DEVELOPMENT AND PROMOTION OF NON-POPS ALTERNATIVES TO DDT

Report On

EXPERT GROUP MEETING TO REVISE DEVELOPED FOUR TRAINING MODULES BASED ON 10 PILOT TESTING TRAINING PROGRAMME

20th - 21st September 2022

CSIR- NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE,
NEHRU MARG, NAGPUR-440 020.

Development and Promotion of Non-POPs Alternatives to DDT

1.0 Introduction

Stockholm Convention (SC) is a global treaty that aimed to protect human health and the environment from chemicals, known as Persistent Organic Pollutants (POPs) as they are toxic, resistant to degradation, can bioaccumulate, have the ability to migrate long distances from their original source and accumulate in terrestrial and aquatic ecosystems. The Government of India (GoI) signed the Stockholm Convention on Persistent Organic Pollutants and assigned work to nodal agency viz. the Ministry of Environment, Forests and Climate Change (MoEFCC). 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 21 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 UNEP Law Division will execute the other part. 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.

IVPM is a tool for managing vector populations 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, be effective against the target species, 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 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.

2.0. Expert Group Meeting

Objectives-

1. Critically review and revise pilot tested four Training Modules.
2. Identify the scope for improvement of the Modules and suggest ways of revision/modification in light of comments/ inputs from pilot testing.
3. Make recommendations to guide future work in the Training Modules.

Expert Group Members meeting was held for two days *i.e.* on 20th and 21st Sept, 2022 at CSIR-National Environmental Engineering Research Institute (NEERI), Nagpur to revise four developed Training Modules, which were tested through 10 pilot training programmes. Expert group members were having vast experience in field of entomology and vector control activities. They are working or were served in different Government research organizations in India. Nomination of experts were invited from National Centre for Vector Borne Diseases Control (NCVBDC) and National Centre for Disease Control (NCDC), Delhi. The nominated Expert from Vector Control and Research Centre (VCRC), Puducherry could not attended the meeting due to preoccupation. Expert group members (**Annexure 1)** were attended the meeting and made deliberations for revision of modules as per scheduled technical programme (**Annexure 2**).

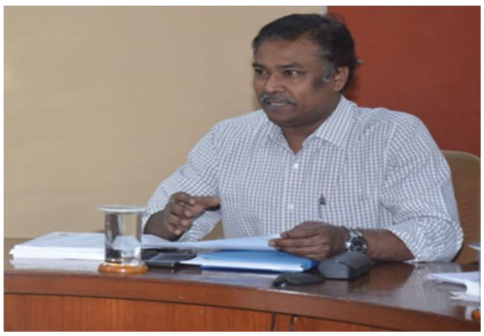

Dr. A. N. Vaidya & Dr. A. Ramesh Kumar,

Dr. A. Ramesh Kumar, Senior Scientist, CHWMD, CSIR-NEERI welcomed Dr. A. N. Vaidya, Director, CSIR-NEERI, Ms Neha Dharmashaktu, Programme Management Officer, UNEP, India Country Office, Delhi and all the expert members, and briefed on the progress of project entitled "Development and promotion of non-POPs alternatives to DDT" and the objective of the meeting. He appreciated efforts made by experts during past meetings, different training periods and expected continued cooperation in the future.

The meeting was chaired by **Dr. A. N. Vaidya**, Director, CSIR-NEERI, Nagpur, who welcomed all participant expert members and introduced activities of CSIR-NEERI in general and particular of the project. He pointed out that CSIR-NEERI has developed four training modules, which were approved by the directorate of NCVBDC to organise training in different states for pilot testing and accordingly ten training programmes (eight online and two offline) were successfully organised. To provide the final shape to these modules, he suggested to consider the technical inputs received during trainings from participant trainees, review the whole contents of each topic, and revise the modules to standard mark. He expected contributions from all experts to revise all sections of the modules as per objectives. **Ms. Neha Dharmashaktu,** Programme Management Officer, UNEP-India Country Office, New Delhi joined virtually via MS-Team and briefly introduced the project components and suggested correct spellings and to check plagiarism including any external photos, images, figures, tables, etc. for which proper credit should be given. She also suggested hiring an independent person

for proofreading and grammar checking of the revised modules. Dr. L. J. Kanhekar, Project Consultant proposed a vote of thanks to the chair and all other experts and expected cooperation during the period (**Exhibit-1**).

