

To develop and promote Integrated Pest Management (IPM)

While assessing the overall performance of NCIPM on the validation and dissemination of IPM, it has been observed that the IPM area under various programmes in different crops has increased (Fig. 1) and some new crops have also been included, especially in vegetables and fruits. The Centre has established the e-pest Surveillance and Advisory System (eSAS) for monitoring the pest situation and issuing the advisories on weekly basis, based upon the pest scenarios. The system has been widely adopted in cotton, rice and pulses covering different states across the country and linking State Agricultural Universities, State Agricultural Departments, KVKs and other agencies (Fig. 2). To monitor the pest situation under changing climate, real time pest surveillance (RTPS) across 36 centres in 12 States for five target crops *viz.*, rice (7), pigeonpea (10), groundnut (6), tomato (7) and mango (6) has been put in place and integrated with ICT for development of the centralized data base.

Comparative table of the area under IPM during previous Quinquennial Review (2003-07) and recent Quinquennial Review (2008-14)

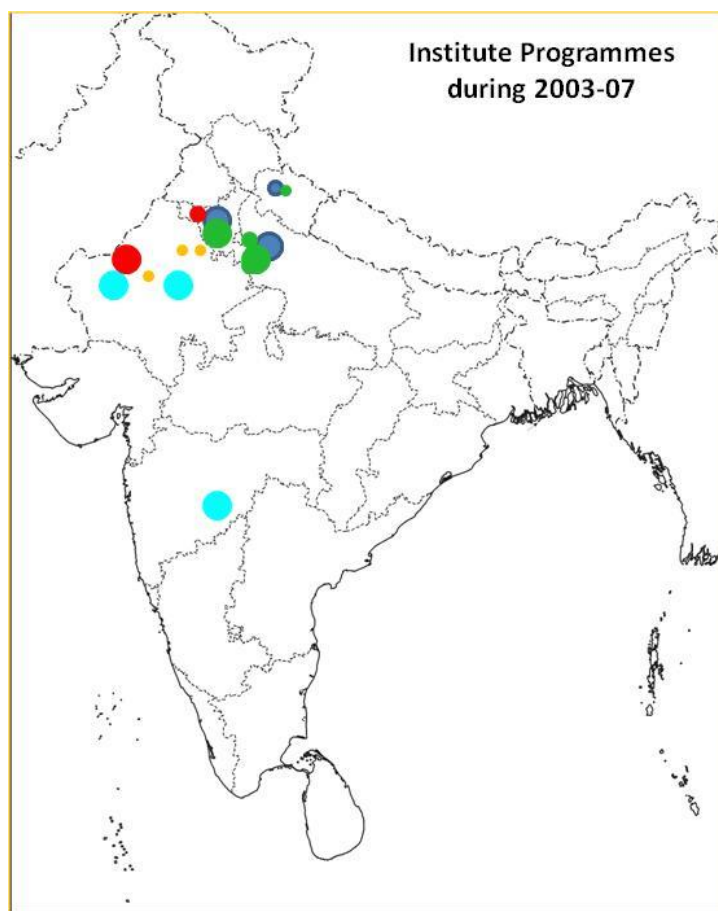
Particulars	Area	
	2003-07	2008-14
RICE	<p>Basmati: Area: 400 ha States: Three (U.P., Haryana and Uttarakhand)</p> <p>Non-basmati: Nil</p>	<p>Basmati: Area: 690 ha States: Four (U.P., Haryana, Uttarakhand and Punjab)</p> <p>Non-basmati: Area: 242 ha States : Seven (U.P., Uttarakhand, Odisha, Punjab, W. Bengal, Assam and Tamil Nadu)</p>
COTTON	<p>Institute Programme: Area: 28 ha State: Two (Haryana and Rajasthan)</p> <p>Externally funded TMC MM 3.1:</p>	<p>Institute Programme: Area: 450 ha State: Two (Punjab and Tamil Nadu)</p> <p>e pest Surveillance and Advisory System:</p>

