NRIIPM

Journey of ICAR-NRIIPM

Expedition towards sustainable plant protection

ICAR-NATIONAL RESEARCH INSTITUTE FOR INTEGRATED PEST MANAGEMENT
Rajpur Khurd, New Delhi-110 068

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Foreword

Integrated Pest Management technologies strive for the food security, food safety, economic viability and sustainable plant protection. National Research Centre for Integrated Pest Management, New Delhi; working under the aegis of Indian Council of Agricultural Research, New Delhi has strived for the same since its inception in 1988. This document provides for the development journey undertaken by the ICAR-NCIPM through the various assignments and challenges. IPM being a knowledge intensive technology, spreading it to the grassroot levels with incorporation of futuristic technologies is the grand accomplishment of the Centre. For which the 'Centre' is rightly upgraded to the 'Institute' and rechristened as National Research Institute for Integrated Pest Management.

I like to congratulate the editors and publisher of the compilation for making this available in a timely manner to on the occasion of Foundation Day of Institute, February 12, 2025.

(Poonam Jasrotia)

Dr. Mukesh Sehgal

Director (Acting)
ICAR-NRIIPM, New Delhi

Preface

The ICAR-National Research Institute for Integrated Pest Management (NRIIPM) since its establishment in 1988 has been focusing on the ways and means of achieving twin targets of maximizing crop yields through minimization of yield losses due to insect pests, diseases, nematodes and weeds. ICAR-NRIIPM is implementing an effective integrated pest management to achieve enhanced farm income-cum-environmental safety. The Institute has been adept in bringing together the scientific plant protection strategies available across the globe to a validation mode specific to farm level with the participation of the growers of many agricultural (cereals, cotton, pulses and oilseeds) and horticultural (vegetables and fruits) crops keeping linkages with the research and developmental institutions and other agriculture related organizations of the country.

An anecdote of the activities and achievements of ICAR-NCIPM is presented in the subsequent sections in this compilation, but it is imperative to state here that "The roads less travelled are often the path to higher horizons". ICAR-NCIPM began its journey from temporary rented building in Faridabad, Haryana in 1988 to January 1995 in LBS building, Pusa and is now housed in a state-of-the-art facility at Rajpur Khurd, Mehrauli, New Delhi since 14 July, 2023. Since its inception, the contribution made by the NCIPM have remain milestones in plant protection research, extension and education. Recently, emphasis has been given to invasive pest problems and changing pest scenario, pest

diagnosis, real time pest monitoring and forecasting. Our Centre also undertook the herculean task of spreading the message of IPM across pan India, which is rather tough due to poor awareness about the subject among line departments and farmers. With the world being more connected, the unseen threats have become visible and demand refocussing of the priorities. The Centre has successfully attained the same by realigning with the national priorities. Cherishing the contributions of the Centre, NCIPM is upgraded and rechristened as **ICAR-National Research Institute for Integrated Pest Management**.

During its journey in the last 37 years, the Institute has many memories and rich technological heritage to be cherished. Over the years, the Institute has generated many valuable research information specific to integrated pest management and disseminated improved technologies to the various stake holders.

I am grateful to Dr Himanshu Pathak, Secretary, DARE & DG, ICAR; Dr TR Sharma, DDG (CS), ICAR; Dr Poonam Jasrotia, ADG (PP&B) for their constant encouragement and support. I am also thankful to members of various research and management committees for offering invaluable suggestions for reorienting our programme to address the present and future needs. The guidance of the QRTs, RACs, and IRCs also helped in fine tuning research and extension activities of the Institute. Scientists of the Institute have been contributing immensely for the technical execution of research programmes and I thank them for their excellent support. I appreciate the admirable efforts made by members of editorial committee in the compilation and editing of this document.

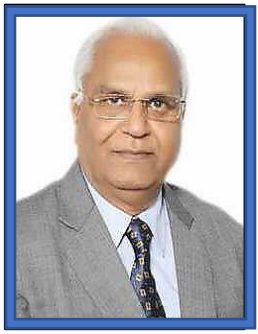
(Mukesh Sehgal)

Pillars of ICAR- NRIIPM

Our Directors

Dr. BL Jalali

1992-1993



Dr. SN Puri

1995-1999

Prof. Amerika Singh

2000-2007

Dr. OM Bambawale

2007-2012

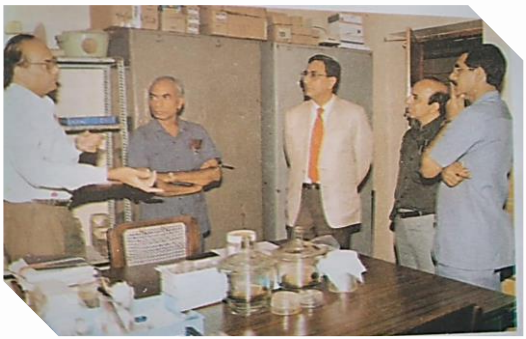
Dr. C. Chhatopadhyay

2012-2016

Dr. Subhash Chander

2020-2024

Memoirs




BRAIN STORMING SESSION ON
PRODUCTION AND PRODUCTIVITY CONSTRAINTS
NOVEMBER 21-22,2003
ED BY : NCIPM, PUSA CAMPUS, NEW DELHI
PONSORED BY : UNDP-TIFAC, NEW DELHI


