Infrastructure for Research and Academics at ICAR-NIASM, Baramati



ICAR-National Institute of Abiotic Stress Management (A Deemed-to-be-University)

> Baramati, Malegaon Pune, Maharashtra 413 115

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1. Introduction

Countries like India need significant increase in crop productivity to satisfy the expected growth in demand for food for ever-increasing population, as the scope for expansion of area for agriculture is limited. Anticipated increase in frequency of extreme weather due to changing climate requires adaptation of crop plants to multiple-occurrence of abiotic stresses, for sustaining the food security. The constraints in food security and agricultural productivity should encourage researchers to develop climate resilient crop varieties and agro-technologies.

ICAR-NIASM, established in 2009, has taken lead to carry out research to deliver technologies for managing various kinds of abiotic stresses with a mission of Promoting Sustainable Agriculture in Stressed Environments. Being young and afresh among the ICAR institutes, ICAR-NIASM a Deemed to be University, is equipped with state of the art facilities for research and education in the field of abiotic stress management in agriculture. Agronomic, genetic, biochemical and omics approaches are being used for mitigation and enhancing adaptation of crop plants to these stresses. Efforts have been made to improve income of farmers of hot and dry areas with adoption of herbal gardens consisting local, low water requiring and remunerative medicinal and aromatic plants.

Further, efforts are also in progress to address abiotic stresses especially high temperature and toxic elements that affect livestock and fish to reduce losses to farmers. Recent initiatives are focusing on the best possible and highly remunerative farming system approach to enhance the income of farmers in abiotically challenged agro-ecologies. With a mission to build sustainable livelihood in agro-ecosystems constrained by abiotic stresses, NIASM has adopted strategy that involves characterization of abiotic stress ecologies, mitigation and adaptation options, repository of knowledge, advanced centre for training and academic activities for improving skills of young generation of farmers, scientists and agrientrepreneurs.

2. ICAR-NIASM as a launching pad for career in agriculture science

ICAR-National Institute of Abiotic Stress Management is working for management of abiotic stresses affecting the sustainability for national food production systems. It deals with stresses due to atmosphere, water and soil, which are major causes for agricultural losses including crop, animal and fisheries. Abiotic stresses are natural, borne in the atmosphere (temperature, heat, cold, chilling, frost, radiation, UV ionisation other gasses, CO₂ and other greenhouse gases), water (drought, flooding, hypoxia, sea water inundation), soil (salinity, alkalinity, sodicity, acidity, water logging, poor water quality), chemicals (mineral deficiency/excess, pollutant, heavy metal/pesticides/ gaseous toxin), mechanicals (aerosol, wind, soil shifting). They occur in the multiples and affect all the sectors of agriculture, crop, animal and fisheries. Since, these stresses are predicted to amplify due to such as above condition, the primary task for the institute is to evolve strategies involving mitigation and adaptation techniques through advance in frontier science research. It is essential to

consolidate by adopting frontier molecular, biotechnological, nano-technological and other tools to developed genetically stable crop, livestock, and fisheries on the strategies platform of resource management. NIASM is structured to enhance capacity of scientist and policy makers mainly by imparting knowledge and providing state of art facilities form multidisciplinary and multi-commodity research. Multi-disciplinary teams have been formed to work together for prompt results in the emerging field of research. The institute has four schools as per the research programme as Atmospheric Stress Management School, Drought Stress Management School, Edaphic Stress Management School and Policy Support Research for cutting edge research.

Having placed in an area surrounded by abiotic stress prone agro-ecologies, NIASM shoulders unique responsibility of providing viable management solutions for sustainable and profitable agriculture for the farmers. Majority of the challenges of abiotic stresses are due to sub or supra optimal levels of water leading to drought or flood, salts leading to salinity or alkalinity, temperatures leading to heat or cold, soil minerals that can create deficiency or toxicity in addition to devastating events such as hail storm. Management of these stresses demand a deep insight into the causal factor and mechanisms of tolerance or survival of agricultural commodities such as crops, livestock and fish which all contribute to farmers' income and livelihood. Hence, NIASM is engaged in basic and strategic research to holistically address atmospheric, drought and edaphic stresses, which are the major causes of substantially losses for farmers and Indian agriculture.

The advantage of studying at NIASM lies in its strategic location featured by agroecological challenges around the institutes, which needs to be created artificially at other institutes in the vicinity of mega cities. These harsh and real-time situations, which farmers routinely face offer opportunities for post graduate students to pick up research topics that can have long term impacts. Students can pick up translatable knowledge in agriculture and basic sciences for making such impacts. Located just two hours away by road from Pune, the cultural city of Maharashtra and being at Malegaon, a model and modern village with all urban facility in the vicinity at Baramati, the institute offers serene ambience for academic and research activities. Scientists of the institutes are sufficiently qualified and experienced in imparting knowledge and skills that are essential to carry out research and management in relevant areas and are common to partnering institute.

3. Facilities for research and academics

3.1. Field facilities for research

3.1.1. South Farm

The south side farm (16 ha) is divided into six blocks, which are further sub-divided into 37 rectangular/trapezoidal plots including agro-met observatory. Experiments related to atmospheric, edaphic and drought stresses are being carried out with crops like soybean, guar, green gram, etc. during kharif season and with wheat, jowar, chickpea, sorghum and sugarcane in rabi season.



Additionally, eight new plots were developed and put under rainfed forages like marvel grass, stylo, anjan grass and irrigated napier grass.

