

# ICT-Based Pest Surveillance & Advisory System: A Path Breaking Initiative

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*“Pest surveillance is the cornerstone for pest management through which epidemic situations can be avoided by detecting damage prior to establishment at a higher population.”*

**C**orrect pest identification and regular wide-area pest surveillance/monitoring are the vital aspects of process of decision-making in pest management. Early pest identification and timely availability of pest surveillance-based management advice to the farmers are of paramount importance in terms of productivity and reduction of the usage of pesticides. Through regular pest surveillance, epidemic situations can be avoided by detecting damage prior to establish at a higher pest population. The basic purpose of pest surveillance is to determine whether and which pests are present in the field and their level of incidence to initiate pest management action, and if required to initiate action, what is the appropriate management option. For effective pest management, farmers require timely support in pest identification and appropriate control measures. Due to limited knowledge and expertise, many farmers rely heavily on pesticide dealers, often leading to excessive and indiscriminate use of chemicals. Timely assistance in pest identification and surveillance-based advisories can help farmers either save crops worth several crores of rupees or avoid unnecessary pesticide applications, thereby reducing costs and protecting the environment.

Recognizing the vast potential of Information and Communication Technology (ICT) in plant protection, with its ability to enable both centralized and decentralized services, ICAR–National Research Institute for Integrated Pest Management (NRIIPM) designed and developed an ICT-based pest surveillance and advisory system. This system has been continuously upgraded using modern ICT tools and has now been integrated into various programmes implemented across the country.

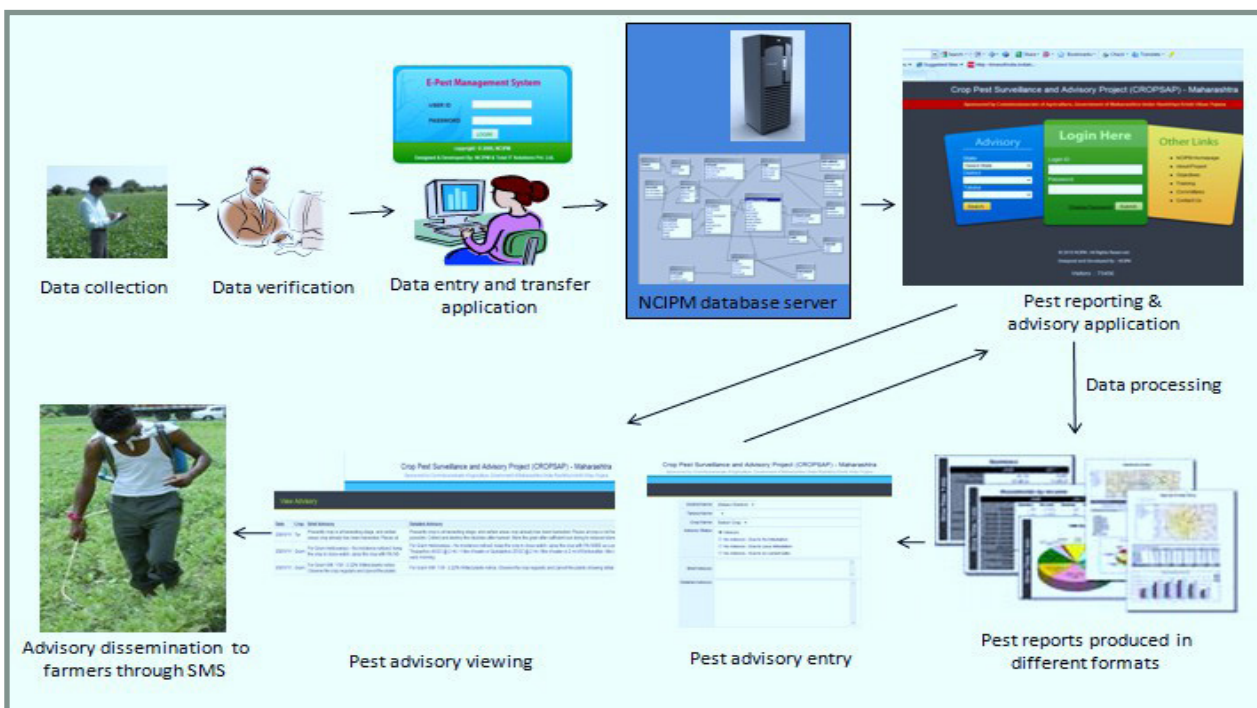
## Why ICT for pest surveillance?