कापूस मेळावा


किसान पाठशाला

Introduction

The need for establishment of National Centre for Integrated Pest Management (NCIPM) was mooted at a meeting chaired by Professor M S Swaminathan, the eminent agricultural scientist and father of the Green Revolution in India, held at planning commission on 12 October 1981. Subsequently the Centre was established at Faridabad (Haryana) during VII five-year plan to develop and promote environmentally sound and economically viable pest management strategies in major field crops. The Centre became functional on 12th February, 1988 as a Nodal Centre for promoting Pest Management. Apropos the major research objectives of this Institute were:

- *To create and serve as a national database /documentation and information retrieval system for Integrated Pest Management strategies.*
- *To develop medium, long range forecasting system for key insect pests disease in the country.*

The erstwhile Commonwealth institute of Biological Control (CIBC) Centre at Bangalore taken over by Indian Council of Agricultural Research on 1st April, 1988 was brought under ICAR-NCIPM as its regional station along with the All India Coordinated Research Project on Biological Control [AICRP(BC)]. Later, in October, 1993 this regional station was elevated to the status of Project Directorate of Biological Control and was delinked from NCIPM along with the AICRP (BC). Thereafter, NCIPM was shifted to Lal Bahadur Shastri Centre for Advanced Research in Plant Protection and Biotechnology, ICAR- IARI Campus, New Delhi in January 1995 with the following mandate:

- To promote IPM concepts in major crops and identify the vital gaps in plant-protection research.
- To monitor out breaks of various pests as well as their resurgence.
- To monitor build-up of pesticide resistance and to provide guidelines for sound pesticide resistance management strategies.
- To develop medium-and long-range pest forecasting and forewarning system based on survey and surveillance programme.
- To establish and serve as a national IPM database/documentation and retrieval system.
- To determine the economic threshold levels of the key pests. Evaluation and utilization of various pest control techniques to formulate practical pest management strategies.
- Synthesis of appropriate IPM models and their fields testing for practical pest control.
- To establish linkages and cooperative programmes with other institutions and government organizations in matters pertaining to plants protection to plant protection research, education and extension.
- To assist in developing national policies and programmes in plant protection research, education and extension and to undertake economic and social analysis of the recommended strategies.
- To provide training in IPM technologies.

The Centre commenced with a modest beginning for higher aspirations of Integrated Pest Management and opted essential and pragmatic approach to various components of IPM. The

Centre had initiated new programs for validation of IPM modules in rice, cotton, mustard, linseed and potato in collaboration with AICRPs and SAUs. And accordingly, mandate of the Centre was redefined as follows:

- To develop and promote IPM technologies for major crops to sustain higher crop yields with minimum ecological implications.
- To develop information base on all aspects of pest management and to advice on related national priorities and pest management policies
- To establish linkages and collaborative programmes with other national and international institutes in the area of IPM
- To extend technical consultancies

With the humble beginning of taking the IPM technology to the farmers' fields to the dissemination of IPM through ICT, the Centre took a much-needed leap in terms of providing accessibility of information and making real-time pest monitoring and advisory possible. These efforts of the Centre and need for making information readily available to all stakeholders, importantly farmers were echoed in the

- *Information and communication technology (ICT) based surveillance, monitoring of pest population, research and promotion of pest smart IPM technologies for major crops.*
- *On farm validation of IPM technologies, forging linkages with commodity-based crop research institutes, AICRP/AINP and capacity building.*

recommendations of QRT (2008-2014). This paved way for the

change in the mandate of the Centre by Department of Agricultural Research and Education (DARE) in 2016 as:

To achieve these mandates the institute started research, development and extension on various aspects of IPM and research of the Centre were structured under the five programmes namely

1. Establishment of a national network for development of area specific IPM modules and technologies for the major production systems of different agro-ecological zones
2. Development of databases on major pests and electronic networking
3. Development of models for forewarning and forecasting of pests of national importance
4. Socio economic issues and impact analysis of IPM technology
5. Human Resource Development in IPM

An anecdote of the activities and achievements of NCIPM is presented in the subsequent sections, but it is imperative to state here that "The roads less travelled are often the path to higher horizons". NCIPM began its journey from temporary rented building in Faridabad, Haryana in 1988 and is now housed in a state-of-the-art facility at Rajpur Khurd, Mehrauli, New Delhi since 14 July, 2023. Since its inception, the contribution made by the NCIPM have remain milestones in plant protection research and extension. Recently, emphasis has been given to invasive pest problems and changing pest scenario, pest diagnosis, real time pest monitoring and forecasting. With the world being more connected, the unseen threats have become visible and demand refocussing of the priorities. The Centre has successfully attained the same by realigning with the national priorities. Cherishing the contributions of the Centre, NCIPM is upgraded and rechristened as **ICAR-National Research Institute for Integrated Pest Management.**

Establishment of a National Network for Development of Area Specific IPM Modules and Technologies for the Major Production Systems of Different Agro-Ecological Zones

