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वार्षिक प्रतिवेदन
Annual Report 2011-12

राअप्रस
NIASM

राष्ट्रीय अजैविक स्ट्रैस प्रबंधन संस्थान, बारामती
National Institute of Abiotic Stress Management, Baramati

वार्षिक प्रतिवेदन | Annual Report
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राष्ट्रीय अजैविक स्ट्रैस प्रबंधन संस्थान
(भारतीय कृषि अनुसंधान परिषद)
मालेगांव, बारामती – 413 115, पुणे, महाराष्ट्र, भारत

National Institute of Abiotic Stress Management
(Indian Council of Agricultural Research)
Malegaon, Baramati - 413 115, Pune, Maharashtra, India

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Preface

NIASM is the unique institute in the making for basic and strategic research to complement the efforts of other organizations for developing agricultural systems suited to harsh agro-ecologies. We plan to work across the commodities and across the crop plants and to scale up our capacities first and then educate and pass on the expertise to the younger generation. For meeting these expectations, the institute is moving ahead with small steps to build its infrastructure, research facilities and to scale up human resources for research and education. Ultimate target is to create state-of-the art facilities like phenomics, phytotrons, rhizotrons, etc. to accomplish the challenging tasks of managing atmospheric, drought and edaphic factors contributing to abiotic stressors. In fact, several institutes within and outside the National Agricultural Research System have already been pursuing their research efforts on these issues. Hence, we plan to go in for networking mode at regional, national and international levels. In our efforts initiated at regional level, we have received overwhelming response and thereby, we take this opportunity to express our deep sense of gratitude to all the directors and heads of institutes who have offered full cooperation and expressed their interest for joint efforts with NIASM.

Taking advantage of agro-climatic features of the location, which is routinely dry without any precipitation, multi-disciplinary team of NIASM scientists have initiated preliminary trials to evaluate heat and drought tolerance in wheat and mung bean under field conditions. In addition, agricultural microbiologist carried out several experiments to investigate useful rhizospheric bacteria that can contribute to drought tolerance in sorghum. Experiments were also initiated to discover genes associated with tolerance to high temperature in fish, while scientists in School of Atmospheric Stress Management and School of Policy Support Research devoted substantial time in developing database of agroclimatic features in the region. Enhanced inclination towards multidisciplinary approach was evident from experiments where an entomologist was involved in investigating role of insecticides for elevating drought stress in tomato. A great deal of service to the region came through lead taken by NIASM in delivering agricultural technologies to tribal farmers in Nandurbar district of Maharashtra under TSP.

We express our sincere gratitude and indebtedness to Shri Sharadchandraji Pawar, Hon'ble Minister of Agriculture and Food Processing Industries, GOI for unstinted support and encouragement for building the NIASM. We take this opportunity to express our sincere thanks to Dr S Ayyappan, Secretary, DARE and Director General, ICAR; Dr A K Singh, Deputy Director General (Natural Resource Management) and Dr J C Dagar, Assistant Director General (Agron & AF), ICAR for their keen interest in growth and development of NIASM.

We thank all the researchers of this institute whose contributions are reflected in this report and also to the members of editorial and publication committee for their sincere efforts in drafting this annual report.

Place : Baramati
Date : June 2012

(P S Minhas)
Director

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कार्यकारी सारांश

राष्ट्रीय अजैविक स्ट्रैस प्रबंधन संस्थान (राअप्रस) भारतीय कृषि अनुसंधान परिषद की एक अति महत्वाकांक्षी परियोजना है जिसकी स्थापना 21 फरवरी 2009 में राष्ट्रीय खाद्य पदार्थ निकाय को स्थिर रखने एवं विपरीत प्रभाव डालने वाले विभिन्न अजैविक स्ट्रैस कारकों के प्रबंधन के अवसरों की तलाश करने के उद्देश्य से की गई है। इस संस्थान का अधिदेश वर्तमान तथा भविष्य में विपरीत कृषि पारिस्थितीकीय निकायों में भारत वर्ष की करोडों की जनसंख्या की अतिरिक्त खाद्यों की मांग की आपूर्ति को पूरा करने की आवश्यकता पर आधारित है। चूंकि विपरीत कृषि पारिस्थितीकीय निकाय पर अजैविक स्ट्रैस का प्रभाव अक्सर वायुमण्डलीय, जल तथा भूमि सम्बन्धित मापकों में विपथन के कारण विपरीत कृषि पारिस्थितीकी निकायों पर पड़ता है और इसमें वृद्धि की भविष्यवाणी जलवायु परिवर्तन की स्थिति में की जाती है। संस्थान का प्रमुख उद्देश्य विज्ञान शोध क्षेत्रों में प्रयोगशालाओं, नियंत्रित वातावरण व प्रक्षेंत्र प्रयोगों में अग्रणीय तकनीकों का उपयोग कर विभिन्न अजैविक स्ट्रैसों के प्रबन्धन के लिए रणनीतियों का विकास करना है। इसके अतिरिक्त संस्थान का निर्माण इस प्रकार से किया जा रहा है ताकि भविष्य के वैज्ञानिकों तथा नीति निर्माताओं को विभिन्न कृषि पारिस्थितकीय निकायों में अजैविक स्ट्रैस के प्रबन्धन की क्षमताओं में वृद्धि, ज्ञान प्रदान कर एवं उच्चतम सुविधाऐं देकर वायुमण्डलीय, जल तथा भूमि व नीति निर्माण के क्षेंत्रों में होने वाले अनुसंधानों की क्षमता संस्थान के चार स्कूलों के द्वारा चहुंमुखी अनुसंधानों तथा विभिन्न संस्थानीय अनुसंधान के दृष्टिकोण से किया जा सके।

संस्थान के अनुसंधान एवं शिक्षा के उद्देश्य को प्राप्त करने के लिए अभी तक बुनियादी सुविधाओं तथा मानव संसाधन के विकास पर जोर दिया गया है। इसके अतिरिक्त प्रशासनिक भवन तथा आवास निर्माण कार्य भी प्रगती पर है। अनुसंधान प्रक्षेत्र के निर्माण एवं विकास की दिशा में पर्याप्त प्रयास किए जा रहे हैं ताकि अनुसंधानों के लिए आवश्यक परिस्थितियों को न्यूनतम से अधिकतम स्तर तक लाया जा सके और इसके लिए भूमि का समतलन, रिपिंगं, गाद एवं काली मृदा की परतें क्रमवार डाली गई हैं। साथ ही संस्थान के भीतर की सड़कों के साथ परिसर व चारदीवारी के साथ वृक्षारोपण का कार्य भी किया जा रहा है। संस्थान में कर्मचारीयों की संख्या 2010-11 में 16 से बढ़कर मार्च 2012 में 37 तक पहुँच गई है। वर्तमान में निदेशक सहित वैज्ञानिक संख्या 20 है जिसमें निदेशक, दो विभागाध्यक्ष, एक प्रमुख वैज्ञानिक, तीन वरिष्ठ वैज्ञानिक तथा 13 वैज्ञानिक हाल ही में नियुक्ति हुए हैं।

वर्तमान में समस्त कर्मचारियों की व्यवस्था एक अस्थाई भवन में की गई है जो कि उच्चतम सुविधायुक्त सम्मेलन कक्ष तथा बायोटेक्नोलाजी प्रयोगशाला से सुसज्जित है। इसके अतिरक्ति पूर्व निर्मित कक्ष भी लाये गये है। अनुसंधान प्रयोगशाला की स्थापना के साथ ही न्यूनतम आवश्यक सुविधाओं के साथ फसल, पशुधन एवं मात्स्यिकी में वायुमण्डलीय, जल तथा भूमि सम्बन्धी अजैविक स्ट्रैस प्रबंधन सम्बन्धी प्राथमिकी अनुसंधान गतिविधियां प्रारम्भ कर दी गई हैं। इसमें कुछ महत्वपूर्ण उपलब्धियां हैं। फसलों के जर्मप्लाज्म का परिग्रहण, बारामती व आसपास के क्षेत्रों के लिए फसल-जलवायु विश्लेषण, ज्वार की प्रजातियों में सूखे के अजैविक स्ट्रैस के प्रति सहनशीलता वाले सूक्ष्मजीवों की जैव विविधता की खोज, एनडीवीआई द्वारा सूखा प्रवण क्षेत्रों का मानचित्रीकरण, जलवायु परिवर्तन के संबंध में बहुभक्षी मीलीबग का प्रसार, मछलियों में स्ट्रैस के प्रतिरोधी कार्यात्मक जीनोमिक्स का अध्ययन, संस्थान का भौगोलिक व जलीय सर्वेक्षण इत्यादि शामिल हैं। जनजातीय उपयोजना के अंर्तगत महाराष्ट्र के नन्दुरबार जिलें में संस्थान ने अनेकों बाह्य पंहुच वालें विकास कार्यक्रमों तथा प्रदर्शनों का आयोजन किया हैं।

विभिन्न महान विभूतियों जैसे कि माननीय कृषि मंत्री, भारत सरकार, सचिव, कृषि अनुसंधान एवं शिक्षा विभाग व महानिदेशक - भारतीय कृषि अनुसंधान परिषद द्वारा किए गए दौरे संस्थान में उनकी रूचि और संस्थान के सामरिक राष्ट्रीय महत्व की ओर संकेत करते हैं। भारतीय कृषि अनुसंधान परिषद के विभिन्न उपमहानिदेशकों ने

भी संस्थान का दौरा किया है। इसके अतिरिक्त, संस्थान के द्वारा अनेकों विचार-मंथन वाले सत्रों का आयोजन किया गया ताकि अजैविक स्ट्रैस प्रबंधन में कृषि के विभिन्न क्षेत्रों में उपलब्ध विशेषज्ञों की सलाह व अनुभव जाने जा सकें। गन्ने की फसल के स्थानीय महत्व को समझते हुए संस्थान के द्वारा वैज्ञानिकों तथा हितधारकों की एक बैठक का आयोजन किया गया ताकि नीरा नदी के क्षेत्र में गन्ने में पूर्व-पुष्पन की समस्या का समाधान किया जा सके।

इस संस्थान का उद्देश्य अजैविक स्ट्रैस प्रबंधन की दिशा में नए शोध करना है ताकि इस दिशा में पूर्व में अन्य संस्थानों में चल रहे अनुसंधानों की पुनर्रावृत्ति न हो। इसलिए इस क्षेत्र में स्थित विभिन्न संस्थानों के साथ सतत संपर्क जारी है ताकि वर्तमान में अनुसंधान की स्थिति, उपलब्ध संसाधनों तथा वैज्ञानिकों के विषय की जानकारी मिल सके। इस प्रकिया में राअप्रस को अन्य संस्थानों के वैज्ञानिकों से भारी समर्थन तथा सहयोग मिला है।

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1. Executive Summary

National Institute of Abiotic Stress Management (NIASM), a dream project of Indian Council of Agricultural Research (ICAR), was established in February 21, 2009 to explore avenues for management of various abiotic stresses affecting the progress and sustainability of national food production systems. Hence, the institute is based on the philosophy that additional food demand for millions existing and future inhabitants of the nation has to be largely met by enhanced productivity of harsh agro-ecosystems. It is since the latter are frequented by stresses occurring from aberration in atmospheric, water and edaphic parameters and are predicted to amplify in the event of climate change. The primary task for the institute is to evolve strategies to manage abiotic stresses by employing advances in frontier science research in laboratories, controlled environments and more importantly from the field experiments. In addition, the institute is being structured to enhance capacity of future generation of scientists and policy makers to manage the abiotic stresses in agro-ecosystems mainly by imparting knowledge and providing state-of-the art facilities for research in the areas of atmospheric, drought, edaphic and policy research through four different schools with multi-disciplinary and multi-institutional approach.

So far, the major emphasis has been on developing infrastructure and strengthening its human resources to accomplish the tasks of research and education. In addition to construction of administrative block and some residential quarters, which is in full swing, substantial efforts have been made to develop research farm by raising suboptimal conditions to optimal conditions for experiments by levelling, ripping, application of spent wash and layers of black soil. In addition, tree plantation along the roads and boundaries of the campus has been initiated. The staff strength has increased from 16 in 2010-11 to 37 by March, 2012. Present scientific staff is 20 including director, two heads of schools, one principal scientist, three senior scientists and 13 scientists those have joined the institute during this year.

All the staffs have now been accommodated in a temporary building that has modular work stations, state-of-the art conference room and a biotechnology laboratory. In addition, prefabricated office cabins have been placed adjacent to the above building to accommodate newly recruited staff as well as mini laboratories. With the establishment of research laboratory with minimum necessary facilities, preliminary research activities have been initiated in the areas of atmospheric, drought and edaphic stresses in crops, livestock and fisheries. Some of the achievements include acquiring germplasm of crops, crop-weather analysis for Baramati and surrounding area, exploration of microbial diversity associated with drought stress tolerance in sorghum, NDVI based mapping of drought prone area, spread of polyphagous mealybug in the context of climate change, functional genomics of stress tolerance in fishes, geological and hydrological surveys of NIASM site, etc. The construction of plant phenomics facility is in progress. The institute has its outreach programme that involves implementation of various developmental and demonstration activities under TSP at Nandurbar District of Maharashtra.

Keen interest in developing this institute as a key national facility for abiotic stress research and education was evident from visit of several dignitaries including Hon'ble Minster of Agriculture and Food Processing Industries and Secretary, DARE and Director General, ICAR. Deputy Director Generals of various divisions of ICAR also visited the institute. In addition, the institute organized several brain storming sessions to get ideas and advices from experts in various field of agriculture particularly with experience in abiotic stress management. Taking into consideration local importance of the sugarcane, NIASM organized a meeting of scientists and stakeholders to address early arrowing problem around Nira canal. Besides this, other mandate committee meetings such as RAC and IMC were held.

NIASM aims at new areas of research for abiotic stress management to avoid any duplication but to ensure complementarities with ongoing research in existing institutes. Hence, interactive sessions with several research institutes in the region have been undertaken to assess present status of research, facilities and scientific manpower. During this process, NIASM received overwhelming response from scientists from these institutes who offered to extend all the cooperation in establishing possible research collaboration.

2. Introduction

Farmers, scientific communities and policy makers are always concerned about adverse impacts of abiotic stresses on agriculture. However, the renewed and immense significance of abiotic stresses emerges from increasing concerns that the intensity and adverse impact of these stresses can amplify multifold in case of harsh events predicted to occur due to climate change and over exploitation of natural resources. Nevertheless, the abiotic stresses even at present level of magnitude will continue to be a major concern as dependence of food security of ever increasing population will tend to incline towards agro-ecosystems that are largely unfavorable for agriculture. Since the proportions of the productive land are gradually declining with anthropogenic activities, there is a need of well-planned basic and strategic research to manage abiotic stresses in agricultural commodities *viz*., crop plants, livestock, fish and poultry birds especially in arid and semi-arid regions. In this context, National Institute of Abiotic Stress Management (NIASM) was established in February 21, 2009 as one of the national institutes under Indian Council of Agricultural Research (ICAR) particularly to investigate avenues for management of agricultural commodities under abiotic stresses.

Abiotic stresses like drought, temperature extremes, floods, salinity, acidity, mineral toxicity and nutrient deficiency have emerged as major challenges for production of crops, livestock, fisheries and other commodities. Recognizing the magnitude of the problem, many countries have already initiated special research programs and have set up dedicated research institutes to embark upon the mitigation of abiotic stresses on agriculture. With substantial agricultural land in tropics and subtropics, India is more challenged with penultimate combinations of abiotic stresses spatially and temporally. Though the country is witnessing the bumper food grain production during the recent past, the threat of adverse climate in long term cannot be neglected. Therefore, there is an urgent need to take up focused research on this important area and hence NIASM has an important role to play for food security in India.

Several research institutes of Indian Council of Agricultural Research (ICAR), State Agricultural Universities (SAUs) and other departments alike are working on abiotic stresses, their efforts are too inadequate considering the magnitude of the problem. Moreover, new tools have emerged from decades of research in the areas of conservation agriculture, irrigation technologies, biotechnology, nanotechnology, remote sensing, information technology, polymer science, etc. those have opened up new opportunities for crop improvement as well as natural resource management to tackle abiotic stresses. Nevertheless, there is a need to evolve a holistic and strategic approach to get best combination of technologies for a particular agro-ecosystem that are often featured by multiple stressors and that needs to be defined with greater precision. Therefore, it is of national importance to not only initiate high quality research programme which is of global standard in this important area, but also to

capture, synthesize, adopt and apply the technological advances taking place within and outside the country.