Information and Communication Technology acts as an accelerating force for increasing agricultural productivity. ICT has become very convenient technology for timely delivery of pest management

information and services to the farmers. This has the potential for improving effectiveness and efficiency of pest management programmes being carried out across the country. Its ability to allow quick transfer of information and its ready access as well as the knowledge base assist the plant protection workers in advising farmers appropriately so as to save the crop from pest damage and economic losses by judicious use of timely intervention and relevant pest management inputs. The goal of using ICT for pest surveillance is to capture the pest information from farmer’s field, transferring it to a centralized database, compilation, reporting and dissemination of data to different stakeholders. Use of ICTs not only automates but also speeds up the process of providing support for pest identification. This also facilitates in quick reporting of pest situations of different locations and thus helps the experts in making appropriate pest management decisions and quick dissemination of these decisions to the farmers as advice.

### Structure of ICT based pest surveillance and advisory System

The system comprises three major components: Mobile app for data capture; a centralized database; web-based application for pest reporting and advisory. System has been enhanced and upgraded regularly, using modern ICTs such as technologies Artificial Intelligence, Hybrid mobile app development packages. Latest version of the system was developed using React Native, Angular, .net core with C# and SQL 2019 technologies.



### ICT-based pest surveillance programmes

ICT-based pest surveillance and advisory system has been successfully implemented in the following programmes in various states of the country, since 2009.

- Crop Pest Surveillance and Advisory Project (CROPSAP)
- Horticulture Pest Surveillance and Advisory Project (HORTSAP)
- Pest Surveillance in Rice, Odisha
- Increasing Chickpea and Pigeonpea Production through Intensive Application of IPM (A3P, NFSM)
- Implementation of ICT based Pest Surveillance in Malawi under TAP Africa
- ICT based Pest Surveillance and Management through Advisory System for Boro Rice in Tripura
- ICT based Surveillance and Advisory Services for Selected Horticultural Crops in Haryana
- National Pest Surveillance System (NPSS)

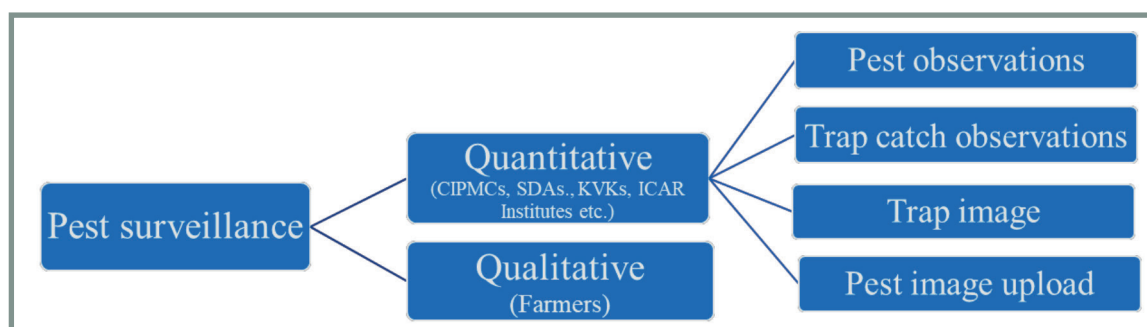
### National Pest Surveillance System (NPSS) at a glance