The Centre started working in Farmers' participatory approach on validation and promotion of IPM technology on farmers' fields in rice, cotton, pulses (chickpea, pigeonpea), oilseeds (groundnut, mustard, linseed) and ber in early 1990s. The synthesized modules were tested in collaboration with SAUs at selected villages in the farmer's fields. The unique approach of the Centre taking the technology from the **Research farm to farmers' fields,** boosted confidence of the farmers and scientists alike in IPM. Efforts of the NCIPM paved to increasing adoption and horizontal dissemination of the IPM specifically in Basmati rice (in Sikohpur) and cotton (in Astha, Maharashtra) during this time and NCIPM was recognized with ICAR **'Best Team Award'** in **2002** and **2006,** respectively. Use of *Sesbania* (*Dhaincha*) as green manure, soil application of *Trichoderma* (for management of *Bakanae* disease), and management of foliar and root diseases with *Trichoderma* and *Pseudomonas* were the critical interventions in the rice cultivation. By 2014, other interventions like planting of 2-3 seedlings/hill, judicious application of fertilizers (60 N: 50P: 40 K kg/ha) and $ZnSO_4$ @ 25kg/ha, use of straw bundles for augmentation and conservation of spiders and release of egg parasitoid *Trichogramma japonicum* @150,000/ha were included to manage the location specific needs for pest management in rice, which further added strength to the programme. These interventions were not only instrumental in conventional rice cultivation but proved boon to the organic rice cultivating farmers further boosting the confidence of the farmers in IPM. Improved cost benefit ratio coupled with curtailed chemical pesticide application led to horizontal dissemination of IPM technology in basmati rice (area of 690 ha in U.P., Haryana, Uttarakhand, Punjab) and non-basmati rice (area of 242 ha in U.P., Uttarakhand, Odisha, Punjab, West Bengal, Assam and Tamil Nadu) by 2014. The exhaustive work carried out by the

scientists' of the Centre was rewarded with **ICAR Outstanding Team Award** for the biennium 2005-06 in the year 2008. The success of IPM in rice boosted confidence of the farmers and IPM cluster villages were developed in and around Bambawad village, Gautam Buddh Nagar, Uttar Pradesh in an area of 1800 ha during by 2024. Development of confidence among the farming community for IPM and self-propagation was the feat achieved by the Scientists in case of Rice IPM. This not only facilitated dissemination of IPM but also inspired public-private partnership (PPP) with two private partners M/s Tilda Hains India Pvt Ltd and M/s LT Foods Ltd. Gurugram, which increased the export of residue free Basmati rice. In order to cope up with the challenges posed with the changing climate towards transplanted rice production, IPM in Direct Seeded Rice (DSR) trials were initiated at Ruksana, Karnal, Haryana and later on in Punjab. Though, in its initial stage, DSR appears to be the road ahead for rice cultivation with hanging challenges of climate change, changing pest scenario and outcry for improving water use efficiency.

Journey of ICAR-NRIIPM: Expedition towards sustainable plant protection

In case of cotton, IPM module developed by NCIPM was tested in all three cotton growing zones of the country with Technology Mission on Cotton (TMC). Large scale adoption of *Bt* transgenic cotton during 2003 led to reduction in the use of pesticides to the tune of 70%. Though the resurgence of minor pests was reported from many areas, overall IPM in cotton remained a success story and widely popularize IPM at the national level. The success in cotton IPM was challenged by mealybug (*Phenacoccus solenopsis*) first reported from Gujrat in 2004 and attained the threating status by 2005-06. Havoc was created by the pest in Punjab as it attained a major pest status consequent to its entry as seed contaminant in 2006, causing an estimated loss of Rs. 159 crores to farmers in 2007 in all eight cotton growing districts of Punjab. Along with the *Mealybug awareness programme* (sponsored by Ministry of Agriculture, Government of India), IPM interventions viz. removal of *Parthenium* and other weeds from fields and other nearby areas, conservation of natural enemies (new species *Aenasius bambawalei* recorded) and need based application of chemical pesticides for mealybug management were tailored. Extensive efforts by NCIPM in collaboration with state Department of Agriculture and under National Information System for Pest Management (NISPM) led to widespread awareness about the mealybug and its management and epidemic situation was not reported again. Further, to strengthen cotton IPM, DAC&FW sponsored project "Online Pest Monitoring and Advisory System (OPMAS)" was implemented in 10 cotton growing states covering >23,000 ha in 234 villages of 26 districts. This programme resulted in reduction in use of pesticides (>33%), increase in yield (12 %) and net profit (49%) of IPM adopting farmers. Pink bollworm, *Pectinophora gossypeilla* (Saunders) became a threat to cotton production 2016 onwards. IPM technology for cotton was developed and validated in 80 ha at Jalna, Maharashtra in farmer participatory mode in 2019-20, and was disseminated to 2208 ha by 2021. Modified IPM strategy included foliar application of 2% DAP and 2% potassium nitrate at flowering; installation of pheromone traps of PBW @ 40/ha for mass trapping one week prior to flowering; release of *Trichogrammatoidea bactrae*

Nagaraja (1.5 lakhs/ha); along with previously validated interventions.