Keeping in view the extensiveness of the problem, NIASM has an additional responsibility to maximize the number of qualified researchers and professionals of impeccable quality in the domain of abiotic stresses in agricultural science. The idea is also to equip these researchers and professionals with the skills to innovate and conduct seamless inter-disciplinary research. The institute, which will be a Deemed University, will focus on imparting education in such areas that are not routinely taught in regular agricultural universities in India.

Role of the institute

NIASM will focus on stresses that are caused by excess or deficit of soil moisture, soil salinity, sodicity, acidity, water logging, declining water quality, heat stress, cold wave, floods, sea water inundation, etc. through approaches involving conventional as well as novel techniques for crop improvement, resource management and policy development. To accomplish the task, the institute will implement important research programmes in a thematic mode and will function through four schools, namely Atmospheric Stress Management, Drought Stress Management, Edaphic Stress Management and Policy Support Research. The institute will emphasize strategic human resource development for managing abiotic stresses on long term by getting involved in a wide network of national and international institutes with provision for visiting fellowships and exchange programmes.

While focusing on abiotic stresses, NIASM will make efforts to complement the ongoing R&D under National Agricultural Research System (NARS) without any duplication of research. It will generate intermediate products for tolerance to multiple stresses such as gene constructs and stress induced promoters, which will be used by other institutes to get end products of crop, livestock, fisheries, etc.

Goal

To develop an insight into background, strategies to mitigate, strategies to incorporate with a foresight to practice climate resilient farming systems for building sustainable and profitable livelihood in stressed environments and constitutionally acceptable policy issues.

Mandate

The mandate of the institute is to enhance the capacity for abiotic stress management through basic, strategic and policy support research.

- To undertake basic and strategic research on management of abiotic stresses of crop plants, animals, fishes and microorganisms through genetic, biotechnological and nanotechnological tools and through conservation agriculture methods for enhanced and sustainable productivity, food/feed quality and farm profitability through inter-disciplinary and inter-institutional approaches

- To develop a Global Center of Excellence by establishing linkages and networking with national and international institutes/agencies
- To act as repository of information on abiotic stress and management

Objectives

i. To assess and quantify the effects of major abiotic stresses on agriculture and to develop a repository of information on abiotic stress management

ii. To develop screening techniques and evolve stress tolerant genotypes/ breeding stock/ strains of crops, horticulture, animals, fish and microorganisms through mining and deploying novel genes for tolerance to abiotic stresses

iii. To evolve technologies for mitigation of drought, edaphic and atmospheric stresses through frontier science tools such as nanotechnology, geo-informatics, etc.

iv. To develop human resource through advanced training and capacity building on the use of modern tools and techniques in abiotic stress research and management

v. To conduct policy support research on abiotic stress management in collaboration with institutes/organizations/SAUs

vi. To forge national and international linkages with other organizations working on abiotic stress

Strategy

The institute is primarily focusing on research issues so far not attended and hence at initial phase of its development will give special emphasis on reviewing the research on abiotic stresses in other institutes at present and for the future to avoid duplication. To complement their research efforts, it will establish close collaboration between the scientists associated with abiotic stress tolerance in different commodities at regional and national level. For this purpose, it is establishing state-of-the art laboratories and research facilities that can attract talented researchers and students to investigate basis of mechanisms of tolerance to stresses at cell, organ and whole plant level as well as in agro-ecosystem perspective. Recent advances in genomics, metagenomics, proteomics, metabolomics and phenomics are planned to be applied to understand the mechanisms of tolerance to stresses and also to identify the stress tolerant traits and genes that can ultimately contribute to resilience of agricultural systems to adverse climate and edaphic factors. Simultaneously, natural resource management technologies will be developed to facilitate abiotic stress management through conservation agriculture that can also contribute to mitigation of global warming through appropriate carbon sequestration strategies. The knowledge accumulated on abiotic stresses in the past in addition to the recent advances will be placed in robust database and will be shared with scientific community. This information together with continuous interaction with national and international research institutes will help NIASM to scale up capacity of next generation of scientists to evolve abiotic stress management strategies that can contribute to mitigation of global warming as well as adaptation to predicted adverse effects of climate change.

Status

The Moily Oversight Committee on OBC Reservations recommended the establishment of a dedicated research institute of Deemed-to-be-University Status on Abiotic Stress Management. In XI plan, the proposal by Ministry of Agriculture was approved by the Union Cabinet to establish "National Institute of Abiotic Stress Management" with a legal status of Deemed-to-be-University under the Indian Council of Agricultural Research at Gat No. 35, Malegaon Khurd, Baramati, Pune District, Maharashtra. After being established as a new institute for abiotic stress management in 2009, NIASM initiated its activities at the camp office at KVK, Sharadanagar, Baramati. The office was then shifted to Gat No. 35, Malegaon Khurd on November 1, 2010 after inauguration of Engineering Workshop by Hon'ble Union Minister of Agriculture and Food Processing Industries. At present, modular office, laboratory and committee room are housed in this 300 m^2 air conditioned workshop. NIASM has initiated its developmental activities with emphasis on main building, schools and the experimental farm. At the same time substantial efforts were made to strengthen its human resources for carrying out research, administrative and technical activities. During previous year (2010-11), NIASM had seven scientists including director, six technical and four administrative staff. During the current year, the scientific, technical and administrative staff strength has increased to 20, 14 and 3, respectively. Thus the filled up cadre strength is 37 against 105 sanctioned posts (Table 2.1). The institute has initiated research through four schools with multi-disciplinary approach (Fig. 2.1).

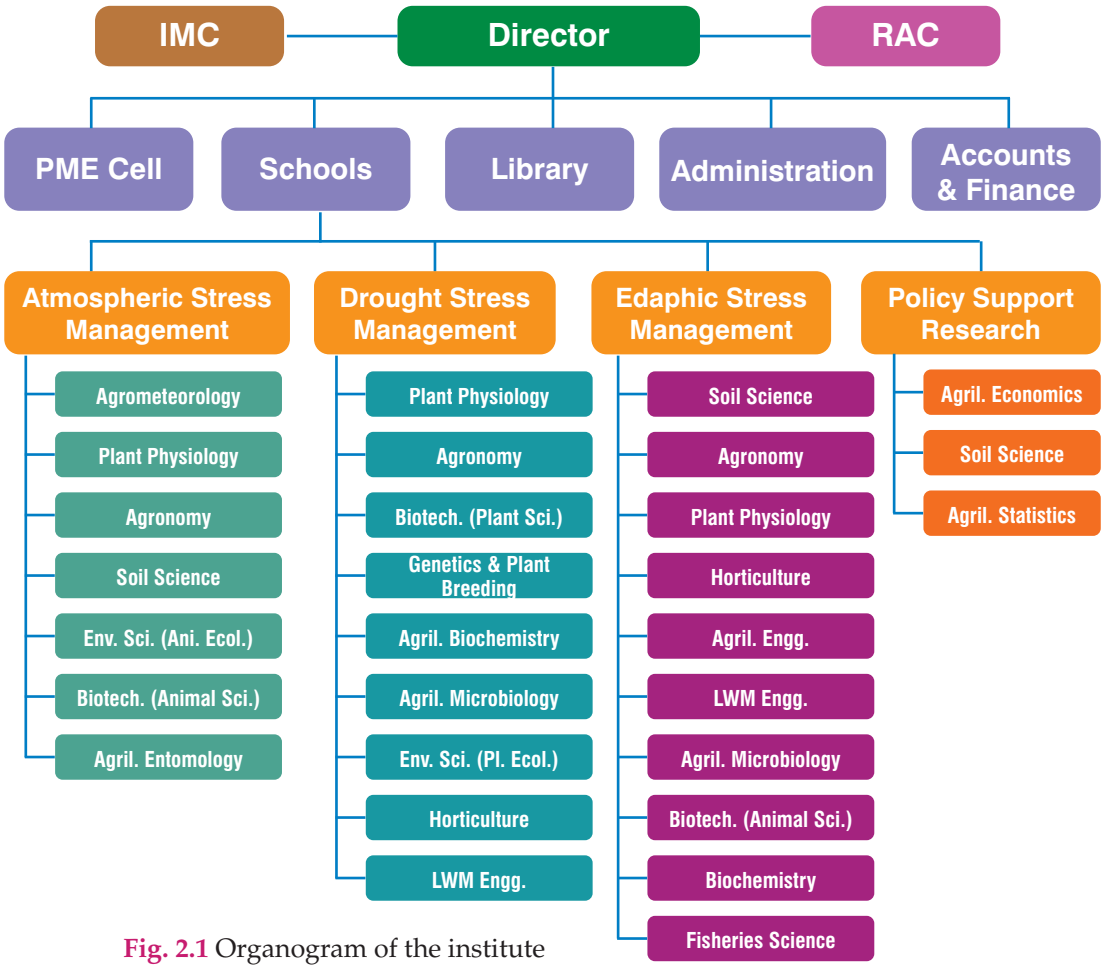

Fig. 2.1 Organogram of the institute

Cadre Strength

Table 2.1 Cadre strength as on March 31, 2012

Cadre	Sanctioned	Filled	Vaccant
Scientific*	51	20	31
Technical	33	14	19
Administrative	21	3	18
Grand total	105	37	68

*Including Director

Research Programmes of the Institute

School of Atmospheric Stress Management

- Impact of extreme weather events like elevated CO_2, high and low temperature, freezing injury, etc. on major food and horticultural crops, livestock and fisheries
- Assessment of photosynthesis, growth and productivity of rice and wheat under Atmospheric Brown Clouds (ABC) of black carbon and other aerosols, isolation of relevant genes for conferring tolerance to ABC
- Elucidating metabolic and molecular basis of adaptation of crops, animals, fish and microbes to elevated CO_2 and temperature using "omics" approach as well as systems biology strategies
- Developing decision support system (DSS) for mitigating the effect of extreme weather events
- Impact assessment of adverse weather events on biodiversity at epicenters

School of Drought Stress Management

- Physiological manifestations, perception and transduction of stress signals and regulation of stress responsive gene expression and efficient screening techniques for abiotic stress tolerance
- Mining of genes involved in stress tolerance from indigenous sources for improvement of major food and horticultural crops
- Use of genomics, phenomics, proteomics and metabolomics for enhancing abiotic stress tolerance in major food crops with a focus on wheat, rice, maize, groundnut, pulses, vegetables, mango, citrus and apple
- Plant-microbe interactions in the rhizosphere, which enhance drought tolerance

School of Edaphic Stress Management

- Genetic and molecular basis of tolerance and ion homeostasis under salinity, nutrient deficiencies, heavy metal excesses and poor water quality in major food and horticultural crops, animals, microorganisms and fishes

- Soil metagenome studies to mine and isolate novel genes that confer tolerance to above stresses
- Application of nanotechnology and nano materials for evolving novel products and methods for bioremediation and biotrapping
- Impact of submergence and anoxia on crop growth and productivity through use of systems biology approach
- Assessment of soil as a sink for greenhouse gases and methods in mitigation of salinity and heavy metal stresses

School of Policy Support Research

- Evolving remediation strategies for moderation of abiotic stresses
- Designing novel management options that provide opportunity for stress mitigation and carbon trading under Clean Development Mechanisms (CDM)
- Policy research for promoting the adoption of mitigation/adaptation strategies for abiotic stresses

Developmental Activities

Construction works

The construction of buildings including administrative block, staff quarters and other developmental works are in progress. Status of other on-going works under patronage of CPWD, Pune is given in Table 2.2 and depicted in Fig. 2.2

Table 2.2 Progress of construction works

Sl. No.	Name of work	Estimated cost (₹ in lakhs)	Status of work
1	Compound Wall, Entrance Gate, Security Office	248.60	Out of 1105 compartments, 650 compartments are completed
2	Residential Quarter Type IV-Six Nos.	238.23	RCC and brick work is completed and internal plastering work is in progress
	Type VII-One No.		RCC work is completed, brick work in progress
3	Office-cum-Administrative Building	2093.00	Foundation and plinth work is in progress
4	Overhead Water Tank under Drinking Water Supply Scheme	47.00	MJP has undertaken the work of establishing Drinking Water Scheme. Construction of tank and laying of pipeline is completed. Finishing work is in progress
5	Guest House	398.00	Tender has been floated
6	Express Feeder for Power Supply	70.00	Installation of all equipments is completed except transformer

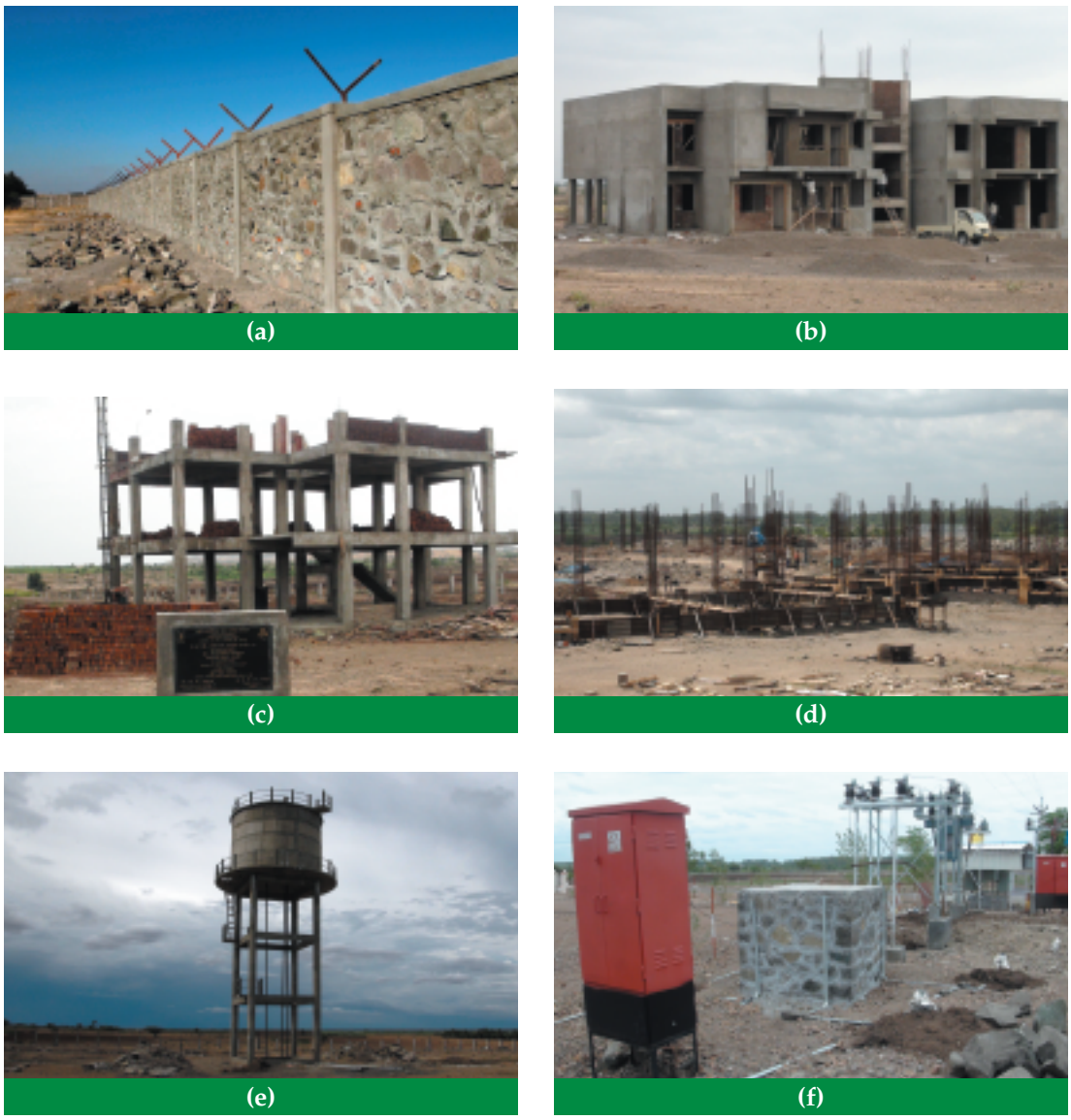

Fig. 2.2. Construction of compound wall (a), type IV quarters (b), type VII quarter (c), office-cum-administrative building (d), overhead water tank (e) and electric power station (f)

Research laboratory

A small well-furnished modular research laboratory has been established to initiate research activities in the areas of biotechnology, microbiology and agricultural entomology. The various equipments available in this laboratory (Fig. 2.3) include Gel documentation system, Horizontal gel electrophoresis system, Vertical protein gel electrophoresis, Microbiological incubator, Centrifuge, Circulating water bath, Vortex mixer, Water purification unit, Laminar air flow chamber, Deep freezer, Orbital shaker, Liquid nitrogen transfer vessel, BOD incubator, Hot air oven, Insect collection boxes and nets, insect rearing cages, aspirators and stretching boards. Stereomicroscope with imaging software, Refrigerated centrifuge, Refrigerated incubator shaker, UV/VIS spectrophotometer and Ice flaking machine have also been added to the existing facilities.