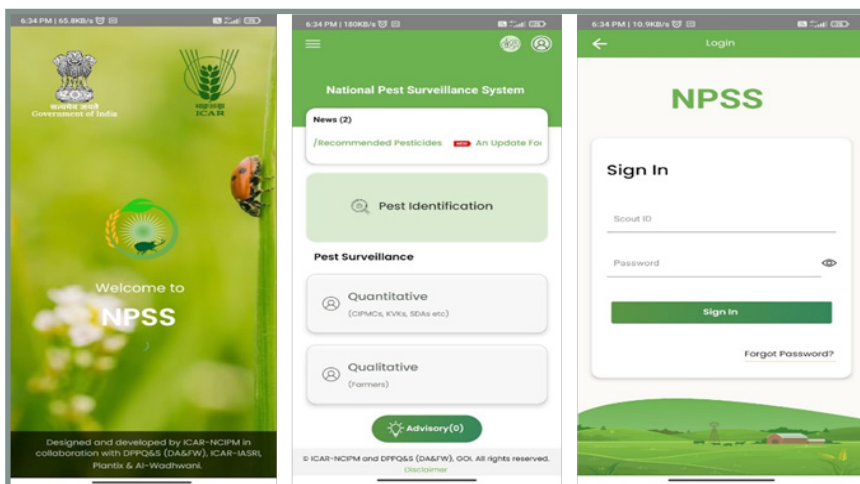
Regular enhancement of the ICT-based pest surveillance system resulted in National Pest Surveillance System (NPSS), a comprehensive technology enabled system for identification, Surveillance and Management of pests. NPSS was developed by leveraging modern ICTs such as Machine Learning (ML), reverse geo coding and hybrid mobile app package, to enhance the pest management across the country, launched by Honorable Minister of Agriculture and Farmers’ Welfare on 15<sup>th</sup> Aug, 2024. The system provides real-time data collection, analysis, expert advisories, and decision-making tools for all stakeholders including farmers, field scouts, agricultural officers, and extension workers. NPSS comprises mobile app, web portal and database. Mobile app has capability of AI-based pest identification for 65 crops and surveillance of key pests of 31 crops to provide pest management advice to the farmers. Web portal comprises admin panel, dashboard & pest reporting. The system is available in four languages viz. English, Hindi, Punjabi & Marathi.

#### NPSS mobile app

Following are the important features of the NPSS mobile app:

- AI-based pest identification
- Pest surveillance
- Pest surveillance-based management advice

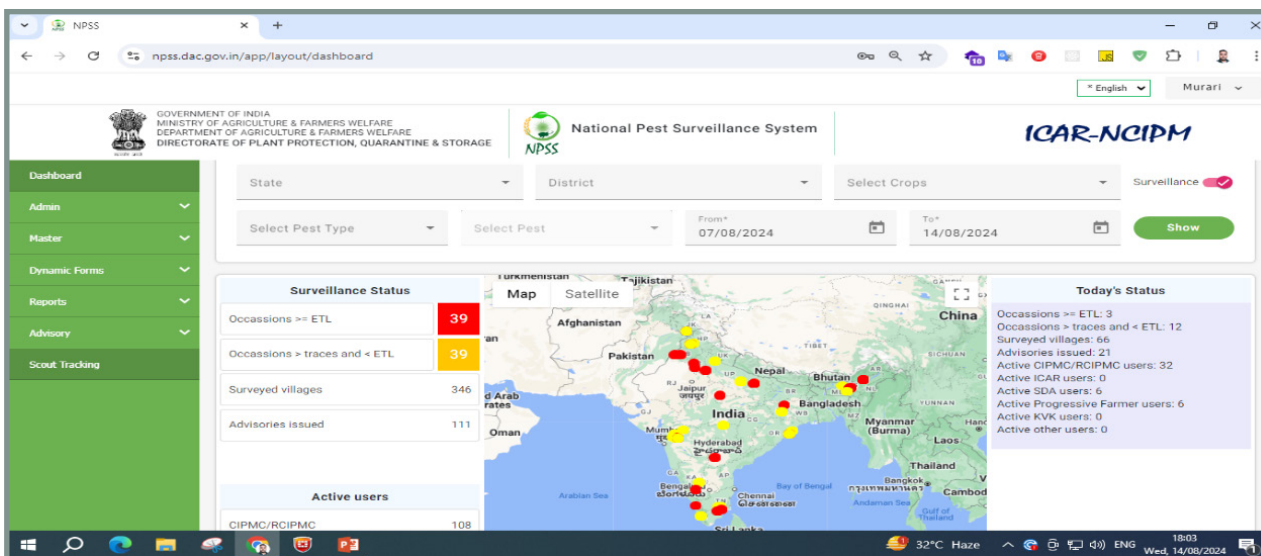




### NPSS Web portal

Important features of the web portal:

- System administration
- Dashboard
- Pest reporting
- Submission of pest advisory