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	Area: 3251 ha (606, 2016 and 629 ha by participation of 421, 496 and 1483 farmers in north, central and south zones, respectively covering 60 villages).	<ul style="list-style-type: none"> • Mealybug Awareness Programme in Punjab: 320 fixed and 160 random villages in 8 districts of Punjab • NISPM: Area under IPM: 21002 ha.; Monitoring pest in 1120 fields spread over 280 villages in 13 districts in nine states • CROPSAP: Area: 3.9 million ha of cotton covering 271 <i>talukas</i>, 30,000 villages, 29 districts in Maharashtra,
PULSES	Institute Programme Pigeon pea in 100 ha in southern Maharashtra; chickpea 80 ha in Rajasthan	Institute Programme: 50 ha in pigeonpea involving 20 farmers in Badnapur at Ambagaon in Maharashtra
		e-pest Surveillances and Advisory System <ul style="list-style-type: none"> • CROPSAP: 1.3 m ha of chickpea, 1.38 m ha of pigeonpea and 2.6 m soybean in Maharashtra • NFSM: covering 5 states and 10 districts. The programme covered 20,000 ha of pigeonpea (470 villages) and 16,000 ha of chickpea (599 villages) in five states (U.P., M.P., MS, A.P. and Karnataka) under IPM in each year (three years). The number of farmers covered were 14,767 in pigeonpea and 9526 farmers in chickpea
OIL SEEDS	Institute Programme Mustard: 0.8 ha Groundnut: 0.8 ha	Institute Programme: <u>Groundnut:</u> 25 ha in Hanumangarh and Udaipur in Rajasthan, and 10 ha at Kadiri Mandal in A.P. <u>Mustard:</u> 63.5 ha in Alwar district of Rajasthan
	NATP: Mustard: 40 ha (Gurgaon)	e-pest Surveillances and Advisory System <ul style="list-style-type: none"> • CROPSAP: 2.5 million ha of soybean,

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VEGETABLE CROPS AND FRUITS (MANGO, POMEGRANATE AND BANANA)	Institute Programme <u>Okra</u> : 16 ha(Ghaziabad) <u>Brinjal</u> : 32 ha (Ghaziabad)	<u>Tomato</u> : 12 ha at Daluhera in Meerut <u>Cauliflower/cabbage</u> : 24 ha Palari (Sonipat, Haryana) and Rajasthan <u>Capsicum/cabbage/ginger</u> in Mid Garhwal Hills of Uttarakhand <u>Bell pepper</u> : 60 ha in Karnal District of Haryana <u>Chilli</u> : 12 ha at Nelhal (Raichur) <u>Onion</u> : 4 ha District Karnal (Haryana) <u>Mango</u> : 8 ha Gujarat
	Externally funded	e-pest Surveillance and Advisory System <ul style="list-style-type: none"> • <u>HORTISAP</u>: Mango, pomegranate and banana in <u>Maharashtra</u>