3.1.2. North Farm

The northeast side farm was terraced and put under various orchards to evaluate the impact of edaphic and drought stresses on horticultural crops. About 4 ha of northwest side farm include a water balancing tank and a playground have been developed. The farm is further subdivided into two blocks with 7 experimental plots. Water storage tank of 80 lakh litres has also been constructed for providing drip irrigation to the orchard crops.



3.1.3. Malad Research Farm

At Malad, which is 8 km away from main campus, a farm of 6.5 ha is available for research.

3.2. Livestock experimentation facility

A low cost livestock experimentation facility has been developed. The facility consists of cattle, goat and poultry sheds, which will be used for housing the animals for carrying out studies related to abiotic stresses in large and small ruminants and poultry birds.



3.3. Fisheries

The ICAR-NIASM has modern facility for study of abiotic stress on fish experimentation. The glass aquarium, plastic rectangular tank, FRP tank and other kinds of facilities are available with this institute. The wet laboratories have facilities to conduct experiments in both ornamental and food fishes. The wet laboratory have also dissection unit for collection of different sample after completion of experiments. The institute has three farm ponds for fish rearing and maintenance of fish brood stock and screening of different abiotic stress management in pond systems.



3.4. Research laboratories

Institute has a modular laboratory at each of the three schools namely School of Atmospheric Stress Management, School of Drought Stress Management and School of Edaphic Stress Management which have been strengthened with sophisticated equipment's such as Inductively Coupled Plasma Mass Spectrometry (ICP-MS), Tetrad PCR & Quantitative PCR, Stereo Microscope, Hyperspectral Spectroradiometer, Atomic Absorption Spectrophotometer (AAS), GFS-3000 Portable Photosynthesis System, START D Microwave Digestion System, Real time Chlorophyll Fluorescence Imaging System, Infrared Thermal Imaging System, Plant growth chamber, Automated autoclave, Refrigerated incubator shaker, Spectrophotometer, Ice Flaking machine, Refrigerated centrifuges, Biosafety cabinet, CO₂ incubator, Electronic weighing balance, tissue culture labs, GC, HPLC, BIOLOG, RT-PCR, Ultra-centrifuge, Chemilluscence imaging system, Vacuum concentrator, Plate reader, Plate washer, Nanodrop, Lyoplyser, Gel documentation

machine, Root scanner, Automatic N analyser, Fluorescence microscope, light microscope, etc.



3.4.1. Plant phenomics facility

Plant phenomics facility established under NICRA program is now fully functional. The Plant Phenomics facility with a capacity to house 225 pots is equipped with three imaging systems viz., Infra-Red (IR), Visible (VIS) and Near-Infra Red (NIR) for knowledge the plants in different wavelength region. The facility is also equipped with automated weighing and watering stations. The system utilizes a conveyor belt system to move the plants with in the facility to and fro from growth chambers to imaging cabinet. The entire facility is computer operated through Lemna Control Software.



3.4.2. Greenhouse facilities

Hi-tech greenhouses (4 Nos.) with area of 240 m² each are being constructed. Each Greenhouse is having three chambers of 10 m x 8 m ($L \times W$) = 80 m² area. Greenhouses are equipped with cooling pad system and axial exhaust fan system with a platform for growing plants. These greenhouses have provision for controlling temperature, photoperiod, humidity and light intensity.



3.5. Conference facilities

3.5.1. Auditorium

The auditorium, named as "Sardar Vallabhbhai Patel Auditorium", has a capacity of 230 seats and is well equipped with audio visual facility, centralised air condition facility and spacious stage which are useful in smooth conduct of the various events at the institute.



3.5.2. Conference rooms

In addition to auditorium, the institute has 4 conference rooms equipped with audio visual systems, which can allow parallel sessions for conferences.



3.6. Canteen

Canteen is situated in the administrative building of ICAR-NIASM. This has good ventilation as well as central air conditioning facilities.



3.7. Main Office Cum Admin building

Office Cum Administrative building is fully furnished with centralized air-conditioning systems, a centrally placed open-air amphi-theatre equipped with public address system. The building also has auditorium facility and a canteen. The building premises are equipped with fire detection and alarm system.



3.8. School buildings

Two school buildings namely School of Drought Stress Management and School of Edaphic Stress Management have been constructed, furnished and equipped with CCTV surveillance system, fire detection and alarm system, fire extinguishers, drinking water and sanitation facility. Each school building has two laboratories with store room, one room for HOD, 12 rooms for scientific staff and two rooms for technical staff, one class room, one reading room, store room, pantry and record room.

3.9. Hostels and lounges

Boys and girls hostels and dining block are on the verge of completion. The hostels have 72 rooms with attached bathrooms and provision of solar water heater. The common dining block of these hostels is equipped with advanced cooking system with a seating capacity of 70 persons.

3.10. Guest house

The NIRA guest house is having fully furnished three VIP suits and 18 regular suits with Wi-Fi connection. The guest house is having facilities of canteen with seating capacity of 44 persons and well-furnished recreation/meeting room.

3.11. Medical Facility

Medical services of the Allopathic and Ayurvedic doctors of the Baramati city are available on part time basis during office hours in the Institute campus.

3.12. Transportation

Baramati is well connected by road to nearest airport of Pune city and Transport Department of Maharashtra operates air-conditioned bus services for every half an hour from Pune to Baramati. Transport department of Maharashtra has also agreed to provide a stop at point nearest to the institute. Malegaon a modern village and educational hub for the region is hosting the institute and well connected with Baramati.