Fig. 2.3. Recently procured Leica-Stereomicroscope and imaging system (a), Shimadzu-UV/Vis Spectrophotometer (b), Khuner-Refrigerated incubator shaker (c) and Hettich-Refrigerated centrifuge (d)

Plant phenomics facility under NICRA

Under the National Inititative on Climate Resilient Agriculture (NICRA) component, a plant phenomics facility is being established at NIASM, Baramati to facilitate the high throughput phenotyping of plant germplasm for tolerance to various abiotic stresses. The construction of the smart greenhouse required for housing the imaging station has been started and the work is expected to complete by September, 2012. The greenhouse covers an area of 432 m^2 with a gable front length of 27 m and gutter front length of 16 m. Zinc coated pregalvanized steel pipes and double polycarbonate sheets (8 mm thick) are being used to construct the greenhouse. Inside the greenhouse, there are four zones (A, D, B and C) to create different climatic conditions. The greenhouse has concrete flooring and electrically operated roof vents with thermal and shading screens. Recently, the imaging station along with conveyor belt system and other accessories from Lemna Tec, Germany has been received by the institute and the installation of the facility shall start as soon as the construction of the smart greenhouse is complete.

The phenomics facility has a capacity to house 240 pots and fitted with three types of imaging systems *viz*., IR, VIS and NIR for imaging the plants and to analyse their response to abiotic stresses. The facility has conveyor belt systems to move the plants through the imaging system. In addition it has automatic weighing and watering stations.

(a) (b)

Fig. 2.4. Smart greenhouse construction (a) and imaging systems (b) received at NIASM, Baramati

Research farm development

The institute plans to develop a "Model Research Farm" for the soil and water conservation technologies suited to the semi-arid climate of the region. Presently, research farm is being developed over an area of about 40 ha (Fig. 2.5). The design and development of research farm is based on scientific considerations like watersheds, natural drainage pattern, topography, contour map and layout of various buildings in the approved master plan of the institute. The research farm is divided by existing east-west road into south side and north side farms. The south side farm is spread over a total area of 16 ha which has been divided into 37 research plots. Of these, centrally located 32 research plots are of regular rectangular shape of size 68.5 m x 36.5 m admeasuring 2500 m^2 area each, while the rest are of the size 68.5 m x 68.5 m. All these research plots were initially levelled and ripped with help of heavy machines provided by the Mechanical Division, Irrigation Department, Govt. of Maharashtra. About 24 million litres of spent wash from Malegaon Sugar Factory was applied over three years in different plots to enhance weathering of gravels. Thereafter, plots were fine levelled by using tractors. Based on requirement, these plots were ripped again using dozers to break the exposed portions of the bed rock. The process has been repeated twice and now a major portion of these plots is partially ready for planting of crops. The crop like dhaincha, marvel grass, stylos, leucaena and other rainfed crops like green gram, soybean, bajra, sorghum, etc. are planned to be cultivated during this year. Black soil of 6000 brass (or 16,990 cu m) quantity was applied to 10 research plots over 2.5 ha area during 2011 and another 2000 brass have been recently applied to cover another 1 ha. Irrigation network of pressurised irrigation systems like drip and sprinkler is being planned after the Lift Irrigation Scheme is installed by Irrigation Department. North side farm covering a total area of 24 ha is being developed into six contour terraces of 30 m width. The contour terraces have been ripped and partially levelled after removing the big boulders by using a 350 hp Dozer-Ripper for initial coarse work. A 200 hp dozer and 75 hp tractor mounted dozer for finer shaping and making bunds. The big boulders and stones were used for bottom layer of farm paths that were overlaid with 10-15 cm thick murrum top layer. Low water requiring and hardy horticulture plantations like sapota, tamarind, guava, pomegranate, custard apple, aonla, fig, etc. are planned to be established using runoff harvested water and drip irrigation system on this north side farm.

Fig. 2.5. Aerial view of the Research Farm (a), A 350 hp dozer-ripper preparing terraces by ripping and levelling (b), Preparation of farm paths using 75 hp tractor mounted dozer attachment (c), Spent wash being applied for developing research plots (d)

About one thousand pits (1 m x 1 m x 1 m size) were dug using poklain and JCB machines along peripheral road and inside north side campus. The pits were filled up with black soil and farm yard manure in 3:1 proportion, phosphorus fertilizer, micronutrients and folidol powder. Different plant species like teak, coconut, mango, jamun, sapota, aonla, tamarind, arjun, etc. have been planted in these pits. Block plantations of teak have also been taken up along north-eastern boundary of the institute (Fig. 2.6). Natural fencing using agave plantation has been established around the eco-reserve area after digging 1 m deep and 1 m wide trench and filling up with black soil. Nursery shed of 180 m^2 area for raising of seedlings was constructed using cement poles, iron pipes and shed net. In addition to raising of nursery, the shed is also being used for keeping pots of experimental plants such as coconut, *Prosopis* sp., teak, cactus and horticultural plants.

Fig. 2.6. Nursery shed to facilitate plantation (a), block plantation of teak (b)

Irrigation system

The main source of irrigation water for the institute is Nira canal, which is flowing at a distance of 2 km on the south side at an elevation difference of a 26 m. The institute has obtained permission from the Irrigation Department, Govt of Maharashtra to draw water from the Nira Canal. A 20 hp monobloc pump set having 22 lps discharge rate has been installed at the canal and water is pumped through 5" diameter PVC pipeline up to a 15000 liter capacity cement tank in the NIASM campus. The electric supply to the pump set is controlled through GSM based mobile system in which motor can be operated by dialing a particular number. Technical staff have been trained to operate this pump remotely from the NIASM campus. (Fig. 2.7).

Fig. 2.7. Remotely controlled irrigation pump located 2 km away from NIASM (a), monitoring irrigation with water meter (b)

Library

The institute library is being developed to cater to the information needs of scientific, technical and administrative staff and particularly the students interested in abiotic stresses. The institute library though in its infancy, has modest collection of books and journals. Presently, the library provides an access to online journals being subscribed by CeRA, electronic dissertations from Krishi Prabha and reference services through the library portal. Users can access the online database and also find out the real-time availability of library materials from their own computer terminals. A repository of institute publications is being maintained through the open source software DSPACE. The total number of acquisitions during this year was 292 books, 45 annual reports and 100 open source articles thus leading to total holding of 462, 85 and 225 of these documents, respectively.

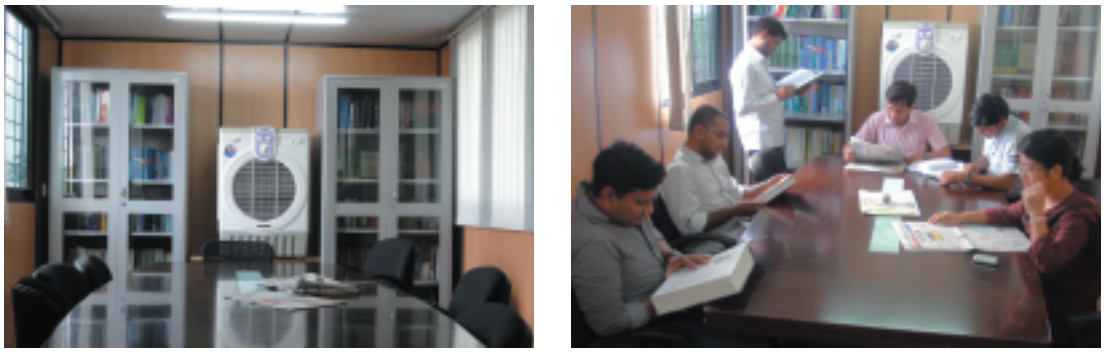

Fig. 2.8. NIASM library

Facility for statistical computing

Efforts are being made to enhance capacity of NIASM scientists and technical staff for statistical analysis under a project on Strengthening Statistical Computing for NARS sponsored by the National Agricultural Innovation Project. As a part of the project the SAS software depot was obtained from Central Institute for Fiesheries Education (CIFE), Mumbai. This software has been installed on all official PCs of the institute and can be accessed by scientists through their PCs for analysing research data. SAS is a very versatile statistical package and can be employed for operational research, experimental designing, data analysis and also to generate the reports and presentations. Scientists have been trained in the usage of SAS program at CIFE.

Facility for applied geoinformatics

This facility includes Dell T5500 workstation with required configuration powered with software for GIS applications and digital image processing software namely ArcGIS (version 10.0) and ERDAS 2011. In addition, a handheld Garmin GPS receiver was also procured for field surveys.

3. Research Highlights

School of Atmospheric Stress Management

Weather analysis

Variability and temporal trends in various weather elements were computed from long term data of various weather variables at Baramati and its neighbourhood, Padegaon. Rainfall in Baramati during 1986-2010 was quite variable with a very high year to year variation. Co-efficient of Variation (CV) of annual rainfall was found to be about 35% (Fig. 3.1). Rainfall showed slightly positive trend with an average annual increment of 10.3 mm over the past 25 years. Annual rainfall in Padegaon during the past 80 years did not show any definite trend. However, maximum and minimum temperature as well as morning and afternoon relative humidity showed increasing trends whereas bright sunshine period showed a decreasing trend. The complex interaction of various weather elements ultimately resulted in a net decrease in climatic water demand over the years.

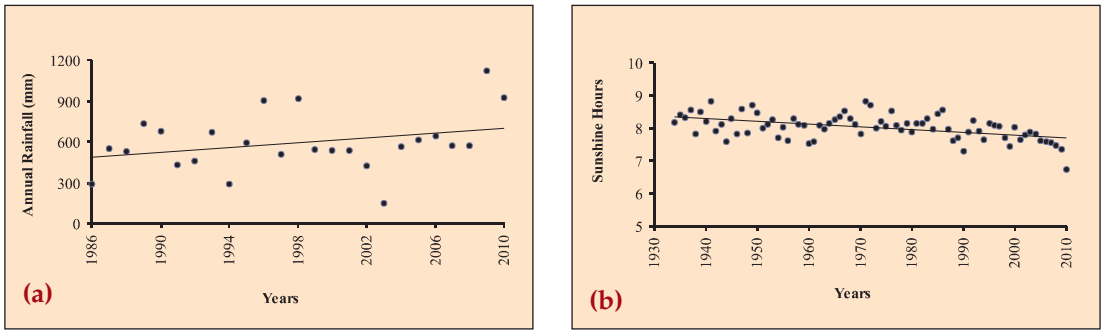

Fig. 3.1. Rainfall trend (1986-2010) in Baramati (a) and time trend of sunshine hours over the past eight decades in Padegaon (b)

Crop-weather interaction studies

The period between 1986 and 2010 was divided into different rainfall regime classes based on the twin criteria of rainfall amount and the number of rainy days occuring at Baramati. The crop performance corresponding to those classes was evaluated by means of the average productivity of *kharif* and *rabi* crops (Table 3.1). No definite trend in productivity of *kharif* crops could be observed since there was improvement in rainfall regime of the monsoon season. However, productivity of *rabi* crops like jowar, wheat, gram, etc. increased with rainfall regime. Productivity of jowar (r=0.66), maize (r=0.60) and soybean (r=0.55) was better related to total monsoon rainfall (Jun-Oct) than the other crops in *kharif*.

Table 3.1. Rainfall regime and average productivity of major crops in Baramati taluka

Rainfall regime	Rainfall (mm)	Crop productivity (kg/ha)		
		Maize	Soybean	Jowar
I	400-600	2767	2448	1388
II	600-800	3183	2086	1343
III	800-1000	3442	1820	709
IV	1000-1200	3784	1500	638

Remote sensing applications in agriculture

A protocol is being developed for estimating canopy cover using digital photographs (obtained under shadowed conditions) and by using standard image processing software. Images were captured from a fixed height off the ground surface with typical zenith-azimuth orientations of the camera during heading and flowering stages from experimental fields grown with four different wheat cultivars in two different soil types (gravelly and black soil) and under differential irrigation treatments (Fig 3.2). Isodata classification method with a chosen set of parameters (no. of iteration: 5; no. of classes: 2, etc.) was followed to estimate per cent canopy cover. These estimates were then correlated with the observed yield data. The methodology did not work well in gravelly soil due to noise created by the reflections from gravelly surface. However, it showed greater promise in black soil. The methodology requires further testing and tuning in terms of the classification methods, the value of the parameters, wave bands, camera angles and the lens type. Such estimates of canopy cover can be used in crop simulation models (e.g. Aquacrop), where percentage of canopy cover at important growth stages is required. Also, these machine generated information are effective in removing biases, which may arise out of the subjectivity in manual methods.

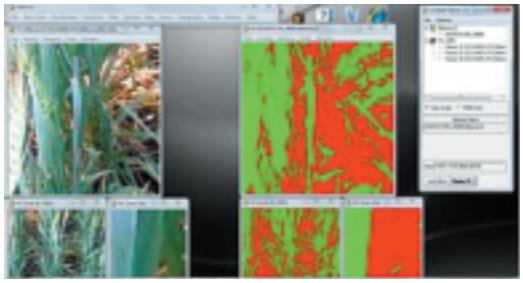

Fig. 3.2. Image classification and information extraction

Modelling geographic distribution of *Phenacoccus solenopsis*

The climate change, a globally acknowledged fact has been reported to impact negatively the diversity, abundance and geographic distribution of crop pests. The rapid invasion and spread of polyphagous species of mealybug *Phenacoccus solenopsis* Tinsley in India within a short period of time implies potential changes in its abundance and geographic distribution in the context of changing climate. Hence potential geographic distribution of *P. solenopsis* in India was modelled using algorithms such as DIVA-GIS (an open source geographic information system for mapping and analyzing spatial data) and MaxEnt (Maximum Entropy species modeling). The predictions were made on available 66 occurrence records for *P. solenopsis* along with the corresponding climate data both current and future, defined on the study area. The algorithm provided reasonable estimates of the species range indicating better discrimination of suitable and unsuitable areas for its occurrence both at current and future climatic scenarios.

The predictions have implications that the current geographic distribution of the *P. solenopsis* in India will be adversely affected by the climate change (Fig. 3.3). The areas highly suitable for the pest occurrence at current climate are predicted as unsuitable or marginally suitable under future conditions. The areas considered to be unsuitable or less suitable for natural occurrence of *P. solenopsis* under current climatic conditions will become more conducive with changing climate for rapid spread and multiplication of the pest species. The areas predicted as having high risk of future pest invasion are Western Gujarat, South-Eastern Rajasthan, Northern Madhya Pradesh and surprisingly, new areas in Uttar Pradesh (Fig. 3.3b).

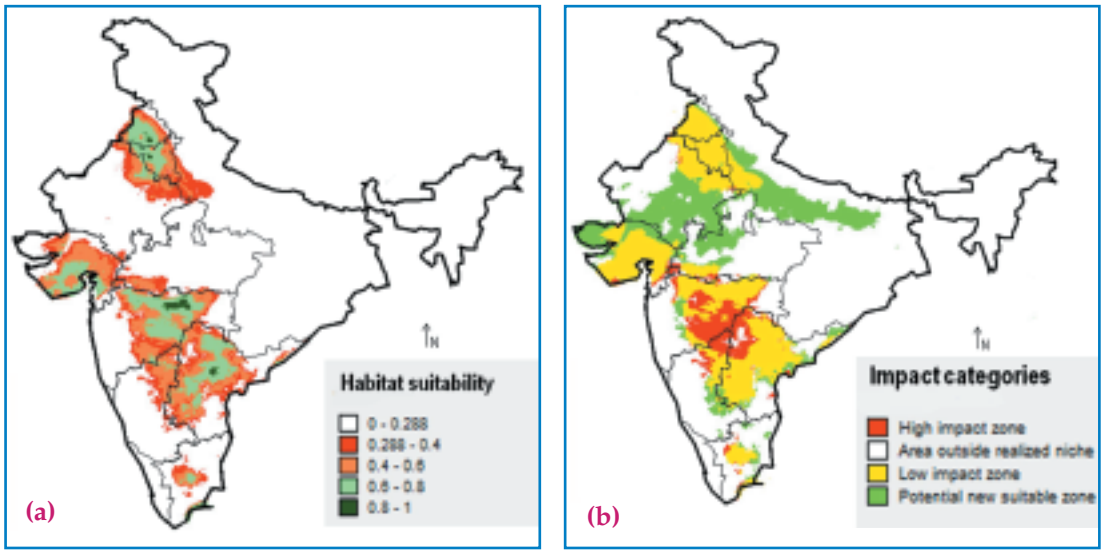

Fig. 3.3. Geographic distribution of *P. solenopsis* at current (a) and future (b) climatic conditions

Effect of systemic insecticides on stress tolerance in tomato

Field and pot experiments were conducted during October, 2011 to March, 2012 to evaluate the impact of systemic insecticide application on water stress tolerance in a variety of tomato Dhanashree (Fig. 3.4). The insecticides/chemicals used were: Imidacloprid (Confidor), 17.80 % SL, 0.005%; Dimethoate (Tafgor), 30% EC, 0.06%;

Monocrotophos (Devimono), 36% SL, 0.054%; Salicylic acid (2 hydro benzoic acid), 99.0%, 100 ppm; Neem pesticide (only for pot experiment) along with a control for comparison. The plants were watered regularly for first five weeks after transplanting. Then, half of the plants were water stressed for next four weeks while rest half were irrigated normally. The insecticides were sprayed both on water stressed and regularly irrigated plants at weekly interval throughout the stress period. The stressed plants were then allowed to recover by resuming the irrigation till the harvest. The stressed untreated and unstressed untreated plants were kept as control for comparisons. Morphological observations on growth parameters such as leaf weight root and shoot weight and length, fruit weight etc. were recorded from each treatment. Biochemical analysis is in progress for assessing the compounds such as antioxidant and other enzymes like catalase (CAT), superoxide dismutase (SOD), ascorbate peroxidase, glutathione reductase, protein, sugar (reducing and non-reducing), glycine betaine, etc. and their role in plant stress tolerance.