Similarly, IPM was instrumental in pulses (pigeonpea and chickpea) and oilseeds (mustard and groundnut) by reducing chemical pesticides and improving cost-benefit ratio. Large scale validation of IPM technology in pigeonpea in 50 ha in collaboration with ARS Badnapura, Maharashtra was carried out with seed treatment and soil application of *Trichoderma* for wilt management, spray of crude neem extract (5%), spray of HaNPV @450 LE/ha as critical interventions. Pulse IPM programme received required impetus with Accelerated Pulse Production Programme (A3P) (2010-11) under National food Security Mission (NFSM) covering 5 states and 10 districts. During 2012-13, A3P was extended to lentil, green gram and urd bean in 13 major pulse growing states covering 1,14,000 ha. During 2013-14, a total of 173 villages were developed as Nuclear IPM villages to validate and demonstrate working and effectiveness of different IPM strategies. IPM programme was further strengthened with Centralized online **e-National Pest Reporting and Alert System** established at NCIPM.

In groundnut crop, IPM validation trials with location specific interventions in Rajasthan and Andhra Pradesh along with popularization were undertaken. These studies reported desirable effectiveness for management of challenging pest problems like collar rot, leaf spots, termite and white grub infestations in Rajasthan and dry root rot, stem rot, Peanut Stem Necrosis Disease (PSND), thrips and leaf miner in A.P. Since 2021 IPM for white grub and collar rot in groundnut at predominant groundnut growing districts of Rajasthan and Jhansi, Uttar Pradesh is being undertaken under wide area approach. ICAR-NRIIPM could successfully curb through biological control agent (*Trichoderma* spp. (NCIPM/T9) and methoxy benzene (Anisole) have encouraging results. In case of mustard, IPM intervention of sowing of mustard crop during October 15-31 could avoid

aphid attack, a challenging task for mustard pest management. The concerted efforts for development of module for *Sclerotinia* rot management in mustard led to their inclusion in package of practices of *rabi* crops for zone 1b (Sriganganagar region) and zone IIIb and IIIa (Bharatpur region) by Department of Agriculture, Government of Rajasthan. Recently, use of *Trichoderma* strain (NCIPM/T9) in for seed and soil treatment is included in the IPM module and encouraging results for the efficacy of the strain are observed under the farmer field conditions.

IPM in horticultural crops (vegetables) was taken up in 2006-2007 in vegetable growing areas of UP and Haryana surrounding Delhi. Collaboration with UAS, Dharwad and Raichur was further explored, it was a humble step towards ensuring nutrition security by bringing horticulture under the umbrella of IPM. During 2008-14, IPM in horticultural crops was extended to tomato, bell pepper, hot pepper, onion, cauliflower, cabbage, fruits (mango, pomegranate and banana) and protected cultivation. Major achievement in horticultural crops was success in management of nematode and other soil borne pathogens by propagating practices like raised bed, use of biocontrol agents etc. In the following years, cucurbitaceous (bitter gourd, cucumber, bottle gourd), solanaceous (chilli, okra), radish, cauliflower and kinnow were also included in the programme under institute projects. In addition, wide area integrated management of fruit fly in cucurbitaceous crops was successful in Karnal district of Haryana in farmer driven mode. IPM in tomato was undertaken at two different agroecologies (Haryana and Karnataka) targeting invasive pest *Tuta absoulta* and other economically important pests. IPM interventions could reduce the pesticide sprays in this very important multipurpose crop in both the locations. Also, IPM in radish for flea beetle management was a success in Haryana during 2020-2022 and was widely adopted by radish growing farmers of Haryana and other parts of northern India. IPM in protected

cultivation for cucumber, bell pepper etc. was validated to cater the needs of farmers of Uttarakhand, Rajasthan, and Haryana. EIQ estimation and residue analysis is integral part of IPM programs. Creating awareness about the residues in the horticultural produce and sustainable pest management gained momentum recently.

Development of mechanical devices and their dissemination to farmers and entrepreneurs beginning from early 2000s was important activity for reducing reliance on chemical pesticides. In this series, various equipment were designed and patented *viz*. Design of egg collection device and sterilization chamber for Corcyra eggs (Patent No. 213744), Insect monitoring device for field crops (Patent No. 226238), various types of insect traps (non-sticky insect trap, Light trap having insect sorting filters, Light trap safer for beneficial insects, Light trap for managing insects) and insect rearing and collection apparatus etc. considering the importance of invention, International patent was also filed for Light trap. Along with the insect trapping devices, a biopesticide formulation was also patented. At present, six national and three International patents are maintained along with one trademark.

