National Agricultural Higher Education Project (NAHEP)
Indian Council of Agricultural Research, New Delhi
Centre for Advanced Agricultural Science and Technology (CAAST)
for
Climate Smart Agriculture and Water Management (CSAWM)

Annual Progress Report

2018-19

Mahatma Phule Krishi Vidyapeeth
Rahuri 413 722, Tal. Rahuri, Dist. Ahmednagar, (MS) INDIA

Table of Contents

Executive Summary

NAHEP Objective:

NAHEP is designed to strengthen India's national agricultural education system with the overall objective to provide more relevant and high-quality education to agricultural university students. This programme aims to promote efficiency and competitiveness through changes in agricultural universities' working mechanisms, raise the teaching and research standards through improved research and teaching infrastructure, enhance faculty competency and commitments; and make agricultural education more attractive to talented students. There are four key components under NAHEP, namely: (1) Institutional Development Plan (IDP), (2) Centres for Advanced Agricultural Sciences and Technology (CAAST), (3) ICAR to support excellence in agricultural universities (AUs), and (4) ICAR Innovation Grants to AUs. It is envisaged that improved AU performance through quality enhancement, better employment and entrepreneurship opportunities created for agriculture graduates, non-accredited AUs attaining ICAR accreditation, and institutional reforms implemented in the education division of ICAR AUs under these components together shall contribute to the achievement of the overall program objective.

Mahatma Phule Krishi Vidyapeeth, Rahuri has been awarded CAAST on Climate Smart Agriculture, and Water Management with the main objectives of 1.To develop the faculties and scientists' capacity for the development and adoption of the precise Climate Smart Agriculture and Water Management technologies 2. To start the one year Post Graduate Diploma in "Climate Smart Agriculture and Water Management" for developing human resources to create entrepreneurship and employable in public and private sectors, strengthen the current M.Sc., M. Tech. and Ph. D. programme (for their research projects); and make provision for the perspective beginner/middle-level faculties/researchers for Post Doctorate studies in precision water management, precise climate smart agriculture and Geo-informatics 3. To develop an integrated system including RS/GIS and GPS tools, modelling and SDSS tools using unmanned aerial system (UAS aka. drone) and sensor-based technologies; and mobile applications and their applications for climate smart and precision agriculture and water management and 4. To conduct end-to-end capacity building through on-the-job training and case study based learning; enhance the employment and placement rate; and business and entrepreneurship opportunities.

During the Annual Progress Report, CAAST-CSAWM identified the concerned faculties and post-graduate students' training needs for enhancing their competencies in climate smart agriculture and water management. The identified training needs are climate-resilient agriculture

mechanism in the context of climate change and climate variability; the precision agriculture techniques such as precision farm machinery, robotics, Unmanned Arial Vehicle (drones), internet of things (IoT), mobile and web-based technologies for real-time decision making and operation; and implementation of climate smart and efficient water management technologies on the farmers' field.

The second objective of the CAAST is to start the PG Diploma in climate smart agriculture and water management and Post Doctoral programme. The course structure in the PG Diploma modular form and the courses and brief outline were developed by organizing workshops with international and national partners. The details of the post-doctoral research programme were also worked out. Both the programmes will start from 2019-2020. The CAAST-CSAWM has developed ten technologies/research-outputs on climate smart agriculture and water management *viz.* framework of post-graduate diploma in climate smart agriculture and water management, identification of ITKs practices, development of Phule soil moisture sensor-based irrigation scheduler, Phule irrigation scheduler based automatic pump controller, relationship between NDVI and crop coefficient (Kc) for sugarcane, developed model for prediction of soil chemical properties using multispectral satellite image and wavelet transform method, prediction of sugarcane crop yield through three different vegetation indices and linear regression model in semiarid region, android based mobile application for the management of pest and diseases of different crops, assessment of impact of climate change on onset and withdrawal of monsoon for Western Maharashtra, evolution of incorporation of crop residue with irrigation management oxidization practices to enhance the nutrient availability and maintain higher SOC into different pools from a farmer's practice (burning of trash and removal of stubbles). These activities will continue in the following years, also with value addition.

Progress During April 2018 To March 2019

Component 1 b: Support to Centres for Advanced Agricultural Sciences and Technology (CAAST)

While IDP focusses on improving standard and quality of agricultural higher education, the investments under CAAST component contribute more towards enhancing the relevance of the teaching and research. The focus of CAAST hinges upon developing multidisciplinary faculty, innovative approaches to teaching and research, technology development and commercialization. The holistic approach to teaching and research for agriculture and rural development would be building capacities in a specialized thematic area and cutting-edge agricultural science and make AUs globally competitive and locally relevant. High emphasis on industry orientation of agricultural science and technology

generation system through strengthened association and partnership will be laid under this component. It is envisaged that the support and efforts under CAAST would strengthen agricultural higher education with better employment and entrepreneurship opportunities for agriculture graduates.