On the first day *i.e.* 20th September 2022 Dr. L. J. Kanhekar, Project Consultant brought to notice that, four module and other training material developed by CSIR-NEERI, Nagpur, which has been tested through organising 10 training of different state's Health officers/ Entomologists (**Exhibit-2**). During 10 pilot testing training, some inputs have been provided by participant trainees, which may be considered. Four sessions have been organised on the first day and each session was chaired by Dr. R. S. Sharma, Dr. P.T. Joshi, Dr. Vijay Kumar, and Dr. Ramesh Chandra respectively. The discussion has been made on the contents and organised all chapters of four modules. Each chapter was reviewed, corrected, redrafted, and provided inputs were included, filled the gaps in the various chapters, and revised.



Dr. A. Ramesh Kumar, Senior Scientist, CHWMD, CSIR-NEERI deliberated on Introduction to Persistent an Organic Pollutants (POPs) and DDT chapter in Module-1 (DDT and Vector Borne Diseases chapters) were checked technically and put in order. He gave their technical advice and redrafted some chapters *i.e.*, Introduction to DDT, the legal status of POPs pesticides in India, current situation of the production and use of DDT, status of DDT in India (as per Central insecticide board and registration committee website) and year wise supply of DDT to NCVBDC, Stockholm Convention on POPs, as well as Dr. Ramesh reviewed on Alternatives to chemical pesticides in vector control, State wise supply of DDT 50% WP during 2019 to 2020 for IRS as per HIL records, DDT production statement for last five years and Global Alliance for alternatives to DDT, accordingly paragraphs arranged in sequential order.

Dr. Ramesh Kumar reviewed and raise the queries on Module-4 in front of other expert group members of IVPM chapter wise *i.e.* Larvicides, Temephos, Adulticides, Dosage and formulation of different larvicides and Preparation & application of synthetic insecticides for IRS for Chemical control methods. He reviewed, corrected, redrafted, provided inputs and, filled the gaps in the above mention chapters.

Recommendations:

1. Should maintain uniform font size in text and paragraph space

2. Cross-check references
3. Cross check Table Numbers and Figure Numbers
4. Check the technical/ scientific words.

Shri. Dinbandhu Gouda, Additional Director & DH-lPC-l, CPCB, New Delhi deliberated on DDT production, the status of DDT supply to states and which states are using DDT for vector control. He suggested including the executive summary of the DDT as it was extensively used for a long time and will be eliminated from the vector control management programme. Shri Gouda deliberated on chapter of Module-3: Environmental management, environmental manipulation, saltwater flooding, strategies applied to control vegetation, stream flushing and coastal flooding. Shri Gouda provided inputs on reservoir clearing & irrigation in environmental modification as well as environmental modification or manipulation of human habitation. His comments on the chapters IVM, IPM, BCC, FSS and Planning and Implementation of Module-4: IVPM were taken to consider by other expert group members.

Recommendations:

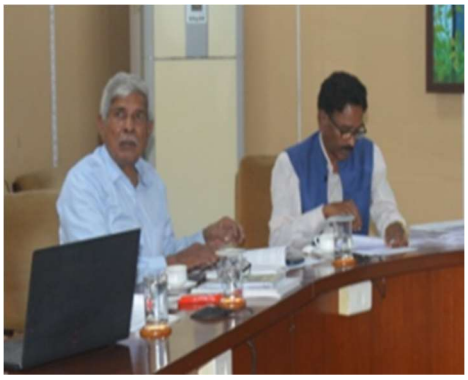
1. Grammar checking of the revised modules
2. Add the year of reference
3. Cross-Check the list of abbreviations.

Dr. R. S. Sharma, Former Additional Director, NCVBDC, New Delhi highlighted the trainee comments during the training period as well as reviewed each chapter in four modules, corrected, redrafted, provided inputs, filled the gaps in the various chapters, and revised. The expert group members also agreed with Dr. Sharma suggestions in Module-1, should be updated all VBDs epidemiological data, graphs, redrafted current situation of the production and use of DDT, state-wise supply of DDT in India, causative agents and vectors, transmission cycle of JE, state wise prevalence of JE vectors and discussion has been made on the contents and organised all chapters of modules 1 (DDT and Vector Borne Diseases) and 2 (Vector Morphology & Bionomics). Fill the gaps in Module-2 *i.e.* vector definition, learning objectives,

replaced the adult female mosquito image and redrafted introductions about the pupa. Dr. Sharma reviewed the chapters of Module-3: Environmental management, environmental manipulation, saltwater flooding, strategies applied to control vegetation, stream flushing and coastal flooding. He emphasises to edit- reservoir clearing & irrigation in environmental modification as well as environmental modification or manipulation of human habitation. Redrafted alternatives to DDT in Vector Control Management. Dr. Sharma revised the chapters IVM, IPM, BCC, FSS, Planning and Implementation, Monitoring & evaluation, Entomological and Epidemiological surveillance & parameters, surveillance tools for malaria, entomological formulae PMHD, Ten Man-hour Vector Density of Module-4: IVPM, expert group members also agreed with Dr. Sharma suggestions/inputs.