Journey of ICAR-NRIIPM: Expedition towards sustainable plant protection

Production of bio-control agents for IPM Programmes of the Centre continued and substantial number of parasitoids were utilized in cotton and rice IPM validation trials. In order to strengthen the biological control programme of the Centre, exploration of microbial biopesticides was initiated after 2008. Entomopathogens *Fusarium pallidoroseum*, *Verticillium lecanii*, *Beauveria bassiana* and *Metarhizium anisopliae* were characterized and evaluated under laboratory and field conditions. Exploration of native *Trichoderma* spp. from north east region and later from different agro-ecologies of the country was also initiated coupled with evaluation of bioefficacy of the potential strains. In addition to the bio-efficacy of the potential strains against biotic stresses, tolerance to abiotic stresses like drought, salinity etc. was taken into consideration. Identified potential strains were submitted in both safe (03 strains) and general deposit (05 strains) of ICAR-National Bureau of Agriculturally Important Microorganisms, Mau, Uttar Pradesh. The talc formulations of potential biocontrol agents were evaluated under farmers' field conditions and used for demonstrations. Further, Gel based formulations of microbial bio-control agents were developed, in addition to the development of granular formulation with higher shelf life and stability. Efforts were done to add suitable bio-control agents and other organic inputs compatible with the chemical pesticides in IPM modules to reduce reliance on the chemical pesticides and identifying alternate management strategies.

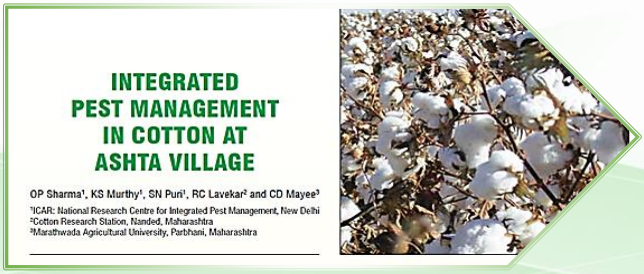
Identification of effective post-harvest management strategy to reduce the losses after crop harvest was taken up by identifying effective fumigant molecule for pest management under storage, the programme was supported by DAC, GOI; further work in this direction is being done in PPP mode.

In late 2020s, Centre included natural farming and diversified its crop base to include maize, sugarcane etc. to meet the challenges of food security as well as food safety.

First IPM Success Story

Calendar based application of chemical insecticides and their injudicious use was the prime strategy to manage the various pests during 1980s. Though the crop occupied only 5% arable land, it consumed 54% of the total chemical pesticides before introduction of transgenic cotton in 2002. The altered cropping systems, multiplicity of non-descript cultivars, imbalanced fertilizer use, and intensive cultivation have aggravated the problems of pests and environmental hazards. IPM strategies had become imperative to sustain productivity of cotton in an eco-friendly manner A bio-intensive IPM module with much reliance on conservation and promotion of naturally occurring bio-agents, bio-pesticides and botanicals as tools for sustainable production of cotton was validated over 200 hectares under farmers' field conditions at **Ashta village** located in Nanded district of Maharashtra State (MS), a predominantly rain-fed cotton belt. The project was implemented on pilot scale in 5 ha of a progressive farmer's field at village Barad located in Nanded (MS) district. During 1997 the (bio-control + intercrop) module proved very effective in managing not only aphids but also jassids, thrips and whiteflies. The general impacts of the Ashta IPM were as below:

- Conservation and enhancement in the activity of the natural enemies.
- Reduction in the quantity of chemical insecticides used
- Environmental safety, evident by increase in the number of bird population in the crop
- Compensatory yields and higher net returns



Development of Databases on Major Pests and Electronic Networking

The imperatives of plant protection should be accessible to all users ranging from the farmers to the policy makers, hence database development and electronic networking remained an integral component of the NCIPM programmes. To begin with sixty-six (66) pest distribution maps for cotton crop were prepared showing the geographical distribution of eleven pests for the period from 1992-97. A computer software named 'Nemvar Test' was developed to retrieve information quickly about the resistance levels against nematodes in different varieties. During 2000s, seventeen online databases were made available on the Centre's website with information on statistics and plant protection measures including seven Pest Management Information system (PMIS), 'Pesticide Advisor' required for taking decisions. Online 'Pest Reporting System' with the aim to provide real time pest information on cotton and soybean was also hosted in early 2000s on NCIPM website. NCIPM pioneered e-Pest surveillance and advisory system based on Information and Communication Technology (ICT). The futuristic approach for collection and transfer of field data on insect pest and diseases in different crops from remote villages of the country to NCIPM servers and issue of advisory through SMS to farmers and extension workers for implementation on farmers' fields. This system was implemented under Awareness-cum-surveillance programme for management of major pests of soybean-cotton based cropping system (CROPSAP) initiated in 2009 and Crop pest surveillance and advisory in fruit crops (HORTSAP) (mango, pomegranate and banana) initiated in 2010. By 2024, e-Pest Surveillance was implemented in an area of approximately 185.9 lakh ha in 17 crops in collaboration with Government of Maharashtra. The success of CROPSAP in Maharashtra led to **National e-Governance award 2012** for the ICT initiative. Following the success in Maharashtra, ICT in Haryana for seven horticultural crops (Supported by Govt. of Haryana) and Tripura for rice crop were also implemented. Besides, e-Pest surveillance in Odisha in rice under RKVY during

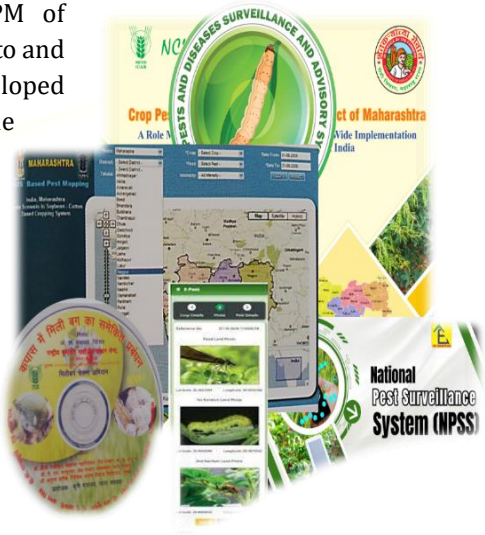
Kharif 2010-11 for managing emerging pests of rice was a success. Recently, NCIPM collaborated with DPPQS, Faridabad for the development of National Pest Surveillance System (NPSS), which is an ambitious project for real-time monitoring of the pest situation and providing advisory to the farmers.