### Area of operation, under ICT-based pest surveillance programmes

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Programme	Crops	State/region	Districts	Sub districts /Blocks
Crop Pest Surveillance and Advisory Project (CROPSAP)	Soybean, Cotton, Rice, Pigeonpea, Chickpea, Sorghum, Maize, Sugarcane	Maharashtra	28	271
Horticulture Pest Surveillance and Advisory Project (HORTSAP)	Mango, Sapota, Sweet Orange, Santra, Pomegranate, Banana, Tomato, Okra	Maharashtra	32	241
Pest Surveillance in Rice, Odisha	Rice	Odisha	13	126
Increasing chickpea and pigeonpea production through Intensive Application of IPM (A3P, NFSM)	Pigeon pea Chickpea	Maharashtra, Uttar Pradesh, Andhra Pradesh, Madhya Pradesh & Karnataka	10	37
Implementation of ICT based Pest Surveillance in Malawi under TAP Africa	Cotton	Southern region	2	4
E-pest surveillance and advisory services for Boro Rice in Tripura	Boro Rice	Tripura	7	54
ICT based pest surveillance & advisory services for horticultural Crops in Haryana	Kinnow, Tomato, cabbage, cauliflower, cucurbits	Haryana	9	14
National Pest Surveillance System (NPSS)	Apple, Banana, Brinjal, Chilli, Cotton, Grapes, Maize, Mango, Pigeonpea, Pomegranate, Rice, Soybean, Sugarcane, Tomato, Urad bean, Wheat	All India	583	2075

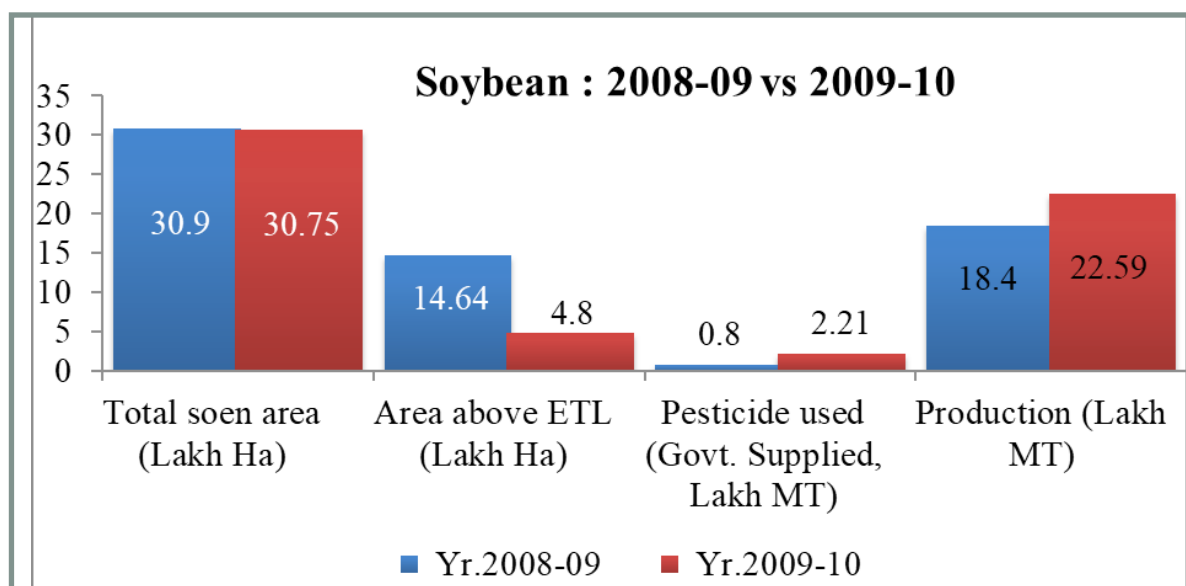


### Tangible benefits of the system

- ✓ ICT infrastructure established: Robust ICT infra created at ICAR-NRIIPM, SAUs and SDAs involved for regular and effective pest surveillance.
- ✓ Scientific methods of recording pest observations: quantitative pest observations recorded according to pest specific scientific methods.
- ✓ Delivery of timely and correct pest management advisories to the farmers of the state.
- ✓ Avoidance of pest epidemic: Regular pest surveillance resulted in avoidance of pest epidemic.
- ✓ Awareness among the farmers on pest identification and their management.
- ✓ Increased socio-economic benefits: Dissemination of timely and pest management. advisories resulted in saving the crop and environment.
- ✓ Enhanced interaction among farmers and the scientific community.

### Impact of ICT-based Pest Surveillance System: a glimpse

#### Maharashtra



Constant and timely watch over pest scenario of the crops with the help of ICT based pest surveillance system aided in identifying the pest hot spots in the states where it was implemented. Staff of state agriculture departments were geared up to manage epidemic situations through awareness creation and supply of critical pest management inputs. The pest affected areas across the crops under pest surveillance viz., soybean, cotton, rice, pulses, vegetables and fruits get scientific pest management practices implemented over wider areas which in turn aids in increased productivity of the crops per se in that region. Pilot study was done to assess the impact of the system for soybean crop during 2010, results are as shown in the following graph.