Recommendations:

1. Check the references
2. Check proper Figure Numbers and Page Numbers
3. List of Abbreviations
4. Check the chapter numbers and arrange sequential order
5. Should maintain uniform font size in text.

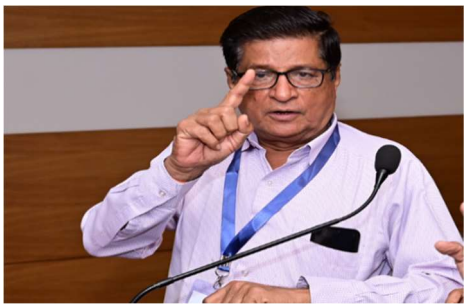


Dr. Ramesh Chandra, Ex-State Entomologists (Uttar Pradesh) deliberated on Module-4, All the chapters were checked technically and put in order. He gave technical advice on the VBDs and epidemiological burden, and accordingly redrafted some chapters, paragraphs arranged in sequential order, and gaps were filled in the missing places in the particular chapters of Modules and added figures as required. Dr. Chandra mainly deliberated on Lymphatic filariasis, Chikungunya and Zika, CCHF, KFD and Scrub typhus in Module-1 (DDT and Vector Borne Diseases) and **2** (Vector Morphology & Bionomics) and per his suggestions revised diagrams, text and references. He revised the texts on Nematodes, Flatworms, Fungus for Biological Control, Plant products, synthetic chemicals and organic chemicals for Chemical Control and Sterile Insect Techniques (SIT), Hybrid sterility for Genetic Control, Insecticide used under NCVBDC, Equipment *i.e.* Knapsack sprayer, Stirrup pumps, Hand compression pump, Fogging machine, Vehicle mounted thermal fogging machine and Vehicle mounted cold fogging machine for vector control and the outcome of UNIDO as alternatives to DDT *i.e.* Neem-derived products- Neem based adulticides, larvicides & repellents for vector control of

Module-3. In Module-4 all the chapters were checked technically and put in order. Dr. Chandra and other experts' members gave their technical advice on the IVPM and Monitoring and Evaluation accordingly redrafted some sub chapters *i.e.*, Accredited Social Health Activist (ASHA), Multipurpose Health Workers (MPHW), paragraphs arranged in sequential order, and gaps were filled in the missing places in the particular chapters of Module-4 and added figures as required. Expert group members also agreed with Dr. Ramesh Chandra suggestions/inputs.

Recommendations:

1. Paragraphs arrange in sequential order
2. Add color photographs
3. Check the entomological formulae i.e., PMHD, Ten Man-hour Vector Density
4. Check the references.



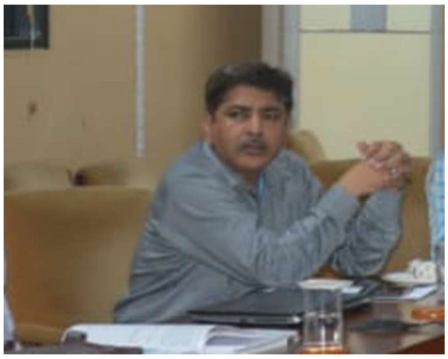
Dr. P. T. Joshi, Ex-State Entomologists (Gujrat), deliberated on Four Modules and reviewed, corrected, redrafted each chapter, included inputs, and filled the gaps in the various chapters to revise. Dr. Joshi drafted Chapter on Vector borne disease – Chandipura Fever as it was suggested by trainees during pilot testing training.

Chandipura Fever Chapter draft discussed by experts and edited to include in Module-1. Joshi mainly focused on Malaria, Zika, Plague, Vector morphology & Bionomics, as well as vectors ecology in Module-1 (DDT and Vector Borne Diseases) and 2 (Vector morphology & Bionomics) suggested to revise graphs, figure numbers, text and references, which have been considered. He revised the texts on Alternatives to DDT in vector control management *i.e.,* Community awareness and sensitization for Conventional methods, Anuran predators for biological control and the outcome of UNIDO as alternatives to DDT *i.e* Neem based adulticides, larvicides & repellents and types of repellents for vector control of Module-3 (Alternatives to DDT in Vector Control Management). Dr. Joshi checked technical part of spraying and redrafted some sub chapters in Module-4 (Integrated Vector and Pest Management) *i.e.,* determinants of local diseases, IVM implantation strategy, Methods of monitoring and evaluation, Annual parasite Incidence for epidemiological parameter of malaria and microfilaria rate for epidemiological parameter of Filariasis.

