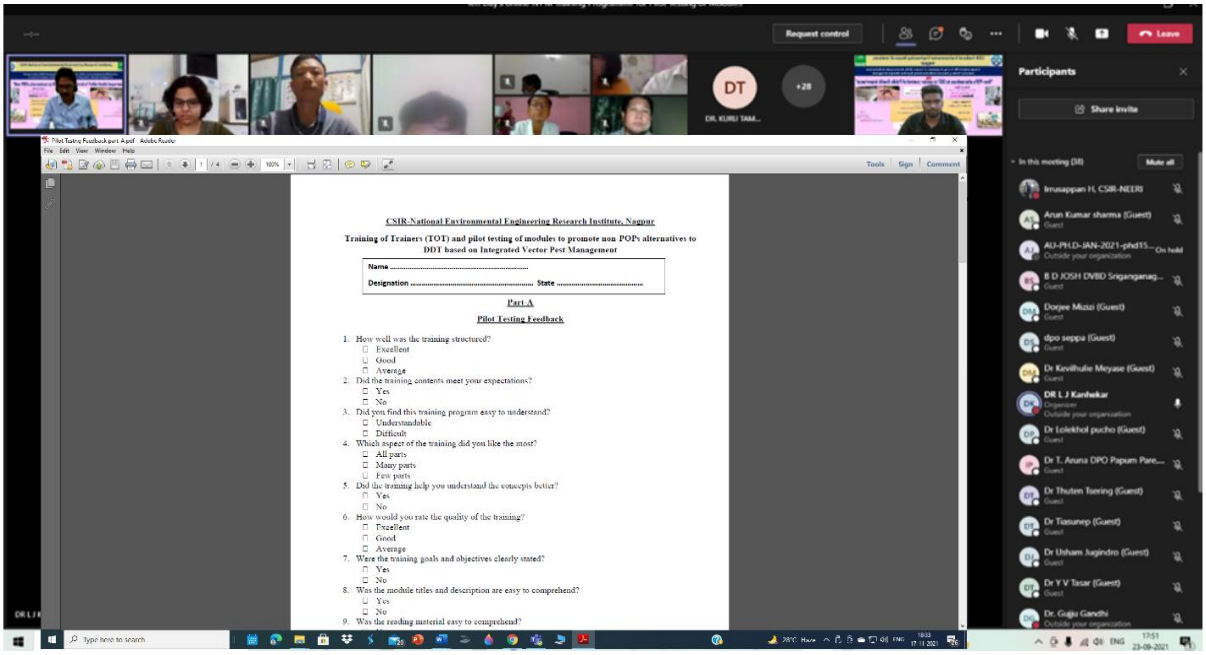

Figure-30: Screen shot of Feedback from Participant trainees & instructions

9.0. Annexures

10.1. List of organizing members

1. **Dr. A. N. Vaidya,**
   Coordinator, Stockholm Convention Regional Centre,
   HOD, Chemical and Hazardous Waste Management Division,
   CSIR – National Environmental Engineering Research Institute.

2. **Dr. A. Ramesh Kumar,**
   Sr. Scientist, (Project Leader),
   CSIR – National Environmental Engineering Research Institute.

3. **Dr. L. J. Kanhekar,**
   Project Consultant & Training Coordinator,
   CSIR – National Environmental Engineering Research Institute.

4. **Dr. Gujju Gandhi,**
   Project Research Associate-II,
   CSIR – National Environmental Engineering Research Institute.

5. **Mr. Irrusapann. H,**
   Project Associate-II (Entomology),
   CSIR – National Environmental Engineering Research Institute.

6. **Ms. Gauri Agasti,**
   Project Associate-I,
   CSIR – National Environmental Engineering Research Institute.

10.2. List of faculties

1. **Dr. R. S. Sharma,**
   Ex. Additional Director,
   National Centre for Disease Control

2. **Dr. P. K. Srivastava,**
   Ex-Joint Director,
   Directorate of National Vector Borne Disease Control Programme

3. **Dr. Kalpana Baruah,**
   Addl. Director,
   Directorate of National Vector Borne Disease Control Programme

4. **Dr. Amit Katewa,**
   National Consultant,
   Directorate of National Vector Borne Disease Control Programme.

5. **Dr. Himmat Singh,**
   Scientist – D,
   ICMR - National Institute of Malaria Research.