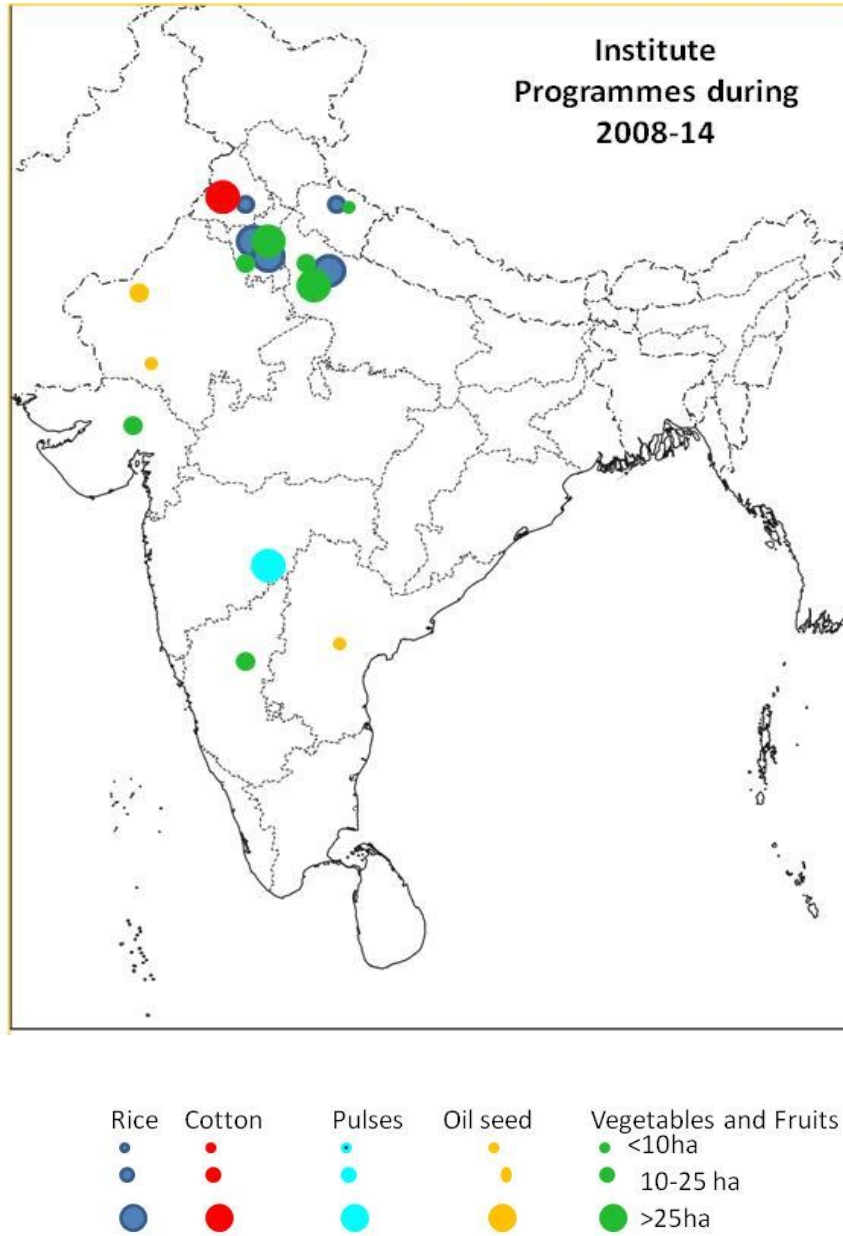


Fig. 1: Relative area covered by IPM programmes of NCIPM during 2003-07 and 2008-14 in different crops