Year	Farmers registered (in lakhs)	Advisories issued	SMSs sent (in lakhs)
2013-14	3.90	85098	265.80
2014-15	15.00	57365	550.27
2015-16	48.66	36593	199.01
2016-17	50.76	5072	366.95
2017-18	46.85	13055	599.81
2018-19	50.76	-----	304.07

**Prime Minister’s Award for Excellence in Public Administration 2012-13**

Crop Pest Surveillance and Advisory Project (CROPSAP), Maharashtra was awarded ‘Prime Minister’s Award for Excellence in Public Administration’ for the year 2012–13.



**E-Governance Gold Medal**

Crop Pest Surveillance and Advisory Project (CROPSAP), Maharashtra was also given National e-Governance awards- 2012: Gold medal for exemplary use of ICT-based solutions, at the 15th National

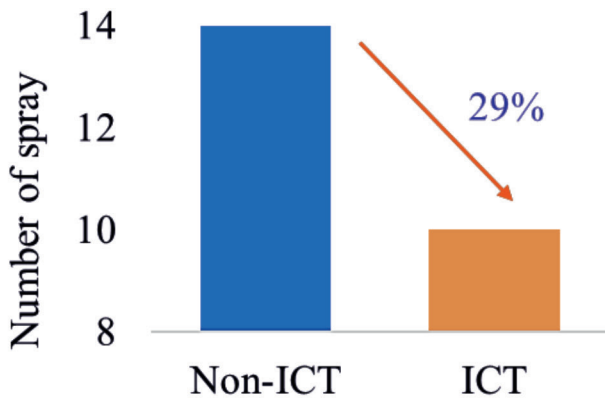
Conference on e-Governance held during 9-10 Feb 2012 at Bhubaneshwar, Odisha.



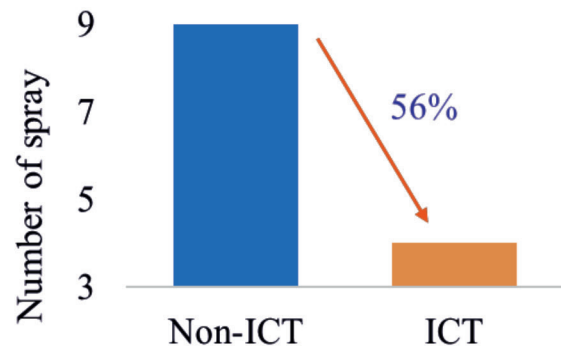
Haryana

Impact of ICT based pest surveillance and advisory system in management was assessed using previous and correct pesticide consumption details for different crops grown in various districts of Haryana state.