Furthermore, Real Time Pest Surveillance (RTPS) under National Initiative on Climate Resilient Agriculture (NICRA) for pests and weather across thirty-six Centers from 12 states representing 11 agro-climatic zones and 14 agro-ecological regions of the country for five target crops *viz*. rice, pigeonpea, groundnut, tomato and mango. Development of web based system consisting of Centralized database, offline client data capture, admin panel and online data reporting and analysis was hosted through ICAR-NCIPM website. Information systems on diagnosis and sampling for pest surveillance were developed for real time pest dynamic studies in rice, pigeonpea, groundnut and tomato crop. Other endeavors taken up by the Centre were Development of web-based database of plant protection research workers, development of expert system for pest management in okra and brinjal, GIS based automated crop pest mapping and development of plant protection personnel information system, besides providing ICT based pest surveillance in Malawi (Africa). Also, development of hyperspectral signatures for important biotic stresses in selected crops in collaboration with Indian Space Research Organization also strengthened the database development of the Centre.

Development of Models for Forewarning and Forecasting of Pests of National Importance

Since 1996, another important activity of the centre aimed at development of forecasting models. Studies taken up on development of forewarning system for *Helicoverpa* indicated that the pheromone trap population, predicted from pre-monsoon rainfall during rainy season had no effect on post monsoon insect population. Thumb rule to predict the

Helicoverpa attack on chickpea and pigeonpea developed and validated and prediction model was used by Karnataka Government for issuing forewarning messages in pigeonpea growing areas. Similarly, forecasting models for potato aphids (*Myzus persicae*) has been developed and validated at Pantnagar (Uttarakhand), Dessa (Gujarat) and Kalyani (West Bengal). Under NICRA, location specific weather based criteria were developed by employing suitable statistical methodology and trend analysis. Weather based criteria and rules predicting severity of rice insects pests viz. yellow stem borer, brown plant hopper, green leaf hopper, white backed plant hopper, gall midge and case worm for *kharif* were developed for the Raipur, Chhattisgarh; Ludhiana, Punjab; Aduthurai, Tamil Nadu; Mandya, Karnataka; Chinsurah, West Bengal; Miryalguda, Telangana and Karjat, Maharashtra. Web and mobile applications of "Pestpredict" covering rule based and empirical models were developed for 24 locations for pests of rice, pigeonpea, groundnut and tomato. Mobile apps for Rabi pest forecasts and on IPM of rice, pigeonpea, tomato and groundnut were developed and hosted on Google play store for easy access of the farmers. Under NICRA 23 mobile apps catering the needs of the farmers were developed and hosted on Google play store.



Socio Economic Issues and Impact Analysis of IPM Technology

Improved cost-benefit ratio and reduction in the number of chemical pesticides' application emerged as the important indicator for the success of the IPM programmes. During late 1990s socio-economic analysis of both the IPM (Ashta village) and non-IPM (Murli) village conclusively made it evident that adoption of IPM practices resulted in more net economic returns. The socio-economic surveys of the IPM villages that farmer's field schools (FFS) helped the farmers in understanding prevailing pest problems and their management. FFS, field days and other outreach practices became integral part of IPM dissemination.

In case of basmati rice and cotton, IPM programmes, favorable indicators facilitated horizontal dissemination of the technology. Success of 'Astha Project' led to recognition of NCIPM as lead Centre for TMC phase I (Pre Bt Cotton period) with 18 cooperating Centers and total outlay of Rs. 4 Crores. The project covered 652 ha in three cotton producing zones and reduction in pesticide application to the tune of 50% could be achieved in these areas with improved yield and higher returns to the farmers. Similarly under NATP funded programmes, reduction in number of sprays of pesticides in groundnut, chickpea, cotton, pigeonpea, tomato, cabbage, mango and apple was achieved. IPM packages of practices by DPPQS and adoption of *Helicoverpa* prediction model by Karnataka government further strengthen the IPM programmes and improved confidence of all stakeholders during this time. Constraint analysis studies conducted by the Center revealed that regular outreach programmes increased confidence of the farmers in IPM. However, timely availability of quality IPM inputs is a bottleneck in realizing the potential of IPM technologies, as farmers resort to easily available alternatives in time of need. Also, in a preliminary study conducted at remote villages of Meghalaya and Mizoram it was observed that farmers may have access to

modern amenities like TV, mobile etc. but their use in IPM in particular is limited due to lack of awareness. The socio-economic scenario of the location and perceiving ability of the farmers are important factors for adoption as well as upliftment of the farmers.