(a) (b)

Fig. 3.4. Experiments to evaluate effect of insecticides on drought tolerance in tomato in field (a) and pot (b)

School of Drought Stress Management

Drought tolerance in green gram

Green gram is one of the important pulses that can be grown in all the seasons and hence can fit into many cropping systems including those under harsh environments. Experiments were initiated to investigate traits and genes associated with drought tolerance in green gram. The genetic variability was assessed in green gram germplasm obtained from National Bureau of Plant Genetic Resources (NBPGR) New Delhi along with local checks BPMR-145 and Vaibhav released by MAU, Parbhani and MPKV, Rahuri, respectively for Baramati region. To evaluate this germplasm for drought tolerance, all the 25 lines were planted in two trials. Both the trials received uniform irrigation at alternate days till flowering. At flowering initiation, irrigation was withheld to impose drought stress. Response of stressed plants was compared with those irrigated regularly. The data on various parameters such as days to flowering, plant height, grain yield per plant and harvest index were recorded and analysis is in progress.

Cloning of partial gene of serine threonine protein kinase

The serine threonine protein kinases are important components of signalling cascades mediating the abiotic stress responses. Hence, experiments were initiated to investigate their role under drought stress conditions in green gram. The cDNA was amplified with gene specific primers for serine threonine protein kinase gene. An amplicon of approximately 200 bps could be successfully amplified. The amplified product was eluted from gel, blunted with blunting enzyme and ligated in pJET 1.2 vector. The resulting ligation mixture was used to transform the competent cells of *Eschericia coli* strain DH5α. The bacterial colonies obtained after transformation were screened for the presence of insert by colony PCR (Fig. 3.5). Experiments are in progress to isolate the colony showing the presence of the right sized insert, which will be used for plasmid isolation and for further confirmation by sequencing.

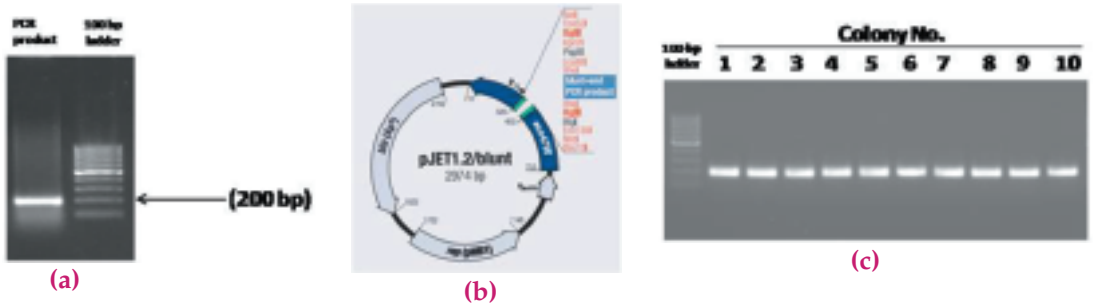

Fig. 3.5. Amplification (a) and cloning of serine threonine protein kinase (b and c) from green gram

Characterization of *Rhizobium* spp. from green gram genotypes

The biological nitrogen fixation process of legume-*Rhizobium* symbiosis significantly affects any crop management or agronomic practices in crop production. Drought-related inhibition of nitrogen fixation seriously limits legume yield in many arid and semi-arid regions. In order to increase nodulation and nitrogen fixation efficiency under these conditions, it is essential to identify superior *Rhizobium* spp. adapted to drought conditions for developing bio-inoculants. Hence, experiments were initiated to characterize *Rhizobium* spp. associated with drought tolerance in green gram genotypes. Fifty five morphologically different strains of *Rhizobium* spp. isolated and purified from the root nodules of 22 different drought tolerant green gram accessions and a local variety grown in pots (Fig. 3.6). Isolation and purification of *Rhizobium* spp. from remaining green gram accessions received from NBPGR, New Delhi is also under progress. The genomic DNA isolation from all 55 *Rhizobial* isolates has been carried out and 16S rDNA amplified from these strains for restriction profile and genetic diversity analysis. In addition, 18 rhizobial isolates and 16 mesorhizobial isolates were isolated

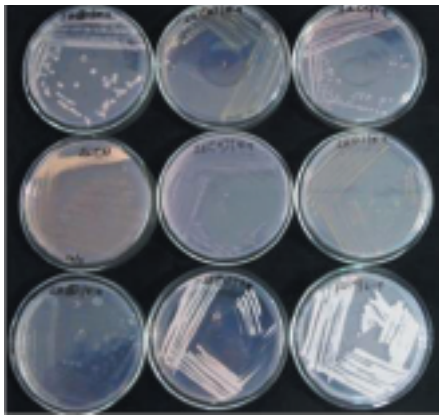

Fig. 3.6. Colony variability in *Rhizobium* spp. isolated from root nodules of green gram accessions

and purified from root nodules of other legume plants such as daincha (*Sesbania aculata*) and chickpea (*Cicer arietinum*) plants grown in different field locations of NIASM, Baramati.

Bacterial endophytes in drought tolerant sorghum

Sorghum is one among the drought tolerant crops growing in arid and semi-arid regions. In addition to its genetic makeup, rhizobacteria and bacterial endophytes associated with sorghum also play a critical role in drought stress tolerance in sorghum. Hence, the above project was conceived with the goal to determine the prevalence, properties, functional and genetic diversity of bacterial endophytes colonizing drought tolerant sorghum cultivars. Seeds of four drought tolerant (*rabi* sorghum) varieties *viz*., Maldhandi 35-1, Selection-3, Phule Anuradha, Phule Maulee were obtained from MPKV, Rahuri. During *rabi* season, seeds of four cultivars were sown in the field at NIASM site and also in pots with red and black soil. Both root samples and rhizospheric soil samples were collected for the isolation and enumeration of rhizobacterial population. Bacterial endophytes and rhizobacteria were isolated at three different growth stages of sorghum *viz*., Seedling development (I), Panicle initiation/pre-flowering (II) and Flowering/reproduction (III). Morphologically different colonies were picked and further purified in separate plates containing respective growth media (Table 3.2).

Table 3.2. Bacterial endophytes isolated from surface sterilized roots of sorghum at different growth stages

Variety	Growth stages	No. of bacterial endophytes		
		Red soil	NIASM field soil	Black soil
Maldhandi 35-1	I	5	13	22
	II	9	6	6
	III	8+20*	12	4
Phule Anuradha	I	8	9	7
	II	6	10	7
	III	6	5	5
Phule Maulee	I	4	5	2
	II	2	10	4
	III	5	6	4
Selection-3	I	5	10	5
	II	6	9	8
	III	6+1*	7	4
Total no. of bacterial endophytes selected		70+ 21*	102	78

*Fluorescent pseudomonads

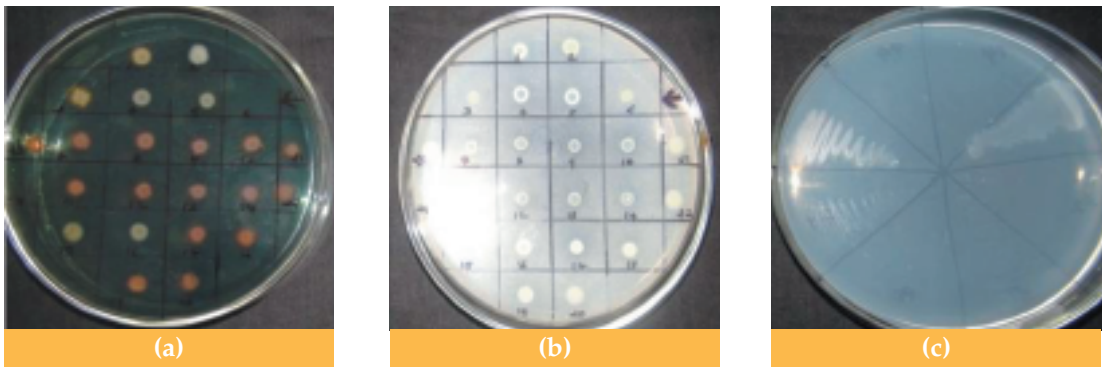

Fig. 3.7. Screening of bacterial endophytes of sorghum for functional traits- Siderophore production (a), P- solubilization (b) and N - fixation (c)

Isolated bacterial endophytes of sorghum were screened for functional traits like N-fixation, P-solubilisation and siderophores production (Fig. 3.7) and further work on screening for phyto-hormones production and ACC deaminase enzyme activity will be carried out. In addition, the genomic DNA was extracted from endophytic and rhizosphere colonizing fluorescent pseudo-monads. PCR screening to identify ACC deaminase (*acdS*) gene in these isolates were carried out (Fig. 3.8).

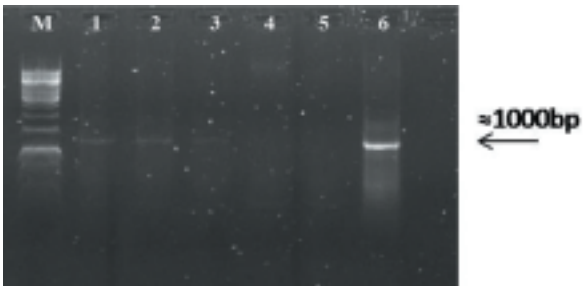

Fig. 3.8. PCR based screening of *acdS* gene from rhizobacterial isolates of sorghum

Drought stress management in muskmelon

An experiment was conducted in farmer's field to evaluate the effect of water stress at critical stages of growth in drip irrigated muskmelon and its alleviation with the use of growth harmones. Recommended package of practices were followed except with holding irrigation for either 7 or 14 days at flowering and fruiting stages. The phyto-hormones sprayed included 6-BAP @ 10 and 20 ppm, GA_3 @ 50 and 100 ppm while a control kept for comparisions. The response of plants to these treatments was recorded in terms of fruit yield, sugar content (Brix %), physiological and biochemical traits (Table 3.3). The impact of water stress at fruiting stage was more svere than that at flowering stage and also when given for longer period (15 days). Growth recovery from stress was higher when it was applied at flowering stage than that of fruiting stage. Application of GA_3 @ 50ppm recorded the highest yield when irrigation was halted for 7 days at flowering stage.

Table 3.3 Fruit yield (kg/plant) under different treatments

Growth harmone (ppm)	Normal irrigation	Flowering stage		Fruiting stage	
		7days stress	14 days stress	7days stress	14 days stress
Control	2.02	1.92	0.56	0.45	0.31
6-BAP @10	2.39	2.17	0.92	0.55	0.34
6-BAP @20	2.69	2.59	1.10	0.71	0.57
GA_3 @50	3.01	3.00	2.11	1.35	0.88
GA_3 @100	2.99	2.96	1.28	0.93	0.53

School of Edaphic Stress Management

Effect of high temperature stress on expression of genes and growth of *Catla catla*

The *Catla catla* fry were procured and experiments on expression of different genes were conducted on exposure to high temperature and oxygen stress. Myostatin (MSTN), Vitellogenin (VTG), Hypoxia Inducing Factor (HIF) genes were expressed in fry stage of *Catla catla* (Fig. 3.9). The total RNA was extracted from whole fish fry and cDNA was prepared. Myostatin cross-species primers MSTN-F1 5′-CAAAT (T,C) CT (T,C) AG (C,T) AAACT (C,G,T)-3′ and MSTN-R1-5′ATAATCCA (G,A) TCCCA (G,T) CCAAA-3′ were used to analyse the expression of MSTN gene. The PCR amplicon size was 500 bp in size. The PCR product was sequenced and the sequence is being confirmed through cloning. Further fish fry were exposed to a temperature stress to analyze the expression of muscle growth inhibiting myostatin gene. The fish were exposed to 31 and 35°C. Myostatin gene expression was higher at 35°C compared to the same at 31°C (Fig. 3.10).

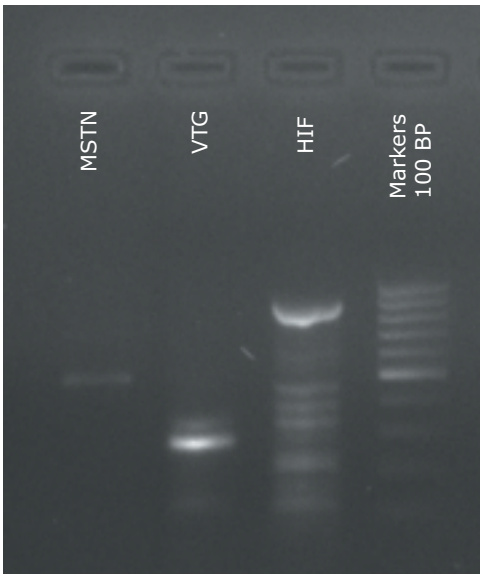

Fig. 3.9. Gene expression at 50°C in *Catla catla*

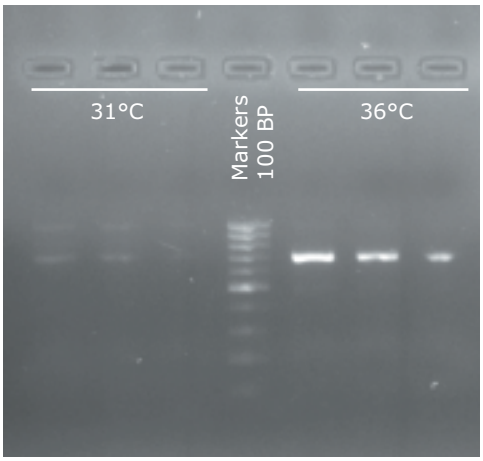

Fig. 3.10. Expression of MSTN gene at 31 and 35°C in *Catla catla*

Further experiment on the impact of temperature stress on growth rate of *Catla catla* fry was conducted in laboratory aquarium. *Catla* fry were exposed to two different temperatures of 31 and 36°C. The experiment was conducted for a period of 80 days. Observation on length (cm) and weight (g) were taken at every 10 day interval. The temperatures were maintained using thermostat. Higher temperature induced better growth initially up to 40 days (Fig 3.11) and then there was reduction in growth while the fry grown at 31°C continue to grow for a period up to 90 days. The fish fry exposed to high temperature exhibited loss of appetite, sluggish movement in water, loss of balance and hanging nature of swimming and rotting of fin.