Strengthening of the Ongoing Post-Graduate and Doctoral Programmes:

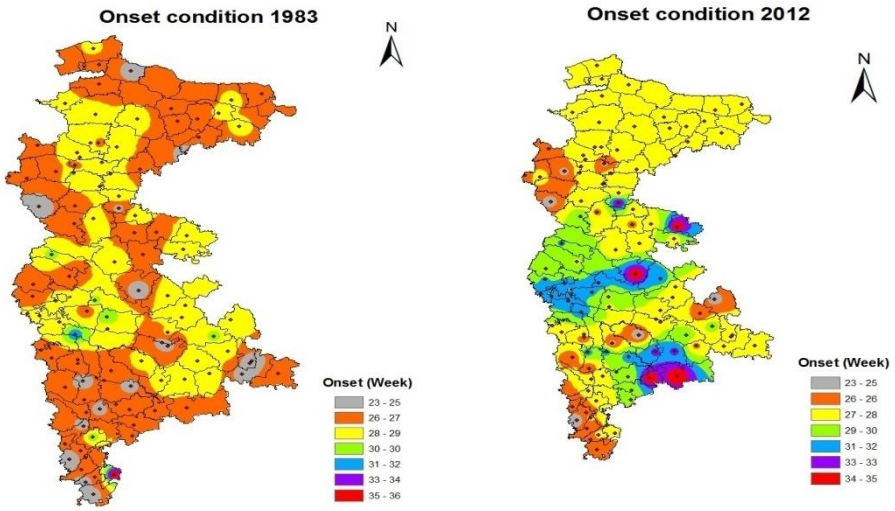
Existing masters (M.Sc., M.Tech.) and Ph.D. programmes in different related disciplines will be strengthened to offer the students projects of M.Sc., M.Tech. and Ph.D. in the CAAST-CSAWM. The Ph. D. programme's main aim will be to make the students experts in Climate Smart Agriculture and Water Management, develop useful tools and technologies and write the research papers in high-quality peer-reviewed journals. The following number of M.Sc., M.Tech. and Ph.D. have currently enrolled for their research work under the respective CAAST project faculties.

Sr. No.	Name of Department	Name of CAAST-Member	Number of students		
			M.Sc.	M.Tech.	Ph.D.
1.	Irrigation and Drainage Engineering	Dr. S.D. Gorantwar and Dr. S.A. Kadam	-	2	-
2.	Extension Education	Dr. M.C. Ahire	-	-	3
3.	Soil and Water Conservation Engineering	Dr. A.A. Atre	-	-	1
4.	Agronomy	Dr. P.S. Bodake		-	1
5.	Farm Machinery and Power Engineering	Dr. S.M. Nalawade	-	1	1
6.	Soil Science and Agril. Chemistry	Dr. B.D. Bhakare	-	-	-
		Total	**-**	**3**	**6**

Broad Activities under component 1 b

1. The CAAST has developed an innovative module course structure for the P. G. Diploma in Climate Smart Agriculture and Water Management and the different courses to be allotted to the students from Agricultural/ Engineering/Social Science.
2. The CAAST has developed the infrastructure for undertaking advanced studies in Climate Smart Agriculture and Water Management for the Post-Graduate/Doctoral level students.
3. It has developed the IoT-based controller for the pump's automatic operations for irrigation to crops, based on crop, soil irrigation system, and real-time crop growth and weather parameters.
4. It has identified the ITKs for climate smart agriculture from tribal the areas.

Glimpses (2018-19)



Impact of Climate Change on Onset of South-West Monsoon for Western Maharashtra

Focused Group Discussion with the Villagers for ITKs Practices

Kanagi Storage Bin ITK practice

Application of Phule Soil Moisture Sensor

IoT based Automatic Pump Controller

in the field

The inception workshop organized on July 15--17, 2018

The workshop on "Social Science Course Contents for PG Diploma

Student Industry Interface on 'Application of drone technology in agriculture.'

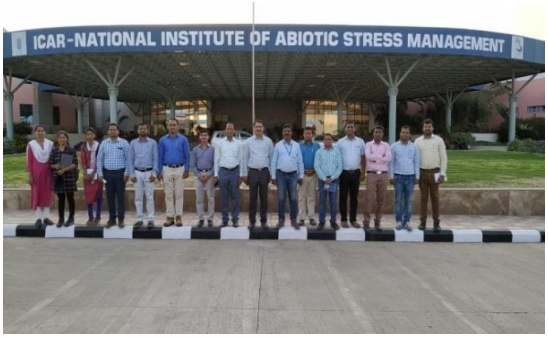

Student Industry interface on 'Robotics and Automation for Climate Smart Agriculture.'