Recommendations:

1. Check the vector images

2. Check the breeding sources
3. Should maintain uniform paragraph to paragraph spaces
4. Check the page numbers in List of Figures
5. Check the Page Numbers in List of tables.

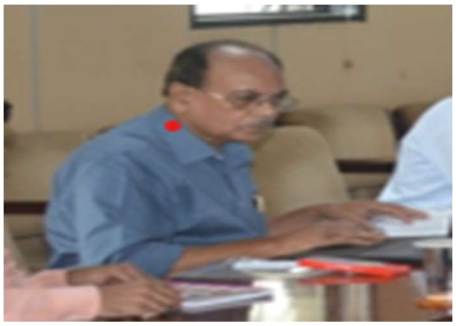


Dr. Himmat Singh, Scientist-E, ICMR-NIMR, New Delhi, deliberated on Module-3 & 4 corrected minor mistakes, edited each chapter and corrected the grammatical mistakes. He provided inputs to fill up the gaps in the various chapters. Dr. Himmat and other expert members provided their technical advice on Module-3 (Alternatives to DDT in Vector Control Management) and Module-4 (Integrated Vector and Pest Management). Reviewed chapters on Bacteria and Larvivorous fishes for biological control and suggested to add color photos of larvivorous fishes. Corrected the text of pyrethrum, Organochlorines and synthetic pyrethroids for chemical control, reviewed the chapter of mosquito larvicidal oil, Temephos 50% EC, Insect Growth Regulation 1% GR for Larval source management as well as corrected the text on Nozzle, Portable thermal fogging machine for equipment of larviciding and adulticiding in Module-3.

He reviewed Module-4: IVPM *i.e.* Entomological Assessment, Xenomonitoring, Selection of vector control methods for Planning and Implementation, Adult surveillance, Larval collection methods, insecticide resistance monitoring through susceptibility test, surveillance of dengue vector and malaria vector for Entomological surveillance and Entomological survey of Lymphatic Filariasis, in addition to Annual parasite Incidence (API), Annual Blood Examination Rate (ABER), Annual *falciparum* Incidence (A*f*I), Slide Positivity Rate (SPR) for Entomological parameter of malaria and Filaria endemicity rate and microfilaria rate for Epidemiological parameters of filariasis.

Recommendations:

1. Check the references
2. Check the Entomological & Epidemiological formulae i.e. API, ABER, A*f*I and SPR
3. Check the spelling of mosquito species scientific names
4. Check the spelling of Larvivorous fishes' scientific names
5. Check the Mosquito biting times.



Dr. Vijay Kumar, Consultant (Sr. Scientist- E), ICMR - RMRI, Patna deliberated on all Module gave technical inputes on the VBDs and epidemiological burden accordingly, redrafted some chapters, paragraphs arranged in sequential order and added figures as required.

Dr. Vijay Kumar and other expert group members provided their technical advice, reviewed and corrected texts on causative agent, transmission and epidemiological burden for Leishmaniasis in Module-1 (DDT and Vector Borne Diseases) and as well as reviewed Sandflies (*Phlebotomus*), External morphology, Vector biology and vector ecology for Vector of kala-azar in Module- 2 (Vector morphology & Bionomics). He suggested to revise references in uniform manner. Dr. Vijay Kumar reviewed and corrected Module-3: Alternatives to DDT in Vector Control Management chapter, Pyrethrum for chemical control method, Organochlorines, Synthetic pyrethroids for Organic chemicals in Chemical control methods as well as Malathion 25%, Long lasting insecticidal nets (LLINs), Indoor residual spray (IRS) and Indoor fogging for adult vector control method in Insecticides used under NCVBDC.

Dr. Vijay Kumar other expert members gave their technical inputs and corrected chapter on the Equipment for larviciding and adulticiding accordingly, redrafted some chapters *i.e*. Knapsack sprayer, Stirrup pump, images of Nozzle and text on Portable thermal fogging machine, Ultra-low volume (ULV) for fogging machine and reviewed Vehicle-mounted cold fogging machine for Vehicle mounted generators. Other expert group member also agreed with Dr. Vijay Kumar's suggestions /inputs for corrections.

Recommendations:

1. Check the *Phlebotomus argentipes* breeding places
2. Check the Types of Nozzles images
3. Check the labelling of stirrup pump.
4. Check all the references.