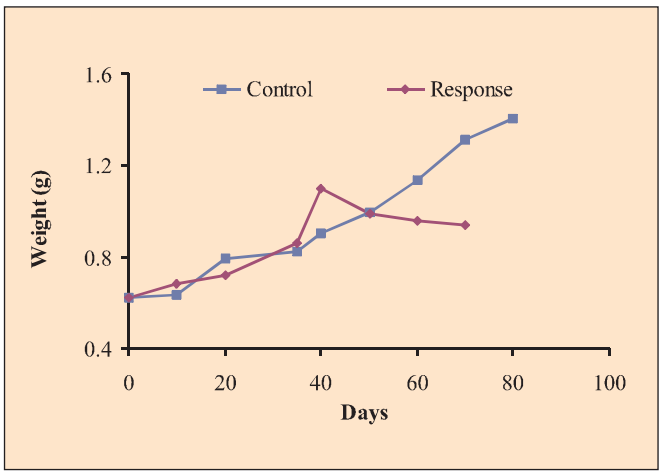

Fig. 3.11. Weight gain in fish fry grown at 31°C (control) and 36°C (response)

Effects of high temperature and soil moisture stress on wheat genotypes

To study the effect of restricted soil moisture and terminal heat on performance of wheat, a field experiment was conducted in native gravel soil and black soil (Fig. 3.12). Tretaments included four wheat genotypes (NIAW 34, NIAW 301, HD 2189 and LOK 1), two dates of sowings (December 10, 2012 and December 16, 2012) and three levels of soil moisture stresses (6 irrigations, 5 irrigations and 4 irrigations). The irrigations were applied by considering the most important critical growth stages of wheat crop. All the wheat genotypes performed better in black soil as compared with native gravel soil. Yield attributes were affteced by different treaments (Table 3.4). The lengthiest spikes and the highest number of grains/spikes were recorded under no soil moisture stress condition (6 irrigations) with the first date of sowing in HD 2189 in both the soil types. Under similar condition, LOK 1 had maximum 1000-grains weight. Irrespective of the wheat genotypes the values of yield attributes were decreased with increased levels of moisture stress and delay in sowing. However, the yield attributes, particularly 1000-grains weight of the LOK 1 and NIAW 34 were not affected due to soil moisture stresses. This could be partially due to their shorter duration which enabled the plants to escape terminal heat stress.

Fig. 3.12. Experimental view of the wheat crop grown under native gravel soil (a) and black soil (b)

Table 3.4 Effect of soil moisture regime and date of sowing on yield attributes of wheat genotypes in two soil types

Treatments	Black soil			Native gravely soil		
	Spike length (cm)	Grains/ spike	1000-Grains weight (g)	Spike length (cm)	Grains/ spike	1000-Grains weight (g)
Genotypes						
NIAW 34	6.86	39.5	42.3	6.17	29.0	36.7
NIAW 301	7.78	45.0	45.3	6.92	34.1	38.2
HD 2189	9.50	50.9	39.3	7.38	36.1	36.2
LOK 1	7.00	41.1	48.1	6.75	27.4	40.3
CD (P = 0.05)	0.32	4.8	3.8	0.23	0.9	1.9
Date of sowings						
10th Dec.	7.93	45.6	45.2	7.09	34.2	39.0
16th Dec.	7.64	42.7	42.4	6.53	29.1	36.6
CD (P = 0.05)	0.13	1.5	1.6	0.14	1.0	1.0
Soil moisture stress						
6 Irrigations	8.10	46.6	46.4	7.21	34.3	40.2
5 Irrigations	7.76	44.2	44.1	6.82	31.9	38.1
4 Irrigations	7.49	41.5	40.9	6.40	28.7	35.3
CD (P = 0.05)	0.42	2.2	0.9	0.29	1.0	2.8

Geohydrological and geophysical surveys of NIASM site

Geohydrological and geophysical (electrical resistivity) surveys of the NIASM site were carried out for the delineation of potential/suitable/favourable zones for sinking of water abstraction structures for water supply to farm land, plots and other utilities on the campus. Hydro-geochemistry of water samples as well as geochemistry of rock/soil samples at different intervals of depth were determined for locating the abiotic stresses. The groundwater of the area is alkaline (pH 7.6 to 8.6) and marginally saline. Total hardness is below the prescribed limit for drinking water. The chloride content is variable (28 to 227 mg/L), nitrate are low (3.2 to 10.5 mg/L), sulphate varies from 70.45 to 72.9 mg/L while carbonate percentage is between 0 to 12 mg/L. The Sodium Absorption Ratio (SAR) is quite low (1.2 to 3.1).

Electrical Resistivity Method (ERM) was employed to conduct geophysical survey of the institute site. 'Vertical Electrical Sounding' (VES) and the 'Horizontal Profiling' (HP) electrode configurations were adopted for lateral as well as vertical variations and the array is moved as a whole along a traverse line. Both VES and HP were conducted at 46 different locations along 18 horizontal and 28 vertical profiles. The values of true resistivity of strata (Ω), its thickness (h) and depth (d) were obtained after modelling of data and are depicted in Fig. 3.13 for site 2 where there is a substantial drop in the resistivity at a depth of 53 to 55 m and thus the locations are good for siting bore wells. At VES 9 the strata is soft up to a depth of 75 m beyond which massive hard rock is envisaged and hence this location is ideal for siting rain water harvesting structure such as recharging well or recharge pit. Similarly, point 11 is also recommended for rain water harvesting structure such as recharging well or recharge pit. At VES 18, the rock strata is conducive as potential aquifer up to a depth of 20 m beyond which the strata encountered is hard, compact and massive.

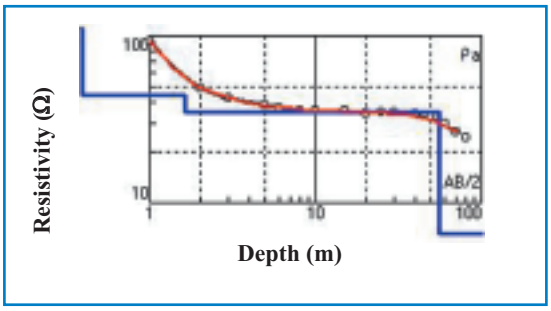

Fig. 3.13. Electrical resistivity data output at location 2 of NIASM site

School of Policy Support Research

Analysis of market arrival and price trend of onion in Maharashtra

The long term data on price and arrival of onion in wholesale markets of Maharashtra were collected and analysed. The ranking of markets based on arrivals was worked out and top ten markets *viz*., Pune, Solapur, Pimpalgaon, Mumbai, Lasalgaon, Yeola, Malegaon, Manmad, Kolhapur and Nagpur were selected for the study based on quantum of arrivals in the markets. The trends, seasonality and price variation in markets indicated that the arrival was higher during the month of February to April and lower during the month of August to November (Fig. 3.14). On the other hand, the prices were lower in the month of February, March, April and May and higher in the months of August to November (Fig. 3.14b). The prices in different

markets showed an increasing trend while arrivals showed the mixed trend in different markets. Intra-year price rise (IPR) was higher in the Yeola, Manmad, Malegaon and Lasalgaon markets and lower in Mumbai, Solapur and Kolhapur. The highest seasonal price variation was observed in Yeola, Pune and Pimpalgaon and lower in Nagpur, Solapur and Kolhapur. The study suggested need of technology package development for promotion of onion cultivation in *kharif*.

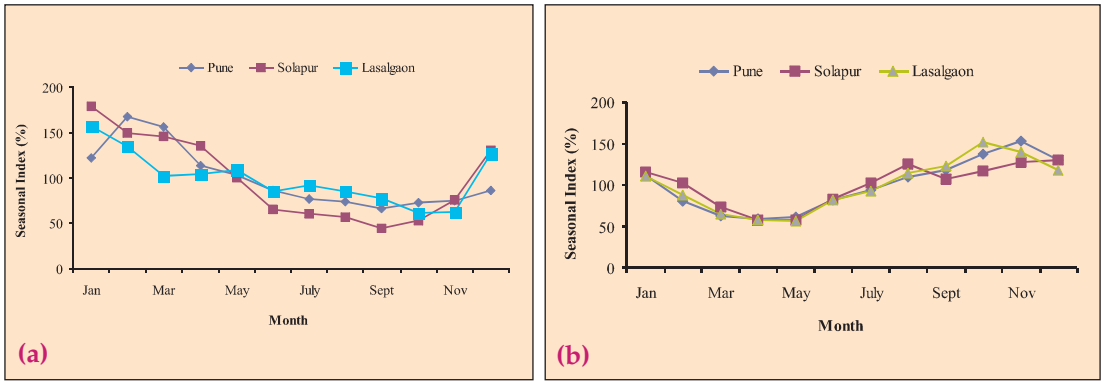

Fig. 3.14. Seasonal index of arrival (a) and price (b) of onion in Maharashtra

NDVI based mapping of drought prone areas in Andhra Pradesh

A study was taken up to explore the possibility to study abiotic stresses using long term Normalised Difference Vegetation Index (NDVI) derived from Moderate Resolution Imaging Spectroradiometer (MODIS). In this exercise, freely downloadable data acquired by MODIS Terra sensor was downloaded for the state of Andhra Pradesh (AP) from 2000 to 2011 on a specified date of September 22 to represent the critical period during *kharif* season. The downloaded data was processed and average NDVI image was obtained. Using the derived statistical parameters a tentative stress map of AP was created. Fig. 3.15 shows clearly demarked areas with varied degrees of stress on the index ranging from <2, 2-3 and >3 as low, medium and high respectively. This information will be analysed along with the crop production data obtained by ground truth survey in select regions.

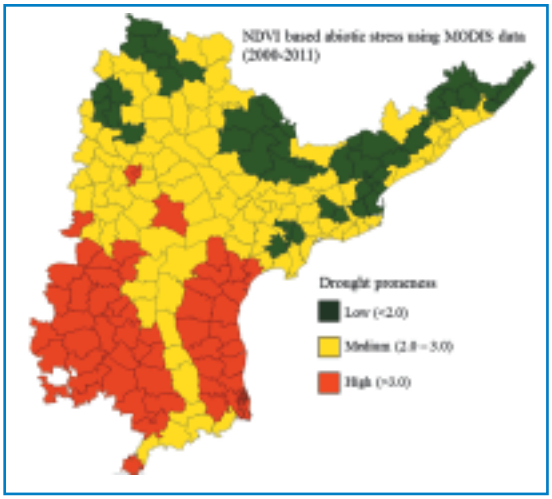

Fig. 3.15. Map of NDVI based drought proneness in Andhra Pradesh

In addition, an exercise was taken up to assist the administration in assessing the developmental activity from time to time using high resolution satellite imagery acquired by Cartosat–I from the beginning of the establishment of the NIASM. Temporal satellite images of the NIASM site were procured from the National Remote Sensing Centre, Department of Space, Hyderabad.

4. Tribal Sub-Plan

The institute started the implementation of Tribal Sub-Plan (TSP) programme in tribal villages *viz*., Karanji Bk., Gadad, Bandharpada, Aanthipada and Bokalzar of Navapur tehsil of Nandurbar district. The focus was on major crops of this area such as sugarcane, rice and groundnut. The crop productivity is substantially low mainly due to traditional methods followed by the tribal farmers in this region. The factors identified as the major constraints in adoption of modern farming in this region were lack of awareness about improved technologies, lack of finance, illiteracy, ignorance, unavailability of farm input and constraints in marketing farm products. Thus to promote modern farming in Nandurbar district, various activities were initiated as under.

Exposure visits

The exposure visit of 45 tribal farmers was organized during December 14-19, 2011 at Jain Irrigation System, Jalgaon; KVK, Babhaleshwar; MPKV, Rahuri; model village-Hiware Bazar; village-Gunjalwadi and Shiroli Kd; DOGR, Rajgurunagar; Gayatri Farmers Club, Malegaon; KVK, Baramati; Govind baugh, Malegaon; NIASM, Baramati and International Exhibition Centre, Moshi (Pune).

Formation of farmers' group

The importance of group farming was realized by tribal farmers during their visit to various farmers' club. As a follow up, few farmers visited the Surat market to collect the information on demand and supply of different varieties of brinjal, okra, cluster bean, tomato, chilli and onion. This ultimately led to formation of five groups of farmers namely Kiran Farmers Group, Gadad; Yahamogi Farmers Group, Aanthipada; Abhinav Farmers Group, Bandharpada; Bhumiputra Farmers Group, Bokalzar and Bahugunit Farmers Group, Karanji Bk. These groups are now actively involved in cultivation and dissemination of modern crop production techniques.

Sugarcane cultivation technologies

Sugarcane productivity of the area is as low as10-25 tones/acre, which is mainly due to use of poor quality planting material, imbalanced application of fertilizer, traditional methods of planting and crop management practices, etc. Therefore best quality planting material was supplied for demonstration in 10 acres area and also to provide an access to good quality sugarcane sets multiplied during this process for cultivation by many other resource poor tribal farmers.

Workshops on soil testing and beekeeping

A workshop on soil testing and soil health was conducted on January 20, 2012 at KVK, Nandurbar. About 110 tribal farmers from selected villages were benefitted from this workshop. A workshop on promotion of beekeeping enterprise was conducted on February 7, 2012 at KVK, Nandurbar and 15 tribal farmers from selected villages attended the workshop. Subsequently, 36 tribal farmers were trained on beekeeping enterprises at Mahabaleshwar, Satara during February 25, 2012 to March 5, 2012.

Vegetable mela

To promote vegetable production in this area the "Vegetable Mela" was organized on February 15, 2012 at Karanji Bk. village. More than 2000 tribal farmers including about 1000 women participated in this mela from 30 nearby villages. The private industries dealing with agricultural inputs exhibited their technologies on vegetable cultivation to tribal farmers. KVK, Nandurbar had displayed various implements and vegetable technologies. As a consequence, brinjal cultivation was initiated on 23 acres by a group of 32 farmers. Similarly, 120 tribal farmers joined together to grow okra on 40 acres. The integrated pest and nutrient management practices in vegetables were initiated by providing pheromone traps, yellow sticky traps, bio-pesticides and bio-fertilizers. In addition, implement bank was created on community basis in selected areas.

(a) (b)

Fig. 4.1. Tribal women and men participating in farmers group meeting (a) and in exhibition of vegetable seeds (b) druing Vegetable Mela, February 15, 2012

(a) (b)

Fig. 4.2. Tribal farmers interacting with Scientists from NIASM at Bandharpada (a) and at Karanji Bk (b), Nandurbar

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5. Meetings

Expert consultancy on gaps in research on abiotic stress management in crops under climate change scenario

Expert consultancy was held at National Institute of Abiotic Stress Management (NIASM), Malegaon, Baramati (MS) during August 24-25, 2011 to identify the research gaps and future network research projects as well as to discuss the research needs arising due to abiotic stresses in crop production and management. The meeting was chaired by Dr Swapan K Datta, DDG (CS). Dr AK Singh, DDG (NRM) specially attended the meet. The discussions on ongoing research endeavours related to abiotic stresses, its impact on agriculture especially crop production and management strategies were led by the DDG (CS). The participants were from different institutes of Crop Science Division of ICAR (DRR, Hyderabad; DWR, Karnal; DMR, New Delhi; DSR, Hyderabad; NBPGR, New Delhi; NRCPB, New Delhi and CRIJAF, Barrackpore), Bose Institute of Kolkata, IMC Members and Scientists from NIASM. The issues discussed in this meeting were as follows:

- Exploring abiotic stress genes from microbes and plants in the backdrop of existing variability for particular trait
- Need to extend existing concepts of abiotic stress tolerance mechanisms and to tailor them for mandate crops and then to explore traits and associated genes
- Possibilities for exploring transgenic technology, RNA profiling, genomics and phenomics approaches for tackling abiotic stresses in crops
- Best use of young brains through training and capacity building by sending them to the best laboratories across the globe and also through communication with scientists from other institutes in order to build a wide network and knowledge base
- Sharing of experiences and scientific input from other crop institutes of ICAR in establishing facilities and strong networks for abiotic stress research
- Open collaboration by NIASM with other ICAR institutions was suggested for utilization of facilities like phenomics where the scientist from NAARS can come to test their material for stress tolerance
- Need for designing and developing indigenous cost effective technology for phenomics for wide scale application has been expressed unanimously

- It was decided to convene one or two days workshop of scientists/ experts all over the country for consultation on establishing phenotyping platform
- The capacity of phenomics being established at NIASM should be expanded from laboratory to field in crops and also to poultry, livestock and fisheries

Research Advisory Committee (RAC)

The first Research Advisory Committee (RAC) meeting of NIASM, Baramati was held on September 21, 2011 in KAB II, ICAR, New Delhi. The meeting was chaired by Dr RB Singh. Dr S Ayyappan, Secretary (DARE) and DG (ICAR), was the special invitee. Dr AK Singh, DDG (NRM) was the co-chair. The members, Dr(s) SP Adhikary, RP Samui, Dr (Mrs) Renu Khanna Chopra, JC Dagar, Shri Rajendra Pawar, SS Magar, KPR Vittal and SV Ghadge attended the meeting. Dr(s) BN Goswamy, Pune, Mrutuyanjaya and Gaya Prasad could not attend. Other invitees were Dr(s) DVKN Rao, MP Brahmane and S Saha from NIASM and A Arunachalam, JP Mishra and PP Biswas from the division of NRM.

Dr AK Singh welcomed all the participants and briefed about the genesis and importance of NIASM. DG (ICAR) stressed on development of intermediate products with networks based multi-disciplinary approach to manage abiotic stresses. Dr KPR Vittal, Director, NIASM, presented various activities undertaken at NIASM through video clippings on history, land and laboratory developments. Three publications *viz*., Second Annual Report, Vision 2030 and Technical Bulletin-2 on Identification of Abiotic Edaphic Stressors of Deccan Trap at NIASM site, Malegaon were circulated.