Student Industry interface on "Application of Drone Technology in Agriculture at College of Agriculture, Pune


Spraying demonstration on horticultural and wheat crops through drone-mounted sprayer


Guest lecture on 'Management of Export Oriented Protected Cultivation.' at College of Agriculture, Pune

Guest lecture on 'Application of Micro-Irrigation Technology in Crop Water Management' at the College of Agriculture, Pune.



नवभारत

राहुरी में आधुनिक कृषि तकनीकी केंद्र शुरू

बदलते मौसम का खेती पर असर

शोध दलों का 1 दिवसीय अभ्यास दौरा संपन्न

आहमदनगर, सं. मौसम में हो रहे बदलाव का खेती क्षेत्र पर भारी परिणाम हो रहे हैं. इस कारण बदलते मौसम का अभ्यास करने पर्यावरण को किसी प्रकार की क्षति पहुंचाए बिना अधिक उत्पादन के लिए प्रयासों की आवश्यकता है. वर्ल्ड बैंक, राष्ट्रीय कृषि उच्च शिक्षण प्रकल्प और भारतीय कृषि अनुसंधान परिषद,दिल्ली के संयुक्त तत्वाधान से राहुरी के महात्मा फुले कृषि विवि में अत्याधुनिक कृषि तंत्रज्ञान केंद्र शुरू किया गया है. इस प्रकल्प में नए रूप से काम के लिए हाजिर हुए अनुसंधान सहयोगियों के लिए 1 दिन के अभ्यास दौरा का आयोजन किया था. इस दौरा में सहयोगियों ने आधुनिक तंत्रज्ञान की जानकारी हासिल की.

ICAR-NATIONAL INSTITUTE OF ABIOTIC STRESS MANA

प्रकल्प समन्वयक डॉ.एस. डी. गोटीयार और सहसमन्वयक डॉ. एम. जी. शिंदे के मार्गदर्शन में इस नई टीम के लिए बारा माती के कृषि विज्ञान केंद्र और मालेगाव में राष्ट्रीय अजैविक तान व्यवस्थापन संस्था में अभ्यास दौरा का आयोजन किया था.

■ इस दौरा के दौरान अनुसंधानकर्ताओं ने मृद परीक्षण प्रयोगशाला, कीड़ नियंत्रण प्रयोगशाला, दुग्धशाल विभाग,मत्स्य विभाग, खेत तालाब, सोरपेप, क्रॉपिंग पैटर्न, आधुनिक अनुसंधान आदि के बारेमें बारीकी से जानकारी हासिल की.

Navabharat Pune Edition
12 Apr, 2019 Page No. 6

Visit to KVK, Baramati & National Institute for Abiotic Stress Management, (NIASM) Malegoan

CAAST-CSAWM, MPKV, Rahuri arranged study cum exposure visit for M.Sc. and Ph.D. students of Department of Extension Education, PGI, MPKV, Rahuri

CAAST-CSAWM, MPKV, Rahuri arranged study cum exposure visit for M.Sc. and Ph.D. students of Department of Agriculture Botany, PGI, MPKV, Rahuri

1. Component 1 b	
Support toCentres for Advanced Agricultural Sciences and Technology (CAAST)	**Component cost USD 46.2 Mn**

3.1 Output-outcome monitoring

Sl. No.	Particulars[1]	April 18 to March'19		
		Plan	Achievement	Progress made during the period
1.	Number of faculty exchange programmes (both national and international) initiated by AU	-	-	-
2.	Number of student exchange programmes (both national and international) initiated by AU	-	-	-
3.	Number of technologies transferred to industry / private sector / national/international organizations **(Mention the activities made in this direction)**	-	-	i. Varieties = 6 ii. Crop Production Recommendation = 40 iii. Farm Implimentation = 1
4.	Number of industry-sponsored projects and positions in cutting-edge areas of agri-science (**Mention the number of MoUs signed with industry**)	-	-	2

3.2 Input and Activity Monitoring

Input / Activity indicator	Sub- head / category	Expenditure / input in INR lakhs		Remarks / Activity elaboration[2]
		Planned	Utilization	
Goods and Equipment	Equipment, Plant & Machinery	141.10	88.72462	For imparting, education&conducting advanced research
	Office equipment	4.14	4.02060	Facilitating day to day office activities
	Laboratory equipment	177.62	127.03166	For imparting, education& conducting advanced research
	Furniture & fixtures	14.00	13.99745	For infrastructure development