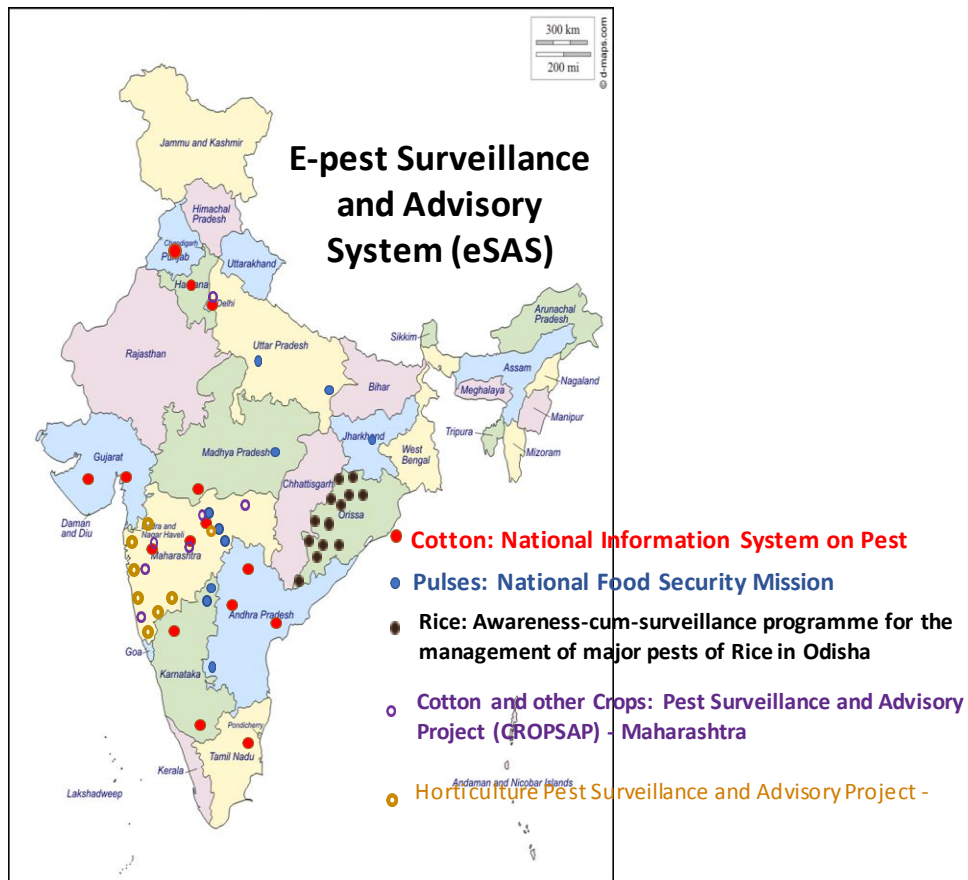
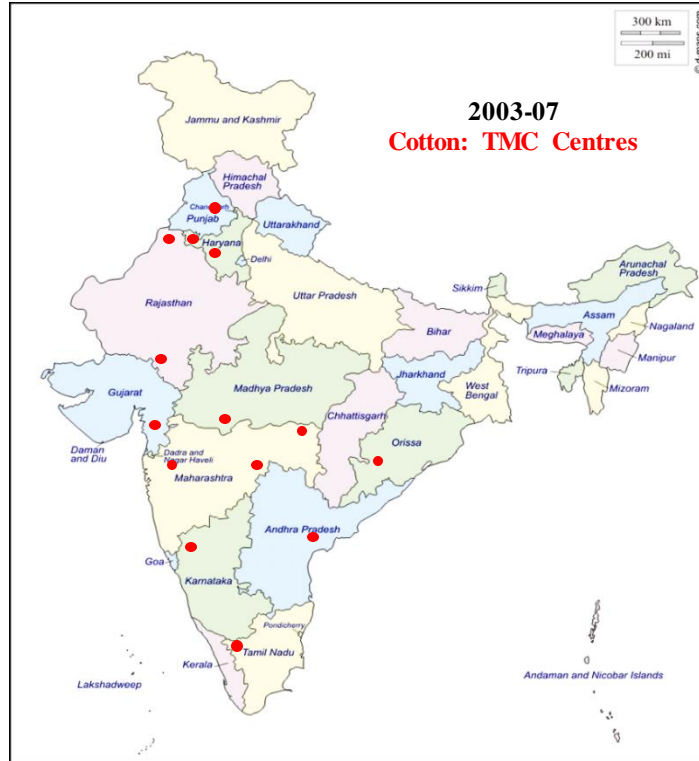


Fig.2: Maps depicting the location of centres of e-pest Surveillance and Advisory network projects during 2003-07 and 2008-14

Major contributions of the Centre are on validation and dissemination of IPM in the targeted crops (rice, cotton, pulses, oilseeds, vegetables and fruits). During 2008-14, area under Centre of IPM programme increased from 658 to 1587 hectares. It is a marginal increase in the area covered under IPM in the country by the Centre. The major contribution of the Centre during 2008-14 has been the establishment of e-pest surveillance and Advisory System covering 14 States with emphasis on Maharashtra and Odisha. This programme has resulted in reduction in the use of chemical insecticides for pest management without compromising the productivity of crops.