Dr S Ayyappan emphasized the necessity to work in a networking mode with other institutes in Pune and also to identify areas of collaboration. Since many national and international organizations are already working on abiotic stress related issues, their research products *viz*., geospatial databases, basic knowledge generated and stress tolerant commodities may be archived in the institute's repository. He also asked NIASM to organize consultancy meeting of small group of experts. Dr RK Chopra, opined that NIASM should work towards identifying the genetic variability in stress tolerance and cisgenic approach. Dr RP Samui explained about the future plan of IMD for setting up agro-advisory units at block levels. Dr SP Adhikary suggested that NIASM should bring hard working and dedicated scientists/researchers and motivated students for research work. He also asked to establish association with reputed international institutes like Max-Plank Institute for Tropical Microbiology at Marburg, Germany; Agricultural Institutes of Tsukuba and Okinawa, Japan and others in tropical countries like Mexico and Brazil. Dr SS Magar, emphasized the importance of testing and evaluation of different carbon sequestration methodologies, developing sound crop and drought forecasting, developing methodologies to give compensation to farmers in case of stress related losses. He

opined that programmes would be successful if implemented with the active association of farmers, KVK and private players. He requested for investigation on the role of abiotic stressors for spongy tissue in mango. Sh Rajendra Pawar expressed concern about early flowering in sugarcane varieties in Baramati region and necessity for research efforts to solve the problem. He asked for expediting the process of formation of the Deemed University.

Dr RB Singh, Chairman, RAC, NIASM, highlighted the importance of an institute like NIASM as it came at a time when climate change vulnerability studies are going on all over the world. Due to decrease in availability of good agricultural land, farmers will be increasingly pushed towards cultivation of degraded lands like toxic and waste lands or soils with significant physical stress. So, Dr Singh emphasized the need to undertake researches in the line of converting uncultivable land to a cultivable one. Chairman felt that to meet the research challenges of the institute it should infuse most up-to-date international thinking. For this purpose he suggested hiring faculties from outside who will contribute to update the knowledge of the scientists and staffs. For quality researches in agro-meteorology he suggested a strong network between NICRA, IMD, IITM and NIASM. He further advised a strong team of scientists especially in disciplines like Soil Science, Engineering, Statistics and Economics. It was suggested to take up strategies on phenomics platform with systems biology in focus in XII plan.

Expert consultancy meeting on early arrowing in sugarcane

This meeting was held on January 9-10, 2012 to address problem of early arrowing in sugarcane in Nira canal area. The meeting at NIASM, Malegaon was preceded by the visit of experts to Central Sugarcane Research Station (MPKV), Padegaon. The experts participated in the discussion were from various research institutes *viz*., Sugarcane Breeding Institute (SBI), Coimbatore, Vasantdada Sugar Institute (VSI), Pune; Central Sugarcane Research Station (CSRS), Padegaon; Agricultural Development Trust, Baramati, Krishi Vigyan Kendra, Baramati; State Agriculture Department, Baramati; Shardabai Pawar Mahila Mahavidyalaya, Shardanagar; Sugar Factory, Malegaon and NIASM.

Dr KPR Vittal, Director, NIASM described in brief how the expert consultancy meet originated from an idea mooted by Sh Rajendra Pawar at RAC meeting held at New Delhi under the Chairmanship of Dr R B Singh, President, NAAS. He also gave the brief introductory remarks highlighting the ongoing research activities, priority areas and future plans of research work to be undertaken by the institute. Dr R B Deshmukh who chaired the expert consultancy, emphasised the need to identify the experts across the country and seek their expertise to develop good research projects for improvement in sugarcane production. He emphasised the necessity for active

participation of SBI, Coimbatore; VSI, Pune and Agricultural Universities in these projects. The varieties used for planting in this region are prone to flowering or early flowering. He suggested screening the available promising varieties for their flowering behaviour and to identify suitable varieties for planting by the farmers. For the immediate future, he emphasized the need for development of non-flowering or shy – flowering varieties with high cane yield and high sugar content. Sh Rajendra Pawar stressed upon the need to find solution to the problem of flowering in sugarcane since it causes losses worth crores of Rupees. Sh Suresh Kale opined that the problem of flowering is more in soils with high moisture content and in light soils with high leaching losses of nitrogen. Mr Santosh Karanje, while expressing his views said that adsali crop has less problem of early flowering. Prof. R B Deshmukh pointed out that starvation leads to vernalin production that induces the flowering. He also added that the soil micro-environment, particularly the soil microorganisms may transmit the stimulus of flowering to the plants. Dr S M Pawar presented details about the problem and strategies to be followed to inhibit early flowering of sugarcane. He said that early ripening varieties of sugarcane flowered earlier than mid late and late maturing varieties.

Dr S Alarmelu stressed upon the need to improve the variety Damodhar for its shy flowering trait but have high sugar recovery and quality. Sh C Mahadevaiah, also pointed out that the flowering stops terminal bud growth and lateral buds develop into side shoots which are unproductive. Sh Malgunde felt that non flowering variety of sugarcane if available can be rapidly disseminated to the farmers.

It is emerged from the discussion that, flowering behaviour is inherited and controlled by both genetic and environmental factors. Flowering is of considerable practical significance in commercial sugarcane production since the yields of sugarcane are substantially reduced due to early flowering. There are large differences from year to year and field to field. It is suggested that cane flowering is primarily a photoperiod response but also conditioned by other factors such as temperature and moisture. Hence, experts suggested an in depth studies and remedies to overcome the early flowering of sugarcane.

To solve the problem, the committee recommended to develop non-flowering, salt tolerant and high yielding variety of sugarcane and appropriate method for suitable N nutrition through biofertilizers and split application of fertilizers. In addition the committee suggested screening and cataloguing of soil microorganisms associated with rhizosphere and endorhizosphere of sugarcane.

Institute Management Committee (IMC) meeting

The 2nd IMC meeting of NIASM was held on March 29, 2012 under the Chairmanship of Dr PS Minhas, Director, NIASM, Baramati. The members who participated in this meeting includes Sh Rajendra Pawar, Dr SS Magar, Dr GS Karibasappa, Dr PR Bharambe, Prof. Nilesh Nalwade and Shri G Laxminarayana. Special invitees were Dr Jagadish Rane, Dr KK Krishnani and Sh Ram Avtar Parashar. The director of agriculture, Government of Maharashtra, Pune; the Commissioner, Commessionerate of agriculture, Government of Andhra Pradesh, Hyderabad; Dr

Jagadish Prasad, NBSS & LUP, Nagpur, Dr VUM Rao, Project Coordinator, AICRP (Ag. Met), CRIDA, Hyderabad and Shri OP Nagar, Sr. Finance and Accounts Officer, NBSS & LUP, Nagpur could not attend the meeting due to pressing engagements.

Committee reviewed action taken on the recommendation of first IMC meeting. Dr P S Minhas presented highlights of research, HRD, equipment procured, consultancy, staff strength, institute publications, progress of expenditure, status of work and farm development. Addressing the issue of non availabilty of land for experiment Sh Rajendra Pawar offered facilities of Agriculture Developmrnt Trust, Baramati including field, livestock and fish pond. He also suggested considering the farm land of the Remand Home, Baramati (Govt of Maharashtra) for establishing an experimental research farm. The committee recommended that the institute scientific and technical staff may be given the best training available in India and abroad. A list of equipment purchased for establishing laboratory at NIASM was ratified. It was suggested that the institute may also conduct geological surveys in collaboration with the MPKV, Rahuri to identify sites for digging well.

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6. Participation in Training Programmes

Name	Trainings programme	Place	Period
Dr Shashikant V Ghadge	National training on "Advanced techno-management programme for middle level scientists"	ASCI, Hyderabad	June 27 - July 29, 2011
Dr V Govindasamy	National training on "Trends in bioinformatics and computation systems: exploring interconnections for molecular biological applications"	NBAIM, Mau (U.P.)	July 16 - 29, 2011
Dr Babasaheb B Fand	NAIP sponsored training programme on "Forecast modelling in crops"	IASRI, New Delhi	August 3-12, 2011
Dr Susheel K Raina	National training on "Molecular breeding for rice improvement"	DRR, Hyderabad	August 17-30, 2011
Dr Shashikant V Ghadge	Installation training workshop on "SAS 9.3 software"	NAARM, Hyderabad	November 15-16, 2011
Dr Babasaheb B Fand	Winter school on "Molecular mechanisms involved in conferring abiotic stress tolerance to the biological control agents"	NBAII, Bengaluru	December 1-21, 2011
Dr Chubasenla Aochen	CAFT course on "Current techniques and protocols in plant biochemistry and molecular biology"	IARI, New Delhi	December 8- 28, 2011
Dr Basavraj Sajjanar	Professional attachment training on "Effect of heat stress on expression of heat shockproteins in broiler birds"	NIANP, Bengaluru	February 1 -April 30, 2012
Mr Satish Kumar	Professional attachment training on "Learning molecular biology based approaches to combat abiotic stresses in plants"	NRCPB, New Delhi	February 1 - April 30, 2012
Mr V Rajagopal	Professional attachment training on "Soil organic matter management for climate resilient agriculture"	IISS, Bhopal	February 1 - April 30, 2012
Dr Babasaheb B Fand Dr Kiran P Bhagat	International training programme on "Capacity building"	College of Agriculture, Baramati	February 15-25, 2012
Dr DV Patil Dr Manoj P Brahmane	Researchers training programme on SAS for genetics and genomics data analysis	CIFE, Mumbai	February 27- March 3, 2012

Name	Trainings programme	Place	Period
Dr DVKN Rao	National level training programme on "Climate change and geospatial technology"	CSIR-NISCAIR, New Delhi	March 12-18, 2012
Mr G Madhukar Mr Pravin More	Total library software solutions	Total IT Solutions, New Delhi	August 2-9, 2011
Mr G Madhukar Ms Noshin Shaik	Remote sensing and geographical information system	NRSC Hyderabad	November 14, 2011 - Febraury 3, 2012
Mr Sunil V Potekar	Agriculture meteorological observers' course	IMD, Pune	February 27- March 16, 2012

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7. Awards and Recognitions

- Dr V Govindasamy, Scientist (Microbiology) was awarded "AMI Young Scientist Award - 2011" in the discipline of Agricultural Microbiology by the Association of Microbiologists of India (AMI), New Delhi at the 52nd Annual Conference of AMI at Punjab University, Chandigarh on November 5, 2011.
- Dr KK Krishnani, Head (School of Edaphic Stress Management) and Dr V Govindasamy, Scientist (Microbiology) were awarded "2012-Endeavour Award" with Post Doctoral Fellowship by the Australian Government at the Australian High Commission, New Delhi on February 22, 2012.
- Dr KK Krishnani, Head (School of Edaphic Stress Management) was awarded "Best Paper Presentation Award" in the National Conference on New Vistas in Indian Aquaculture at Central Institute of Brackish water Aquaculture, Chennai, February 23-24, 2012.

Dr V Govindasamy receiving AMI Young Scientist Award

Dr K K Krishnani receiving 2012-Endeavour Award

Dr V Govindasamy receiving 2012-Endeavour Award

Dr K K Krishnani receiving Best Paper Presentation Award

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8. Linkages and Collaborations

Initiatives for research collaboration between NIASM and other institutes

Research institute	Areas identified for research collaboration
MPKV, Rahuri and its Central Sugarcane Research Station, Padegaon	• Phenotyping protocols for screening large number of germplasm of sugarcane under field conditions for their responses to abiotic stresses • Improving recovery of the sugar from drought and salinity tolerant genotypes • Measures to inhibit pre-harvest bud germination in drought tolerant genotypes • Physiological, biochemical and molecular aspects to control early flowering in sugarcane • Utilization of endophytes and mycorrhizal association for abiotic stress tolerance in sugarcane
Vidya Pratishthan's School of Biotechnology (VSBT), Baramati	• Bioremediation • Gene discovery for abiotic stress tolerance
Directorate of Soybean Research, Indore	• Phenotyping protocols for screening large number of germplasm for drought and heat stress


NIASM scientists interacting with scientists at MPKV, Rahuri

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9. Publications

Research Papers

1. Fand, B.B., Gautam, R.D., Kamra, Anju, Suroshe, S.S. and Mohan, S. (2012) Bioefficacy of aqueous garlic extract and a symbiotic bacterium, *Photorhabdus luminescens* against *Phenacoccus solenopsis* Tinsley (Homoptera: Pseudococcidae). *Biopesticides International* (In press).

2. Krishnani, K.K., Gupta, B.P., Muralidhar, M., Sarswathy, R., Pillai, S.M., Ponnusamy, K. and Nagavel, A. (2011) Soil and water characteristics of traditional paddy and shrimp fields of Kerala. *Indian Journal of Fisheries* **58** (4), 71-77.

3. Krishnani, K.K., Kailasam, M., Kathiravan, V. and Nagavel, A. (2012) Aquatic bioaugmentation in coastal aquaculture: development and demonstration of green water technology. *Fishing Chimes* **31** (10), 76-79.

4. Krishnani, K.K., Zhang,Y., Yan, Y., Xiong, L., Boopathy, R. and Mulchandani, A. (2012) Bactericidal and ammonia removal activity of silver ion exchanged zeolite. *Bioresource Technology* **117**, 86-91.

5. Kathiravan, V. and Krishnani, K.K. (2012) Diversity of nitrite oxidizers in green water system of coastal aquaculture by metagenomic approach targeting *nxrB* genes. *Journal of Basic Microbiology* (In press).

6. Magheshwaran, V., Walia, S., Govindasamy, V. and Annapurna, K. (2011) Antibacterial activity of metabolite produced by *Paenibacillus polymyxa* strain HKA-15 against *Xanthomonas compestris* pv. Phaseoli. *Indian Journal of Experimental Biology* **49** (3), 229-233.

7. Maurya, U.K. and Vittal, K.P.R. (2011) Geological and mineralogical formations on various abiotic edaphic stresses at Malegaon, Baramati, Maharashtra. *Clay Research* **30** (1), 61-71.

8. Rao, D.V.K.N. and Tripathi, S.B. (2011) Statistical techniques to understand soils. *Journal of Indian Society of Soil Science* **59**(3), 224-228.

9. Rao, D.V.K.N. and Vijayakumar, K.R. (2011) Effective soil volume - A prime consideration for fertilizer management in rubber. *Journal of Indian Society of Soil Science* **59** (4), 329-335.

10. Sarswathy, R., Muralidhar, M., Gupta, B.P., Krishnani. K.K. and Ponniah, A.G. (2012) Effect of stocking density on soil, water quality and nitrogen budget in *Penaeusmonodon* (Fabricius, 1798) culture under zero water exchange system. *Aquaculture Research* (In Press).

11. Shukla, A., Kumar, A., Jha, A., Gupta, A. and Rao, D.V.K.N. (2012) Phosphorus threshold for arbuscular mycorrhizal colonization of crops and tree seedlings. *Biology and Fertility of Soils* **48,** 109-116.

Books/Book Chapters

1. Dwivedi, P. and Aochen, C. (2012) Phenolic compounds : Structural relationship with antioxidant activity and stress in plants. In: *Advances in Botany: Indian Botanical Society Commemoration Volume* (Vimala, Y., Trivedi, P.C. and Govil, C.M., Eds.), 1st Edition, Pointer Publishers, Jaipur.

2. Fand, B. B., Gautam, R. D. and Suroshe, S. S. (2012) Biointensive management of mealybug *Phenacoccus solenopsis*: methods and approaches. LAP Lambert Academic Publishing, Saarbrucken, Germany. 124 p.

3. Govindasamy, V., Senthilkumar, M., Bose, Pranita, Vithalkumar, L., Ramadoss, D. and Annapurna, K. (2011) ACC deaminase containing PGPR for potential exploitation in agriculture. In:*Bacteria in Agrobiology*: *Plant Nutrient Management* (Maheshwari, D. K., Ed.) Springer- Verlag, Berlin, Heidelberg. pp.183-208.

4. Ishitani, M., Rane, J. Beebe, S., Sankaran, M., Blair, M. and Rao I.M. (2011) Molecular breeding approaches in managing abiotic stresses. In: *Biology and Breeding of Food Legumes* (Pratap, A. and Kumar, J. Eds.). CAB International. pp. 276-295.

5. Krishnani, K.K. and Gupta, B.P. (2012) Characteristics and bioremediation of wastewater in coastal shrimp aquaculture. In: *Environmental Pollution and Health Risk to Man and Animals* (Garg, S. R., Ed.) C.C.S. Haryana Agricultural University, Hisar, (In Press).