Input / Activity indicator	Sub- head / category	Expenditure / input in INR lakhs		Remarks / Activity elaboration[2]
		Planned	Utilization	
	Computers and Peripherals	6.62	6.48	For day to day office activities
	Books and Journals	4.14	1.88712	For references to students & faculties
Civil Works	Minor repair and renovation work	50.00	49.39805	Office purpose
Human Capacity Building	National level training	0.00	0.00	0
	International level training	20.71	0.00	0
	Short visit/ seminars / **certificate courses undertaken**	4.14	0.00	0
	Meetings and workshops	2.90	2.52255	Capacity building
Consultancy	National level consultancies	28.99	1.60	Student management system
Recurrent Cost / Miscellaneous	Travel	8.00	4.87536	Project activities
	Contractual services	244.78	31.74813	Hired services for conducting project activities
	Operational costs	196.23	107.932	Need-based goods and services
	Institutional charges	20.45	20.45	Towards institutional development
Total		**923.82**	**460.67**	--

3.3Challenges faced and lessons learnt under Component 1 b:	
1.	Climate smart and precision farming technologies are not easily grasped and accepted by practitioners and farmers in India. Hence, they need to be developed appropriately and disseminated in a meaningful form.
2.	The delegation of powers; procurement and financial rules and regulations are different than the university; and hence initially there were certain hurdles but now slowly smoothened out.
3.	For the CAAST-CSAWM project, networking with different organizations (Govt./ Private / NGOs) was challenging. Every organization has its objectives and vision and to convince them for collaborative work with the CAAST-CSAWM project was a challenging task. However, the CAAST-CSAWM convinced and motivated them for the joint venture from 2018-19.
4.	It is necessary to upload the procurement plan on STEP portal of the World Bank. However, the portal does not have the facility for uploading the procurement plan year-wise separately. If some contract is over and if grants remained unspent under that heading, it is still unclear whether this grants could be utilized.

3.4 Plan ahead (Key activities) for the next reporting period	
1.	The procurement of equipment, plant machinery, lab equipment as per procurement plans and their use in imparting education and advanced research projects in climate smart agriculture and water management in different crops.
2.	Application of climate smart agriculture and water management, precision farming related technologies on the CAAST–CSAWM platforms and farmers farms.
3.	Capacity building of PG, Ph.D. student, faculties and scientists by organizing different duration, workshops, seminars, exposure visits, demonstrations and adoption of villages to disseminate climate smart agriculture and water management technologies to farmers.
4.	To start the one year Post Graduate Diploma in "Climate Smart Agriculture and Water Management" for developing the human resources enabling them to create entrepreneurship and employable in public sectors and private industries, strengthen the current M.Sc., M. Tech. and Ph. D. programme (for their research projects); and make provision for the perspective beginner/middle-level faculties/researchers for Post Doctorate studies in precision water management, precise climate smart agriculture and Geo-informatics
5.	Employment and placement rate; and business and entrepreneurship opportunities enhancement by organizing the on-the-job training and case study based learning programmes.

Future Plans: The tentative plan has already been submitted. However, again the plan is attached herewith.

Disclaimer

This report has been prepared only for the Indian Council of Agricultural Research (ICAR), by the agreed terms and conditions as per the contract dated October 8, 2018, and for no other purpose. We do not accept or assume any liability or duty of care for any other purpose or to any other person to whom this report is shown or into whose hands it may come to save where expressly agreed by our prior consent in writing.

The opinions contained in this report are based on the facts, assumptions, and representations stated herein. Our assessment and opinions are based on the fact and circumstances provided/ collected during our meetings with related officials and research from sources in the public domain held to be reliable. If any of these facts, assumptions or representations are not entirely complete or accurate, in that case, the conclusions drawn therein could undergo material change, and the incompleteness of inaccuracy could cause us to change our opinions. The assertions and conclusions are based on the information available at the time of writing this report.

The procedures we carried out in performing the work that forms the basis of this report were not as to constitute an audit. As such, the content of this report should not be considered as providing the same level of assurance as an audit. PwC disclaims all liability to any third party who may rely on this report. Therefore, it does not assume responsibility for any loss or damage suffered by any such third party in reliance thereon.

This report is provided on the basis that it is for the use of ICAR only and that it (and any extract of it) will not be copied or disclosed to any third party or otherwise quoted or referred to, in whole or in part, without PwC prior written consent. Furthermore, PwC will not be bound to discuss, explain, or reply to queries raised by any agency, other than the intended recipient of this report.

© 2019 PricewaterhouseCoopers Private Ltd. All rights reserved. "PwC", a registered trademark, refers to PricewaterhouseCoopers Private Limited (a limited company in India) or, as the context requires, other member firms of PwC International Limited, each of which is a separate and independent legal entity.

National Agricultural Higher Education Project (NAHEP)
Indian Council of Agricultural Research, New Delhi
Centre for Advanced Agricultural Science and Technology (CAAST)

for

Climate Smart Agriculture and Water Management (CSAWM)

Mahatma Phule Krishi Vidyapeeth

Rahuri 413 722, Tal. Rahuri, Dist. Ahmednagar, (MS) INDIA