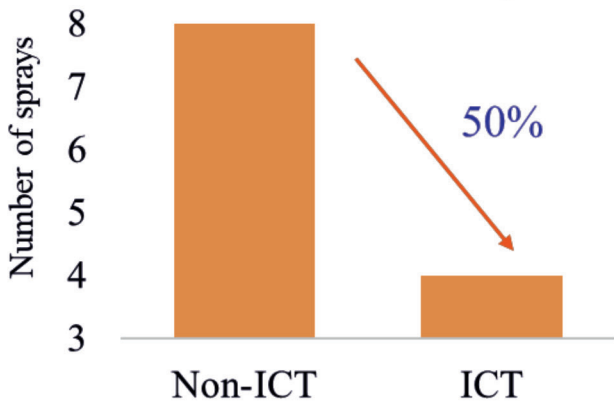
**Karnal, during 2021**



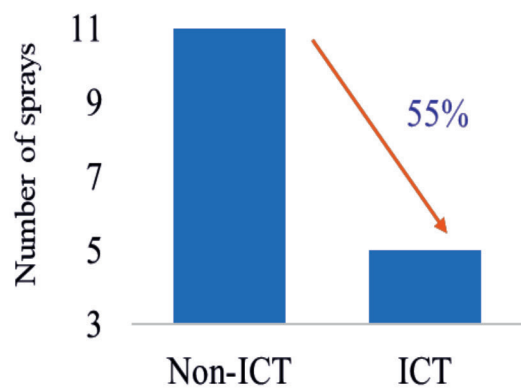
**Sonipat during 2021**



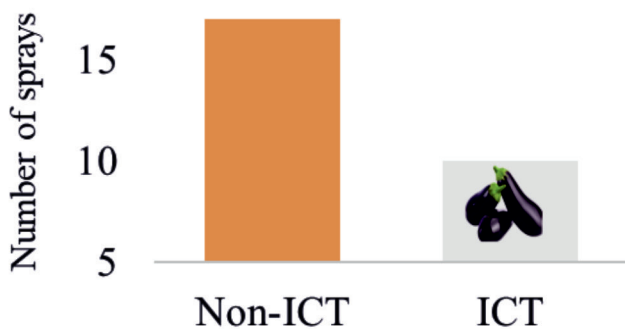
**Kurukshetra during 2021**



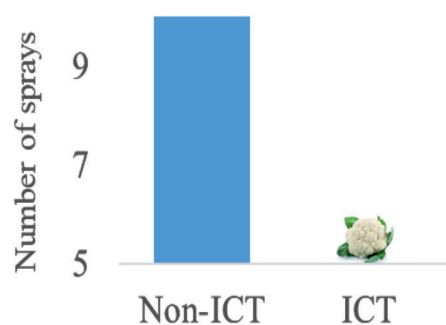
**Kurukshetra during 2022**

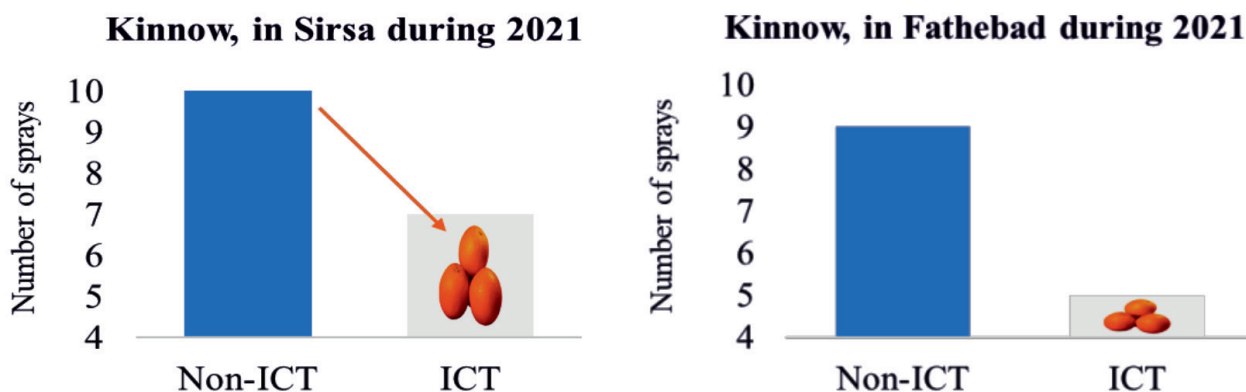


**Brinjal, in Hisar during 2022**



**Cauliflower, in Sonipat during 2022**





Small study was also done to assess the economic impact of ICT based pest surveillance and advisory system in management of late blight in tomato crop in Karnal district of Haryana state, during 2023-2024. The results are detailed below in the table.

Loss due to biotic stresses in Karnal	30%
Loss in neighbouring areas of Punjab	70%
Average potential yield t/acre	20
Monitory loss (based on potential yield in 400 acres of Karnal, @Rs 15,000/t)	3.6 crore
Monitory Loss (based on potential yield in 400 acres of neighboring states )	7.2 crore
Benefit (Estimate, based on survey)	3.6 crore

### ICT-based Pest Surveillance and Advisory System – A success story, why?

- ICT-based pest surveillance and real time advisory dissemination system is need of the hour for minimisation of yield losses under the fast-changing pest scenario due to changing weather/climate.
- Multi stakeholder involvement brought in harmony to the technicalities of pest surveillance and management
- Advisory capsules are scientific as they are formulated in consultation with domain experts, which improves the implementation of pest management recommendations.
- Engagement of trained human resource for pest surveillance, data feeding and advisory dissemination ensures regular pest surveillance and need based pest management amongst farmers.
- Regular trainings to staff (departmental staff of department of Agriculture, pest scouts, pest monitors and data entry operators) to impart the do-how of pest surveillance and pest management empowered capacity building.
- Exposure visits to the department officials and farmers updated their knowledge and enhanced the vision and skills on crop production and protection.
- The real time pest status based on ETL and management advisories resulted in the judicious use of pesticides.