6. Krishnani, K.K. and Pillai, S.M. (2012) Anthropogenic aquatic xenobiotics - hazards and remedies. In: *Environmental Pollution and Health Risk to Man and Animals* (Garg, S. R., Ed.) C.C.S. Haryana Agricultural University, Hisar, (In Press).

7. Mishra, S.B., Panigrahi, P., Choudhary, R.L., Singh, B. and Behera, U.K. (2012) Water as enterprises: attempting a PPP model for poverty alleviation at grass root level. In: *Advances in Farming Systems* (Behera, U.K. Ed.). Agrotech Publishing Academy, Udaipur. pp. 703-718.

8. Umemura, Y., Rane, J., Seki, M., Utsumi, Y., Narangajavana, J. and Ishitani, M. (2011) Cassava genetic improvement: Omics approaches for facing global challenges. In:*Improving Crop Resistance to Abiotic Stress*. Vol 2. (Tuteja, N., Gill, S.S., Tiburcio, A.F. and Tuteja R., Eds.). Wiley Blackwell. pp. 1049-1066.

Technical bulletins

1. Maurya, U.K. and Vittal, K.P.R. (2011) Identification of abiotic edaphic stressors of deccan trap at NIASM Site, Malegaon: A geotechnical and geological study, *NIASM Technical Bulletin* – 2. National Institute of Abiotic Stress Management (ICAR), Baramati, 40 p.

2. Maurya, U.K., Vittal, K.P.R. and Ghadge, S.V. (2012) Formation of zeolites in development of edaphic stresses on vertic toposequence, *NIASM Technical*

Bulletin – 3, National Institute of Abiotic Stress Management (ICAR), Baramati, 56 p.

3. Maurya, U.K., Duraiswami, R.A., Vittal, K.P.R., Karmalkar, N.R., Ghadge, S.V. (2012) Groundwater exploration, development and management in the NIASM watershed, Malegaon Khurd, Baramati with special emphasis on characterizing abiotic stresses, *NIASM Technical Bulletin* - 4, National Institute of Abiotic Stress Management, Baramati, 65 p.

Conference Abstracts

1. Vittal, K.P.R., Rao, D.V.K.N., Saha, S. and Maurya, U.K. (2012) Climate change and abiotic stress management. International conference on climate change, sustainable agriculture and public leadership, NASC complex, New Delhi: 7-9 February, 2012.

Popular articles

1. बाबासाहेब फंड आणि अंकुश कांबळे. (2011) बदलत्या हवामानातील घटते किटक परागीभवन: अन्न सुरक्षेसाठी आव्हान. कृषिदूत (देशदूत), शनिवार जुलै 16, पृष्ठ 8.

2. बाबासाहेब फंड. (2011) किटक जैव-विविधतेवर हवामान बदलाचा परिणाम (भाग-1). कृषिदूत (देशदूत), शनिवार जुलै 30, पृष्ठ 8.

3. बाबासाहेब फंड. (2011) किटक जैव-विविधतेवर हवामान बदलाचा परिणाम (भाग-2). कृषिदूत (देशदूत), शनिवार ऑगस्ट 6, पृष्ठ 8.

4. बाबासाहेब फंड. (2012) प्रभावी किड नियंत्रणासाठी जीआयएस प्रणाली (भाग-1). कृषिदूत (देशदूत), शनिवार मार्च 31, पृष्ठ 9.

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10. Participation of Scientists in Meetings, Conferences and Workshops

Meetings

Name	Meeting	Place	Period
Dr Susheel K Raina Dr V Govindasamy	Thematic group meeting of NICRA	CRIDA, Hyderabad	June 6- 7, 2011
Dr Shashikant V Ghadge	Meeting-cum-workshop of the heads of the divisions	CIAE, Bhopal	June 15, 2011
Dr Susheel K Raina Dr V Govindasamy	National stakeholders consultation meet on climate change platform	CRIDA, Hyderabad	September 19-20, 2011.
Dr Babasaheb B Fand	Meeting of RFD nodal officers	KAB-II, ICAR, New Delhi	September 21-22, 2011
Dr Shashikant V Ghadge	Platform for conservation agriculture	KAB-II, New Delhi	September 22, 2011
Dr Manoj P Brahmane Dr DVK Nageswara Rao	National consultation on water platform: research prioritization to present concept on prioritized development of abiotic stress tolerant crops varieties through biotechnology and waste water utilization for aquaculture by bioremediation	NBFGR, Lucknow	October 18, 2011
Dr V Govindasamy	2nd High level monitoring committee meeting of national initiative on climate resilient agriculture (NICRA)	NAASC, New Delhi	December 12-13, 2011
Dr DV Patil	Expert consultancy meet on early arrowing problems of sugarcane varieties under Nira canal	NIASM, Baramati	January 9-10, 2012.
Dr Jagdish Rane Dr Susheel K Raina Dr DVK Nageswara Rao Dr Kiran P Bhagat	NIASM-ACIAR meeting on developing national and international research collaboration on abiotic stress tolerance of crops	NAASC, New Delhi	January 25, 2012
Dr Shashikant V Ghadge	Interaction meet of scientists in the discipline of farm machinery and power	CIAE, Bhopal	March 16-18, 2012

Lectures

Name	Topic of lead lectures	Place	Date
Dr Babasaheb B Fand	Abiotic stresses affecting crop-insect pest interactions in the context of global climate change	NIASM, Baramati (National training programme on biotic and abiotic stress management in fruit crops, MPKV, Rahuri)	September 29, 2011
Dr Susheel K Raina	Abiotic stress tolerance in fruit crops through biotechnological interventions	NIASM, Baramati (National training programme on biotic and abiotic stress management in fruit crops, MPKV, Rahuri)	September 29, 2011
Dr Jagadish Rane	Recent advances in plant phenomics to enhance benefits from genomics for crop improvement.	Training program on phenotyping and molecular breeding for improving drought adaptive traits in crops, UAS, GKVK, Bengaluru	February 16, 2012
Dr KK Krishnani	Development and evaluation of biostimulation and bioaugmentation technologies	Workshop on greenwater technology and bioremediation at CIBA, Chennai	February 27, 2012
Dr Ankush L Kamble	Course lectures on agri-business management	College of Agriculture, Baramati	December 2011-April 2012

Conferences

Name	Conference	Place	Period
Dr V Govindasamy	52nd annual conference of AMI & International conference on microbial biotechnology for sustainable development	Punjab University, Chandigarh	November 3 - 6, 2011
Dr Kiran P Bhagat Dr Mahesh Kumar Dr Ram Lal Choudhary Dr DVKN Rao Dr UK Maurya	International conference on climate change, sustainable agriculture and public leadership	NASC Complex, New Delhi	February 07-09, 2012
Dr KK Krishnani	National conference on new vistas in Indian aquaculture	CIBA, Chennai	February 23-24, 2012
Mr Sunayan Saha	National seminar on Indian agriculture: preparedness for climate change	NASC complex, New Delhi	March 24-25, 2012

Workshops

Name	Workshop	Place	Period
Dr Ankush L Kamble	National mega meet on technology commercialization	NAARM, Hyderabad	September 29 - October 1, 2011
Mr Sunayan Saha	USAID-India joint workshop and consultancy meeting on climate change adaptation	NASC Complex, New Delhi	October 18-19, 2011

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11. Distinguished Visitors

1	28.05.2011	Dr KD Kokate, DDG (Agricultural Extension), ICAR, New Delhi
2	29.06.2011	Dr JC Dagar, ADG (Agro & AF), ICAR, New Delhi
3	26.08.2011	Dr PS Minhas, ADG (SW & M), ICAR, New Delhi
4	24.08.2011	Dr AK Singh, DDG (Natural Resource Management), ICAR, New Delhi Dr SK Dutta, DDG (Crop Science), ICAR, New Delhi Prof AN Lahiri Majumdar, Bose Institute, Kolkata Dr SS Magar, Ex-VC, Dr BSKKV, Dapoli (Maharashtra) Dr R Sai Kumar, Project Director, DMR, New Delhi Dr JV Patil, Project Director, DSR, Hyderabad Dr KC Bansal, Director, NBPGR, New Delhi Dr KV Rao, Principal Scientist, DRR, Hyderabad Dr Jagdish Rane, Sr. Scientist, DWR, Karnal Dr Sindhu Sareen, Sr. Scientist, DWR, Karnal Dr Debabrata Sarkar, Sr. Scientist, CRIJAF, Barrackpore Dr Jasdeep Padaria, Sr. Scientist, NRCPB, New Delhi
5	15.09.2011	Sh. RP Verma, Assistant Director (Rajbhasha), PCDA, Pune
6	23.09.2011	Dr S Ayyappan, Secretary (DARE) and DG (ICAR), New Delhi
7	29.09.2011	Mr Albertien Knie, Van Hall Larenstein, University of Applied Sciences, Part of Wageninger UR, Netherlands
8	29.09.2011	Mr Ingrid de Vries, Van Hall Larenstein, University of Applied Sciences, Part of Wageninger UR, Netherlands
9	12.10.2011	Group of farmers from MPKV, Rahuri
10	18.12.2011	Group of farmers from Nandurbar
11	21.12.2011	Dr Kumudini Nautiyal, Deputy Director (Rajbhasha), ICAR, New Delhi
12	09.01.2012	Prof. Ganesh Pawar, Head, Dept of Biochemistry and 25 Students of SIES College of Arts, Science and Commerce, Mumbai
13	10.01.2012	Dr RB Deshmukh, Ex- VC, MPKV, Rahuri and Director, VSI, Pune Sh. Rajendra D Pawar , Chairman, ADT, Malegaon Dr SM Pawar, Sugarcane Specialist, CSRS, MPKV, Padegaon Dr RM Garkar, Scientist, CSRS, MPKV, Padegaon Dr S Alarmelu, Senior Scientist, SBI, Coimbatore Dr C Mahadevaiah, Scientist, SBI, Coimbatore Sh. DB Phonde, Scientist, VSI, Pune Sh. Keshav Malgunde, Technical Officer, Sub Divisional Office (Agriculture), Baramati Sh. Suresh Kale, Cane Development Officer, Sugar Factory, Malegaon Prof. RB Deshmukh, Dept. of Botany, SMM, Baramati Sh. SV Karanje, SMS (Agron), KVK, Baramati

12. Celebration of Days

हिन्दी सप्ताह समारोह

संस्थान में हिन्दी सप्ताह समारोह का आयोजन 14 से 20 सितम्बर 2011 के दौरान किया गया। राजभाषा समिति की बैठक की अध्यक्षता निदेशक महोदय ने की जिसमें राजभाषा के प्रचार-प्रसार के लिए उठाये गए कदम तथा संस्थान में किए जा रहे कार्यक्रमों का ब्यौरा संस्थान के राजभाषा हिन्दी समिति के सदस्य (सचिव) डा उमाकांत मौर्य ने दिया। अध्यक्ष महोदय ने बारामती में स्थित सभी विद्यालयों, महाविद्यालयों में भी हिन्दी कार्यक्रम आयोजित करने का भी सुझाव दिया। राजभाषा समिति ने उद्घाटन और समापन समारोह के लिए क्रमशः श्री राजेन्द्र प्रसाद वर्मा, सहायक निदेशक, राजभाषा हिंदी शिक्षण योजना विभाग, गृह मंत्रालय, भारत सरकार, पुणे और डा. राजेन्द्र खैरनार, आचार्य एंव प्रमुख, हिन्दी विभाग, कला एवं वाणिज्य महाविद्यालय, विद्या प्रतिष्ठान, बारामती को नामांकित किया।

प्रतियोगी भाग लेते हुए

कार्यक्रम की शुरूआत 14 सितम्बर 2011 को सदस्य सचिव (हिन्दी) के स्वागत भाषण के साथ शुरू हुई जिसमें उन्होंने संस्थान में हिन्दी में किये गये कार्यो का विस्तृत विवरण तथा हिन्दी सप्ताह के दौरान आयोजित किये जाने वाले सभी कार्यक्रमों की जानकारी दी और महानिदेशक भाकृअप द्वारा भेजे गये अभिलेख पत्र को पढ़ कर सुनाया। कार्यक्रम का समापन श्री महेश खुबडीकर, प्रशासनिक अधिकारी के धन्यवाद ज्ञापन के साथ सम्पन्न हुआ। हिन्दी सप्ताह का उद्घाटन 15 सितम्बर 2011 को संस्थान के निदेशक एवं अध्यक्ष, हिन्दी समिति की उपस्थिति में किया गया, जिसमें मुख्य अतिथि श्री राजेन्द्र प्रसाद वर्मा, सहायक निदेशक, राजभाषा हिंदी शिक्षण योजना विभाग, गृह मंत्रालय, भारत सरकार, पुणे, ने हिन्दी के बारे मे भारत सरकार के शिक्षण विभाग द्वारा चलाये जा रहे विभिन्न कार्यक्रमों की विस्तृत जानकारी दी। संस्थान के निदेशक महोदय ने अपने विचार हिन्दी मे व्यक्त किये और राजभाषा के प्रचार प्रसार का आश्वासन दिया। हिन्दी सप्ताह के दौरान विभिन्न प्रतियोगिताओं जैसे हिन्दी शब्द अनुवाद, हिन्दी निबन्ध (विषय: आज की भारतीय नारी), हिन्दी पठन, हिन्दी सुलेखन तथा आशुभाषण का आयोजन किया गया। संस्थान के लिये घोष वाक्य ''तनाव मुक्त खेती-तनाव मुक्त किसान'' का चयन भी किया गया। इन प्रतियोगिताओं में संस्थान के सभी अधिकारीयों/कर्मचारीयों ने बढ़ चढ़कर भाग लिया। एक दिवसीय हिन्दी शिक्षण कार्यक्रम में श्री राजेन्द्र प्रसाद वर्मा ने राजभाषा को सरल एवं सहज बनाने के लिए भारत सरकार द्वारा चलाई जा रही विभिन्न योजनाओं की जानकारी दी। हिन्दी मे सर्वाधिक कार्य करने के लिए निदेशक महोदय (राअप्रस) ने डा अरूण कुमार शर्मा को सम्मनित किया।

Celebration of National Days

NIASM celebrated Independence Day and Republic Day with great enthusiasm in the campus. The Director hoisted the national flag and addressed the staff members on these occasions.

(a)

(b)

Celebration of Independence Day (a) and Republic Day (b)

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13. New Staff and Superannuation

Superannuation

Dr KPR Vittal, the founder Director of NIASM, superannuated on August 31, 2011. He continued as Director on reemployment and was relieved on February 29, 2012. NIASM family wishes Dr Vittal a happy retired life.