Human Resource Development in IPM

Since beginning Human Resource Development was given priority by promoting professional human resource management of plant protection researchers, extension functionaries, farmers and encouraging the staff to participate in the training's workshops, conferences and symposia. Capacity building in IPM started with external funding from Ministry of agriculture, APEDA and Directorate of Extension, GOI, besides conducting paid training programmes in the area of mass production technology for biocontrol agents, IPM in selected field crops and dedicated IPM training programmes in cotton, rice and vegetables. Capacity building gained momentum with more awareness about IPM among the stake holders. The Centre continued outreach activities by conducting Farmers Field Schools, Field days, Gosthis, Farmers-Scientist interaction etc. these activities not only aimed at popularize IPM but created awreness about the safe use of pesticides, waiting periods and biocontrol agents etc.

Additionally, the centre offered structured and customized IPM training programmes to other stakeholders like State Department Officials, Plant Protection functionaries, students, researchers and its own staff for skill upgradation in IPM. Networking with ICAR institutes, SAUs, SDAs, KVKs, industries, NGOs and farmers and other plant protection organization in India and abroad. Development of modern training aids/tools/methodology of research studies in plant protection and their validation and popularization for promotion of IPM were made. The Centre laid emphasis on supporting IPM managers/ ambassadors in their professional development. Four ICT trainings for use of ICT in plant protection were conducted in Malawi, Africa and Thirty-six ICT trainings were also conducted at Tripura, Maharashtra, Karnataka for pest scouts and farmers to reduce time gap between the expert advice and farmer operations which help to reduce the risk of pest

incidences. During 2014-19, the centre directly trained 12,592 master trainers (607 KVK personnels, 470 extension functionaries from ICAR institutes, SDAs and SAUs and remaining 11,515 progressive farmers) in recent developments of IPM in important crops. In addition to that, one MEA sponsored international training, two ICAR sponsored Winter schools, sponsored training programmes from state department of Bihar for department officials and farmers (02), collaborative training programmes with National Institute of Agricultural Extension management (04) were instrumental in recent years in reaching out participants in different strata.

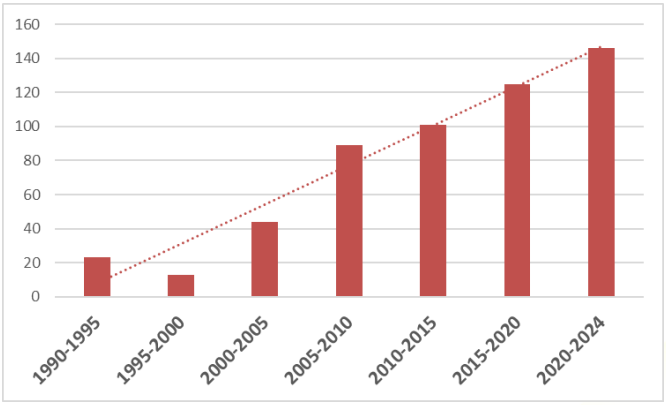
Besides providing IPM trainings, thematic trainings catering the needs of the industries were also organised in the area of biological control and pesticide dealership. For skill development of various stakeholders mass multiplication of bioagents involving a combination of inputs, practical demonstrations, micro- training were undertaken to bridge the gap between IPM understanding and implementation. A consultancy project "Bridging the gap between conventional & sustainable rice production through Integrated Pest Management: an Outreach programme" with m/s LT Foods Ltd. Gurugram, Haryana, in which more than 10,000 basmati rice growing farmers were trained. The project was implemented in Ludhiana, Jalandhar, Amritsar and Gurdaspur (Punjab) and Sonipat (Haryana) in active collaboration with State Department of Agriculture, ATARI (Ludhiana) and Punjab Agriculture University.

Recently, Agri-business incubation programme provided avenues to the youth and entrepreneurs to connect to institution and explore the business opportunities in IPM. In this context >10 Orientation cum Awreness programees under entrepreneurship development programme (EDP) conducted since 2019. The institute also took lead in disseminating IPM to the underprivileged and far-reached areas of the country under

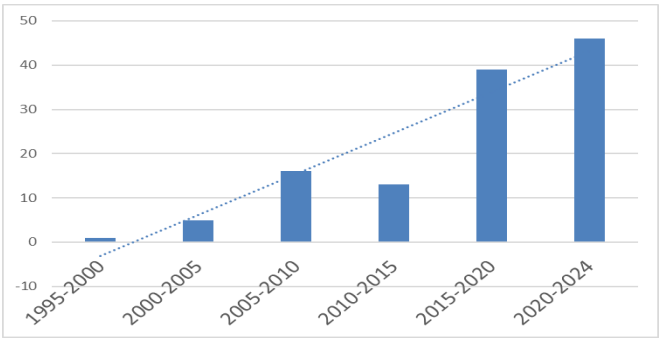
NEH, Tribal Sub Plan (TSP), Scheduled Castes Sub Plan (SCSP) and *Mera Gaon Mera Gaurav* (MGMG) programme. Under these programmes critical IPM input distribution along with capacity building of the targeted beneficiaries has resulted in IPM dissemination to remote areas.