Exhibit-1: Expert Members with Director

Exhibit-2: Photographs of Expert Group Meeting sessions

Annexure-1: **List of Expert Members**

S. No	Name of the Expert	Designation & Organization
1	Shri. Dinbandhu Gouda	Additional Director & DH-lPC-l, CPCB, New Delhi
2	Dr. R. S. Sharma	Former Additional Director, NCVBDC, New Delhi
3	Dr. Ramesh Chandra	Ex State Entomologists (UP)
4	Dr. P. T. Joshi	Ex State Entomologists (Gujrat)
5	Dr. Himmat Singh	Scientist-E, ICMR-NIMR, New Delhi
6	Dr. Vijay Kumar	Consultant (Sr. Scientist- E), ICMR -RMRI, Patna

Annexure-2: Programme Schedule

CSIR-National Environmental Engineering Research Institute
Nehru Marg, Nagpur- 440020

Expert Group meeting for two days to revise developed four Training Modules based on 10 pilot testing training

Date and Time: 20/09/2022 to 21/09/2022 10.00AM AM to 05.00 PM

Technical Program of meeting

Date and Time	Program	Experts
20/09/2022 (Day 1) 10.00 – 10.25 Hrs	**Welcome Address**: Dr. A.N. Vaidya, Director, CSIR-NEERI **Address by**: Dr M. P. Patil, Head & Sr Scientist, CSIR-NEERI **Introduction**: Dr. A. Ramesh Kumar, Sr. Scientist, CHWMD, CSIR-NEERI **Address by**: Ms Ms. Neha Dharmashaktu, Programme Management Officer, UNEP **Vote of thanks**: Dr L. J. Kanhekar, Project Consultant, CSIR-NEERI	
10.25 to 10.35 Hrs	**High Tea**	
10.35 – 11.30 Hrs	**Module No 1:** Revision of Chapters on DDT, Malaria, LF, JE, Dengue, Chikungunya, Zika	Dr R S Sharma Dr Ramesh Kumar Dr Ramesh Chandra Dr P T Joshi
11.30 to 13.30 Hrs	Inclusion of VBD – Chandipura Virus Revision of Leishmaniasis, Plague, CCHF, KFD and Scrub typhus	Dr P T Joshi Dr Vijay Kumar Dr L J Kanhekar Dr Gujju Gandhi
13.30 – 14.00 Hrs	**Lunch Break**	
14.00 to 15.30	**Module No.2**: Vector morphology & Bionomics Revision on Vectors of Malaria, LF, JE, Dengue, Chikungunya, Zika	Dr Vijay Kumar Dr P. T. Joshi Dr Ramesh Chandra

		Dr A Ramesh Kumar Sh. Dinbandhu Gouda
15.30 to 15.40	**Tea Break**	
15.30 to 17.00 Hrs	Vectors of Chandipura, Leshmaniasis, Plague, CCHF, KFD and Scrub typhus	Dr Ramesh Chandra Dr R S Sharma Dr L J Kanhekar Dr Gujju Gandhi Sh. Dinbandhu Gouda
21/09/2022 (Day 2)		
10.00 to 11.30 Hrs	**Module No 3**: Revision of Chapters on Alternatives to DDT in VCM- Environmental Management, Biological, Chemical and Genetic control	Dr R S Sharma Dr Ramesh Kumar Dr Ramesh Chandra Dr Himmat Singh
11.30 to 11.40 Hrs	**Tea Break**	
11.40 to 13.30 Hrs	**Module No 3**: Revision of Chapters on Alternatives to DDT in VCM- Insecticide Used Under NVBDCP, Equipment for Vector control and outcome of UNIDO as alternatives to DDT for Vector control	Dr P. T. Joshi Dr Vijay Kumar Dr Ramesh Chandra Dr A Ramesh Kumar Sh. Dinbandhu Gouda
13.30 to 14.00 Hrs	**Lunch break**	
14.00 to 15.30 Hrs	**Module No 4** – Revision of IVPM Chapters IVM, IPM, BCC, FFS	Dr R S Sharma Dr A Ramesh Kumar Dr Ramesh Chandra Dr Himmat Singh
15.30 to 15.40 Hrs	**Tea Break**	
15.40 to 16.45 Hrs	**Module No 4** – Revision of IVPM Chapters Planning & implementation Monitoring & evaluation, Entomological and Epidemiological surveillance	Dr P T Joshi Dr Himmat Singh Dr L J Kanhekar Dr Gujju Gandhi Sh. Dinbandhu Gouda
16.45 to 17.00 Hrs	**Vote of thanks**	Dr A. Ramesh Kumar

Dr. L. J. KANHEKAR
Project Consultant
CSIR-NEERI