6. **Dr. Vijay Kumar,**
   ICMR- Consultant, (Ex- Scientist E),
   ICMR-Rajendra Memorial Research Institute of Medical Sciences.

7. **Dr. N. Balakrishnan,**
   Ex-Joint Director,
   National Centre for Disease Control.

8. **Dr. P. T. Joshi,**
   Ex-State Entomologist, Gujarat state.

9. **Dr. T. Ratna Joseph,**
   Ex-Deputy Director,
   Government of Andhra Pradesh.

10. **Dr. Y.P. Ram dev,**
    National Technical Adviser,
    United National Industrial Development Organization.

11. **Dr. Regu,**
    Addl. Director,
    National Centre for Disease Control.

10.3. List of Participants – Andaman & Nicobar, Arunachal Pradesh, Manipur, Nagaland and Rajasthan

Training of Trainers (TOT) and pilot testing of modules to promote non-POP alternatives based Integrated Vector Pest Management

Training dates :20-09-2021 to 01-10-2021 (2.30 PM to 5.30 PM)

Andaman & Nicobar		
Sl. No.	**Name**	**Designation**
1	**Dr. M. Kaliyamoorthy**	State Entomologist
Arunachal Pradesh		
2	**Dr. Kopi Gyadi**	District Programme officer
3	**Dr. Keni Lego**	District Programme officer
4	**Dr. S. Towang**	District Programme Officer
5	**Dr. Nangkong Yirang**	District Programme Officer
6	**Dr. Kuru Tama**	District Programme Officer
7	**Dr. C. M. Thanmoung**	District Programme Officer
8	**Dr. Tana Aruna Likha**	District Programme Officer
9	**Dr. Maru Taro**	District Programme Officer
10	**Dr. Thuten Tsering**	District Programme Officer
11	**Dr. D. K. Mizizi**	District Programme Officer
12	**Dr. Y. V. Tasar**	District Programme Officer
13	**Shri. Millo Ribya**	Assistant Entomologist
Manipur		
14	**Dr. A. R. Chishti**	State Programme Officer
15	**Smt. NG. Sujalata**	Entomologist
16	**Smt. H. Sudhersana Devi**	Biologist
17	**Dr. Usham Jugindro sing**	District Malaria Officer
18	**Dr. Ph. Henkhneng Mate**	District Malaria Officer
19	**Dr. Manibhushan Yaikhom**	District Malaria Officer
20	**Dr. Thaimei Gairanlung**	District Malaria Officer
21	**Dr. Nengkhanmang**	District Malaria Officer
22	**Dr. M. Gambhini Devi**	District Malaria Officer
Nagaland		

23	**Miss Khisen Jemu**	Assistant Entomologist
24	**Dr. Nitovi Shikhu**	Deputy Director
25	**Dr. Kevilhoulie Meyase**	District Vector Borne Officer
26	**Dr. Shevo Hiese**	District Vector Borne Officer
27	**Dr. Lolekhol Pucho**	District Vector Borne Officer
28	**Dr. S Marina Yaden**	District Vector Borne Officer
29	**Dr. Hedungkiebe**	District Vector Borne Officer
30	**Dr. William Humtsoe**	District Vector Borne Officer
31	**Dr. Tiasunep**	District Vector Borne Officer
32	**Dr. Kavito Zhimomi**	District Vector Borne Officer
33	**Shri. Kikolul Khieya**	District Vector Borne Officer
34	**Mrs. Vizobonuo Sophie**	District Vector Borne Officer
35	**Ms. Imsubenla**	District Vector Borne Officer
36	**Yimliyangla Ong**	District Vector Borne Officer
Rajasthan		
37	**Dr. Nirmala Sharma**	Deputy Director Malaria
38	**Chain Roop Soni**	Consultant NVBDCP
39	**Arun Kumar Sharma**	Zonal Entomologist
40	**Kameshwar Singh**	District VBD Consultant
41	**Sita ram Jat**	District VBD Consultant
42	**Chandra Gorav**	District VBD Consultant
43	**Bhansidhar**	District VBD Consultant
44	**Iqbal Qurashi**	District VBD Consultant
45	**Sanjay Prabhakar**	District VBD Consultant
46	**Sanju Batar**	District VBD Consultant
47	**Reetu Singh**	District VBD Consultant
48	**Shubhagi Bhatt**	District VBD Consultant