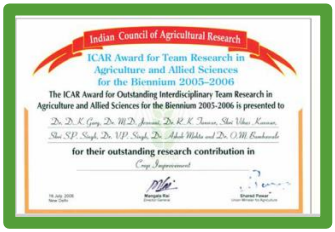
National Research Institute for Integrated Pest Management at a Glance

Research Papers

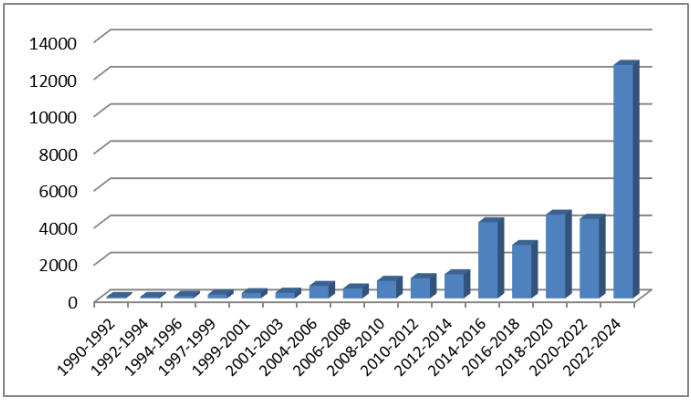


Awards & Recognitions





Budget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2018-2020
2020-2022
2022-2024

Staff list as on 12 February 2025

S. No	Name	Designation
Scientific		
1	Dr. Mukesh Sehgal	Director (Acting)
2	Dr. M. Narayana Bhat	Principal Scientist (Plant Pathology)
3	Dr. Sumitra Arora	Principal Scientist (Agricultural Chemistry)
4	Dr. S.K. Singh	Principal Scientist (Agricultural Entomology)
5	Dr. M.S. Yadav	Principal Scientist (Plant Pathology)
6	Dr. S.P. Singh	Principal Scientist (Agricultural Entomology)
7	Dr. Ajanta Birah	Principal Scientist (Agricultural Entomology)
8	Dr. Satyendra Singh	Principal Scientist (Nematology)
9	Dr. Jitendra Singh	Principal Scientist (Agricultural Entomology)
10	Dr. Niranjan Singh	Principal Scientist (Computer Applications)
11	Dr. Shravan M. Haldhar	Principal Scientist (Agricultural Entomology)
12	Sh. A.K. Kanojia	Scientist (Geography)
13	Dr. Meenakshi Malik	Scientist (Agricultural Statistics)
14	Dr. D. Raghavendra	Senior Scientist (Agricultural Entomology)

15	Dr. Rakesh Kumar	Scientist (Agricultural Entomology)
16	Dr. P.N. Meena	Senior Scientist (Plant Pathology)
17	Dr. Anoop Kumar	Senior Scientist (Agricultural Entomology)
18	Dr. Manoj Choudhary	Scientist (Plant Pathology)
19	Dr. MK Khokhar	Scientist (Plant Pathology)
20	Dr. Rekha Balodi	Scientist (Plant Pathology)
21	Dr. Raghavendra K.V.	Scientist (Agricultural Entomology)
22	Sh. Licon K. Acharya	Scientist (Plant Pathology)

Technical		
1	Sh. S.P. Singh	Chief Technical Officer
2	Smt. Neelam Mehta	Asstt Chief Tech. Officer
3	Sh. Nirmal Kumar	Technical Officer
4	Sh. Satish Babu	Technical Officer
5	Sh. Suresh Pal	Technical Officer
6	Sh. Hera Lal Yadav	Senior Technical Assistant
7	Sh. US Mishra	Senior Technician
8	Sh. Ratnesh Kumar	Technician

Administrative		
1.	Sh. Mangal Singh	Sr. Finance & Accounts Officer
2.	Sh. Jaswant Kumar	Administrative Officer
3.	Sh. B.S. Tewthia	Principal Private Secretary
4.	Sh. B. Chaudhary	Assistant
5.	Sh. Pradeep Kumar	Assistant
6.	Smt. Anima Lugun	Personal Assistant
7.	Sh. Abhishek Kaushik	Assistant
8.	Sh. Suresh Yadav	Upper Division Clerk
9.	Sh. Pratap Singh	Upper Division Clerk
10.	Sh. Raj Kumar	Lower Division Clerk
11.	Sh. Mahesh Kumar	Lower Division Clerk

Skilled Supporting Staff	
1.	Smt. Kamla Devi
2.	Sh. Rajendra Kumar Shah
3.	Sh. Sunil Kumar
4.	Smt. Sarita Kumari

Acknowledgements

"*The authors and all staff members express their gratitude to the previous Directors, scientists, technical, administrative and skilled staff including contractual workers of ICAR-NRIIPM, whose continuous efforts and diligence have enabled us to achieve this milestone. As we cherish this moment, we feel indebted to them. We are thankful to farming community and our collaborators from SAUs, SDAs, KVKs, DPPQ&S, and other collaborators for partnering with us on this journey. We hope that this milestone will mark the beginning of an era of sustainability in plant protection and that the Institute will reach greater heights*."


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