BIOLOGICAL CONTROL

- During the survey conducted for collection of natural enemies on cotton mealybug (*P. solenopsis*), an entomopathogen, *Fusarium pallidoroseum*, was isolated from cadavers collected from Haryana and Maharashtra.
- Among different media tested for growth and sporulation of *Verticillium lecanii* isolates, Sabouraud Dextrose Agar was found to be the best medium followed by Potato Dextrose Agar, Potato Malt Agar, Czapek Dox Agar and Potato Carrot Agar.
- Talc-based formulation of *V. lecanii*, *Beauveria bassiana* and *Metarhizium anisopliae* were supplied to different centres under TMC 3.1 for laboratory and field evaluation against mealybug and mirid bug.
- Among Oat Meal Agar, Nutrient Agar, Sabouraud Dextrose Agar (PDA), Czapek Malt Agar and Czapek Dox Agar, PDA was found to be the best medium for maintenance of nucleus culture of *F. pallidoroseum*. Mass multiplication of *F. pallidoroseum* was achieved best with maximum number of spores on rice husk followed broken rice, sorghum grains and cow dung.
- Shelf life study of the talc-based formulation prepared from bio-agents received from NBAII (PDBC) Bengaluru viz. *V. lecanii* (VL 5), *M. anisopliae* (Ma 4), *T. harzianum* (Th KSD), *T. viride* (Tv 97) and the *F. pallidoroseum* (CICR, Sirsa and Delhi) was carried out under laboratory conditions. These talc-based formulations of the bioagents viz. *V. lecanii* (VL 5), *M. anisopliae* (Ma 4), *T. harzianum* (Th KSD) and *T. viride* (Tv 97) could be stored up to 8 months at $4\pm 1^{\circ}\text{C}$ without much change in CFU count as compared to room temperature $10\text{-}20^{\circ}\text{C}$ and $26\pm 1^{\circ}\text{C}$. Initial CFU count of *V. lecanii* (VL 5), *M. anisopliae* (Ma 4), *T. harzianum* (Th KSD) and *T. viride* (Tv 97) viz. 2.1×10^9 , 1.9×10^9 , 2.2×10^9 and 2.0×10^9 were reduced to

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1.65×10^8 , 1.367×10^8 , 1.25×10^8 and 1.133×10^8 , respectively, after 8 months at $4 \pm 1^\circ\text{C}$. In case of *F. pallidoroseum*, CFU count was almost equally reduced at all the temperatures tested.

- Exploration of native *Trichoderma* spp. for the management of soil borne diseases in North East Region: The promising isolates of *Trichoderma* were characterized for biopriming, plant growth promoting characteristics, reduction of disease incidence and corresponding yield increase in cabbage, cauliflower, mustard and field pea. The seeds of cabbage, cauliflower, mustard and field pea were bioprimed with freshly prepared bio-control (*Trichoderma*) preparation. 5-10 g of bio-control preparation was made in slurry form by adding appropriate quantity of water and carefully mixed 1 kg of seeds to ensure uniform coating of all seeds. Shade dried these seeds and sown in the field. Another important method of delivery of *Trichoderma* tested was soil application/soil treatment. The potential *Trichoderma* spp. (1 kg) were inoculated in well rotten FYM (100 kg) 21 days in advance and allowed to grow and multiply in it. The *Trichoderma* enriched FYM obtained, was applied (5 kg/m^2 , wet weight basis) in the field before sowing of cabbage, cauliflower, mustard and field pea. The field emergence of four crops was recorded at 30 days after sowing and seedling vigour of all crops was calculated. The disease incidence (*Rhizoctonia solani* induced collar rot in cabbage and cauliflower, *Fusarium oxysporum f sp. pisi* in pea and *Sclerotinia sclerotiorum* stem rot in mustard) was recorded at 30 DAS, 45 DAS and 60 DAS and final yield was recorded after harvest of each crop.

The results revealed that all isolates of *Trichoderma* have significantly improved the field emergence and seedling vigour, reduced the collar rot incidence and increase in yield of cabbage. However, highest seeding vigour (1848.9), lowest collar rot (3.2%) incidence and highest yield (25.8q/ha) was recorded with isolate Th-22b. This isolate was followed by Th-4, Th-25a, Th-17, Th-27, Th-10, Th-12b, Th-19c, Th-2, Th-16c, Th-7, Th-11, Th-9b and least effective isolate was Th-8b.