Newly joined scientific and technical staff

Director	Date of Joining
Dr PS Minhas	June 13, 2012 (OSD from February 1 to June 12, 2012)
Heads of Schools	
Dr Jagadish Rane, Drought Stress Management	January 25, 2012
Dr Kishore K Krishnani, Edaphic Stress Mangement	January 27, 2012
Principal Scientists	
Dr Santanu K Bal	March 6, 2012
Senior Scientists	
Dr DVK Nageswara Rao	August 27, 2011
Dr DV Patil	November 11, 2011
Scientists	
Mr Sunayan Saha	September 3, 2011
Mr Mahesh Kumar	September 5, 2011
Ms Chubasenla Aochen	September 5, 2011
Mr Ram Lal Choudhary	October 31, 2011
Mr V Rajagopal	December 22, 2011
Dr Basavaraj Sajjanar	December 23, 2011
Mr Satish Kumar	December 23, 2011
Dr Kiran Bhagat	December 24, 2011
Dr Goraksha Chimaji Wakchaure	March 14, 2012
Technical staff	
Mr Aniket More, T-1	March 1, 2011
Mr Rushikesh Gophane, T-3	June 30, 2011
Mr Gubbala Madhukar, T-3	July 2, 2011
Mr Ajay Nakhawa, T-3	July 7, 2011
Mr Ajit Magar, T-3	July 8, 2011
Mrs Priya George, T-3	July 13, 2011
Mr Aher Lalitkumar, T-3	July 14, 2011
Mr Potekar Sunil Vishnu, T-3	July 28, 2011
Mr Patwaru R Chahande, T-3	September 16, 2011

14. Budget

(₹ in lakhs)

Sub head of accounts	Plan		Non-Plan	
	Allocation	Balance	Allocation	Balance
a. Recurring				
Pay and allowances	150.50	0.14	0.00	0.00
TA	11.90	0.15	3.00	0.02
HRD	2.25	0.03	0.00	0.00
Contingencies	173.35	-0.02	22.00	0.06
Sub total	338.00	0.30	25.00	0.08
b. Non-Recurring				
Equipment	64.35	-0.04	0.00	0.00
Furniture and fixtures	32.00	0.04	0.00	0.00
Vehicles	1.75	0.00	0.00	0.00
IT	45.10	0.01	0.00	0.00
Library	4.10	0.01	0.00	0.00
Works	494.70	0.06	0.00	0.00
Sub total	642.00	0.08	0.00	0.00
Grand total (A+B)	980.00	0.38	25.00	0.08
TSP	20.00	0.00	0.00	0.00
Total plan	**1000.00**	**0.38**	**25.00**	**0.08**
NICRA	1262.00	39.30		

15. Research Projects

No	Name of the project and associated scientists
School of Atmospheric Stress Management	
1.	Monitoring and quantifying abiotic stresses in soybean-*rabi* sorghum genotypes: index based approach for crop water management (S Saha, SK Bal , KP Bhagat)
2.	Abiotic stresses affecting crop-insect pest interactions in the context of global climate change (BB Fand, M Kumar, AL Kamble)
3.	Impact of climate change on physio-biochemical behaviour and hormonal regulations in soybean and *rabi* sorghum (KP Bhagat, SK Bal, S Saha, BB Fand, RL Choudhary)
4.	Sugarcane yield optimization in Western Maharashtra Scarcity Zone using DSSAT-canegro model (SK Bal, S Saha, KP Bhagat, DVKN Rao)
5.	Study of genetic polymorphism of heat shock protein genes among indigenous and cross bred cattle (B Sajjanar)
School of Drought Stress Management	
6.	Standardization and development of plant phenomics procedures to support genomics approach for drought and heat stress (J Rane, SK Raina , V Govindasamy)
7.	Identification of traits and genes associated with resilience to moisture stress in soybean (M Kumar, V Govindasamy, C Aochen, RL Choudhary)
8.	Investigations on traits and genes associated with adaptation of wheat genotypes to local/regional drought environments (C Aochen, , M Kumar, S Saha, J Rane, SK Raina)
9.	Elucidating drought tolerance mechanisms in green gram for enhancing productivity under water deficit environments (SK Raina, C Aochen)
10.	Functional and genetic diversity of bacterial endophytes of drought tolerant sorghum crop (V Govindasamy, M Kumar, DV Patil)
11.	Enhancing adaptability of *Cyamopsis tetragonoloba* L. Taub to drought stress through breeding approaches (DV Patil, SK Raina, C Aochen, J Rane)
School of Edaphic Stress Management	
12.	Nano (bio-) remediation of nitrogenous contaminants using silver ion-exchanged zeolites (KK Krishnani, UK Maurya, V Rajagopal)
13.	Identification, cloning and expression analysis of temperature, salinity and hypoxia responsive genes in fish (MP Brahmane, B Sajjanar, S Kumar)
14.	Examination of unculturable microbial diversity of saline soils using metagenomics (S Kumar, KK Krishnani, V Rajagopal)
15.	Design and development of livestock and fishery structures for heat stress management (GC Wakchaure, SV Ghadge, B Sarkar)
16.	Brood stock management, breeding and seed production of important fin fishes in abiotic stressed farms (B Sarkar, MP Brahmane, KK Krishnani)
17.	Evaluation of bioregulators for alleviation of drought and salt stress in some major crops (DP Patel, RL Choudhary, GC Wakchaure)

18.	Conservation agricultural practices for enhancing crop productivity and resource-use efficiency (RL Choudhary, V Rajagopal, GC Wakchaure, KK Krishnani)
19.	Utilization of agricultural and agro-industry by products as biosorbent materials for heavy metal removal from waste water (SV Ghadge, KK Krishnani)
School of Policy Support Research	
20.	NDVI based mapping of abiotic stress (DVKN Rao, SK Bal, J Rane)
21.	Analysis of climate imposed vulnerability of onion farming in Maharashtra (AL Kamble)
22.	Tribal Sub-Plan (AL Kamble)
External Projects	
23.	Evaluation of green gram genotypes for resilience to moisture stress, funded by NICRA (SK Raina, V Govindasamy, C Aochen)

16. Personnel

(As on June 30, 2012)

Dr PS Minhas	Director
Heads	
Dr Jagadish Rane	School of Drought Stress Management
Dr Kishore K Krishnani	School of Edaphic Stress Management
Scientific Staff	
Dr Santanu K Bal	Principal Scientist (Agrometeorology)
Dr DP Patel	Principal Scientist (Plant Physiology)
Dr Shashikant Ghadge	Senior Scientist (Farm Machinery and Power)
Dr DV Patil	Senior Scientist (Plant Breeding)
Dr DVK Nageswara Rao	Senior Scientist (Soil Chemistry/Fertility/Microbiology)
Dr Biplab Sarkar	Senior Scientist (Fish and Fishery Science)
Dr P Suresh Kumar	Senior Scientist (Horticulture)
Dr Manoj Brahmane	Scientist (Senior Scale, Biotechnology-Animal Science)
Dr Goraksha Wakchaure	Scientist (Agricultural Structure & Process Engineering)
Dr Ankush Kamble	Scientist (Agril. Economics)
Dr Susheel Kumar Raina	Scientist (Plant Breeding)
Dr Babasaheb Fand	Scientist (Agril. Entomology)
Dr V Govindasamy	Scientist (Agril. Microbiology)
Dr Kiran Bhagat	Scientist (Plant Physiology)
Mr Sunayan Saha	Scientist (Agrometeorology)
Dr Mahesh Kumar	Scientist (Plant Physiology)
Dr Chubasenla Aochen	Scientist (Plant Biochemistry)
Dr R L Choudhary	Scientist (Agronomy)
Mr V Rajagopal	Scientist (Soil Chemistry/Fertility/Microbiology)
Dr Basavaraj Sajjanar	Scientist (Biotechnology-Animal Science)
Mr Satish Kumar	Scientist (Plant Biochemistry)

Technical Staff	
Dr Arun K Sharma	T-7 (Documentation)
Dr U K Maurya	T-6 (Geology)
Ms Noshin Shaikh	T-3 (Civil)
Mr Santosh Pawar	T-3 (Electrical)
Mr Pravin More	T-3 (Computer)
Mr Rushikesh Gophane	T-3 (Horticulture)
Mr Madhukar Gubbala	T-3 (Information Technology)
Mr Ajay Nakhawa	T-3 (Fisheries)
Mr Ajit Magar	T-3 (Agricultural Engineering)
Mrs Priya George	T-3 (Microbiology)
Mr Lalitkumar Aher	T-3 (Biotechnology)
Mr Sunil Potekar	T-3 (Agrometeorology)
Mr Patwaru R. Chahande	T-3 (Agriculture)
Mr Aniket More	T-1 (Mali)
Administrative Staff	
Mr G Laxminarayana	Administrative Officer
Mr Paurav Jani	Administrative Officer
Mr Ram Avtar	Finance & Accounts Officer
Smt Purnima S Ghadge	Assistant

Appendix

Members of RAC

1. Dr RB Singh, President, NAAS, New Delhi (Chairman)
2. Dr SP Adhikary, Head, Centre for Biotechnology, Visva-Bharati, Santiniketan
3. Prof. BN Goswami, IITM, Pune
4. Dr Mruthyunjaya, Ex-ND, NAIP, New Delhi
5. Dr SS Magar, Ex-Vice Chancellor, BSKKV, Dapoli
6. Dr JC Dagar, ADG (Agro & AF), ICAR, New Delhi
7. Sh. Rajendra Pawar, Chairman, ADT, Malegaon, Baramati
8. Dr RP Samui, DDG (Agrometeorology Division), IMD, Pune
9. Dr (Mrs) Renu Khanna Chopra, Emeritus Scientist, WTC, IARI, New Delhi
10. Dr Gaya Prasad, ADG (AH), ICAR, New Delhi
11. Director, NIASM, Malegaon, Baramati, Pune

Members of IMC

1. Dr PS Minhas, Director, NIASM, Malegaon, Baramati, Pune (Chairman)
2. Sh AN Javale, Director of Extension Education, MCAER, Pune
3. The Commissioner, Commissionerate of Agriculture, Fatehmaidan, Hyderabad
4. Sh Rajendra Pawar, Chairman, ADT, Malegaon, Baramati
5. Prof. Nilesh Nalavade, Principal, College of Agriculture (MPKV), Baramati
6. Dr SS Magar, Ex-Vice Chancellor, BSKKV, Dapoli
7. Dr Jagdish Prasad, Principal Scientist, NBSS & LUP, Nagpur
8. Dr PR Bharambe, Principal Scientist & Head, CICR, Nagpur
9. Dr GS Karibasappa, Principal Scientist (Hort.) NRC for Grapes, Pune
10. Dr VUM Rao, Project Coordinator, AICRP (Ag. Met.) CRIDA, Hyderabad
11. Dr JC Dagar, ADG (Agro & AF), ICAR, New Delhi
12. Sh OP Nagar, Sr. Finance & Accounts Officer, NBSS & LUP, Nagpur

PME Cell

Dr J Rane (In-charge), Dr SK Bal, Dr DV Patil, Dr DVKN Rao, Dr AL Kamble, Dr AK Sharma

RFD Committee

Dr DVKN Rao (Nodal Officer), Dr BB Fand, Dr MP Brahmane, Dr AL Kamble, Dr SK Raina, Dr V Govindasamy, Sh G Laxminarayana, Sh Ram Avtar

Grievance Cell

Head of Divisions, Mr Santosh Pawar, Sh G Laxminarayana (AO), Sh Ram Avtar (FAO)

Women Cell

Ms C Aochen (Chairman), Mrs PS Ghadge, Ms Noshin Shaikh, Mrs Priya George, Sh G Laxminarayana (AO), Sh Ram Avtar (FAO)

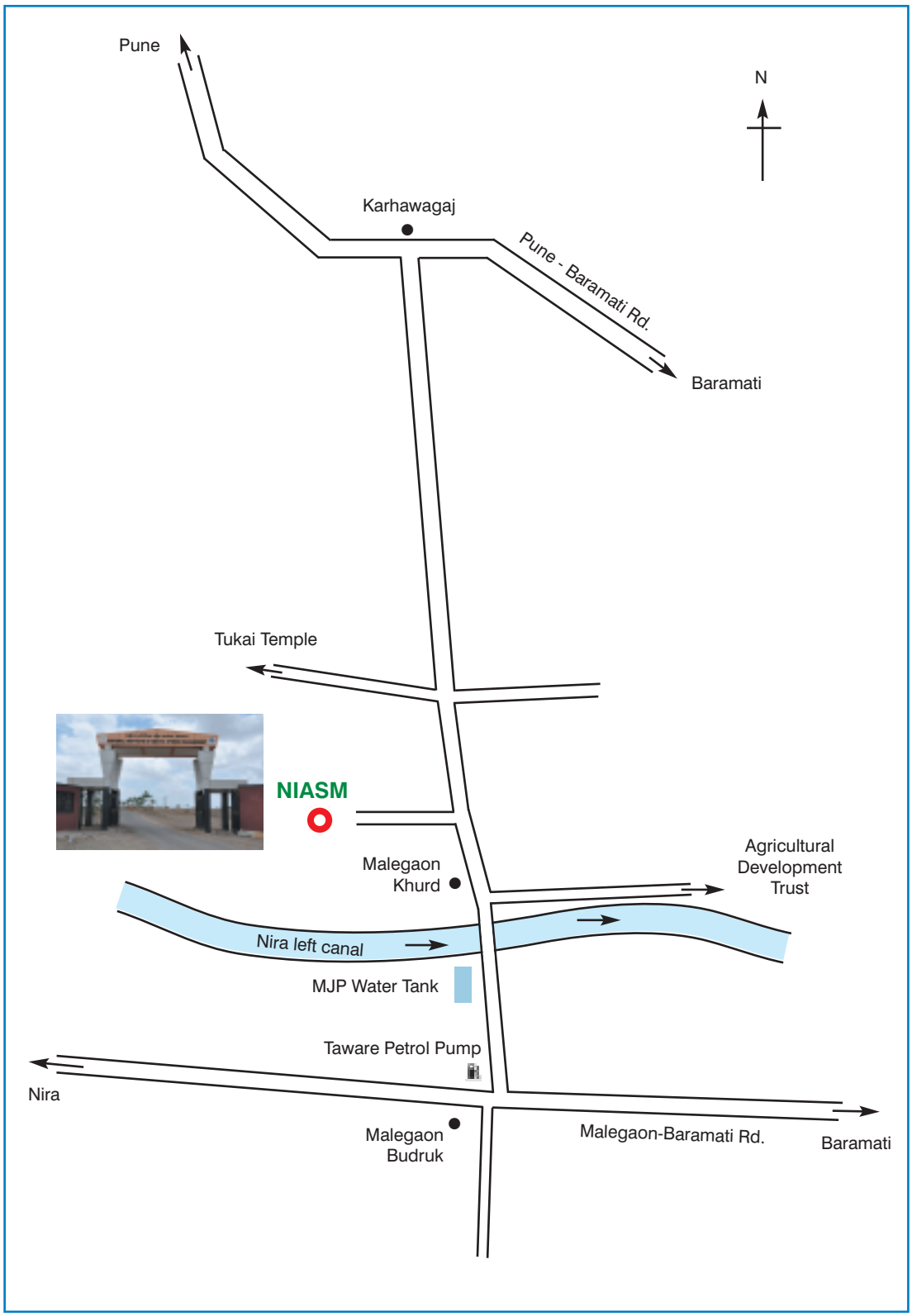
RTI Cell

The Director, NIASM (Appellate Authority); Dr AK Sharma, Documentation Officer (Assistant Public Information Officer), Dr SV Ghadge, Sr. Scientist (Transparency Officer)

Abbreviations

ABC	:	Atmospheric Brown Clouds
ADG	:	Assistant Director General
ADT	:	Agricultural Development Trust
AICRP	:	All India Coordinated Research Projects
6-BAP	:	6-Bromo Amino Purine
BSKKV	:	Dr Balasaheb Sawant Konkan Krishi Vidypeeth
CAT	:	Catalase
CD	:	Critical Difference
CDM	:	Clean Development Mechanisms
CIAE	:	Central Institute of Agricultural Engineering
CIBA	:	Central Institute of Brackish water Agriculture
CIFE	:	Central Institute of Fisheries Education
CPWD	:	Central Public Works Department
CRIDA	:	Central Research Institute for Dryland Agriculture
CRIJAF	:	Central Research Institute for Jute & Allied Fibres
CV	:	Co-efficient of Variation
DARE	:	Department of Agricultural Research and Education
DDG	:	Deputy Director General
DG	:	Director General
DSS	:	Decision Support System
ERM	:	Electrical Resistivity Method
GA	:	Gibberellic Acid
GIS	:	Geographical Information System
ICAR	:	Indian Council of Agricultural Research
IITM	:	Indian Institute of Tropical Meteorology
IMC	:	Institute Management Committee
IMD	:	India Meteorological Department
IPM	:	Integrated Pest Management
KVK	:	Krishi Vigyan Kendra
MCAER	:	Maharashtra Council of Agricultural Education and Research
MPKV	:	Mahatma Phule Krishi Vidyapeeth
MODIS	:	Moderate Resolution Imaging Spectroradiometer
MS	:	Maharashtra
NAAS	:	National Academy of Agricultural Sciences
NAIP	:	National Agricultural Innovation Project
NASC	:	National Agriculture Science Centre
NBPGR	:	National Bureau of Plant Genetic Resources
NBSS& LUP	:	National Bureau of Soil Survey and Land Use Planning
NDVI	:	Normalized Difference Vegetation Index
NIASM	:	National Institute of Abiotic Stress Management
NICRA	:	National Initiative on Climate Resilient Agriculture
NRC	:	National Research Centre
PCR	:	Polymerase Chain Reactions
PME	:	Project Management and Evaluation
RAC	:	Research Advisory Committee
RFD	:	Results - Framework Document
RH	:	Relative Humidity
SAU	:	State Agricultural University
SOD	:	Super Oxide Dismutase
TSP	:	Tribal Sub-Plan

Route Map


Pune
N
Karhawagaj
Pune - Baramati Rd.
Baramati
Tukai Temple
NIASM
Malegaon
Khurd
Agricultural
Development
Trust
Nira left canal
MJP Water Tank
Taware Petrol Pump
Nira
Malegaon
Budruk
Malegaon-Baramati Rd.
Baramati

NIASM Staff

Participation in ICAR Zonal Sports Meet at CAZRI, Jodhpur

राष्ट्रीय अजैविक स्ट्रैस प्रबंधन संस्थान

(समतुल्य विश्वविद्यालय)

भारतीय कृषि अनुसंधान परिषद

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