



Information Brochure

Climate based Digital Knowledge Support Centre



Dr. Gopal U. Shinde
Principal Investigator (PI)

National Agricultural Higher Education Project
CENTRE OF EXCELLENCE : DIGITAL FARMING SOLUTIONS FOR ENHANCING
PRODUCTIVITY BY ROBOTS, DRONES AND AGVS

Vasantrao Naik Marathwada krishi Vidyapeeth Parbhani,
Maharashtra (INDIA)
www.nahp.vnmkv.org.in

1. Introduction:

Climate change is one of the most extreme challenges Indian agriculture is facing today and will have to deal with in future. There have been overwhelming and growing scientific evidences to establish that the world is getting warmer due to climate change and such increasing weather variability and worsening extremes will impact the agriculture sector more and more adversely.

In order to fulfill the burgeoning demands of food and water by the existing population, and to deploy resources for upcoming generations, much technological advancement are taking place in the agricultural sector. These advancements have been able to release stress from our existing lands, as well as the farmers.

The use of technology in agriculture is not very new. Farming is a highly labor-intensive job, and in order to increase farm efficiency, manage costs, and increase the production of crops, farmers are encouraged to learn the use of technology and adopt it in daily agricultural practices. Some examples include: Sustainable agricultural practices using high-performance tools and equipment; vertical farming; use of AI (Artificial Intelligence); block chain technology; use of drones; and more.

One such technological advancement that is doing wonders in the field of agriculture is precision agriculture. Also known as satellite farming, or site-specific crop management (SSCM), precision agriculture is growing in India, driven by the country's worst water crisis and the need to substantially increase food production.

Precision agriculture is a new way of managing farms, which encompasses observing, measuring and responding to field variability in crops. It is a decision support system (DSS) for managing a farm with the intent of optimizing returns on inputs, and at the same time preserving resources. In simple words, precision agriculture is a farming technique that makes the growing of crops and raising livestock, more accurate and controlled.

This modern-day agricultural practice makes use of information technology and a wide array of equipment such as GPS guidance, sensors, drones, bees, control systems, robotics, autonomous vehicles and hardware, variable rate technology, GPS-based soil sampling, telemetric, and software.

Furthermore, the adoption of mobile devices, increase in IoT, falling prices of sensors, drones and computer chips, access to high-speed internet, low cost and reliable satellites used for positioning and imagery, and inter-connected farm equipment are some of the key technologies, contributing to the increasing trend of precision agriculture. It has also been suggested by some experts that more than 50% of farmers today are using at least one precision farming practice.

Under NAHEP CAAST VNMKV,Parbhani “Climate based Digital Knowledge Support Centre” portfolio has been formulated for PG/Ph.D students and faculties of VNMKV to acquire knowledge about climate change, digital technologies in agriculture, precision farming technologies, IoT tools, app development etc. by using trainings, workshops, research projects etc.

2. OBJECTIVE:

1. Establishment of the laboratories for GIS and remote sensing with computational software for application of Agri bots, Agri drones and Agri AGVs in CDKS for climate based digital support centre.
2. Involvement of UG/PG/ Ph. D. (Agri. Engineering, Agronomy and Soil Science etc.) students and faculty in project work, elective and certificate courses related to CDKS.
3. Development of case studies, Internet of things (IoT), Apps and software tools related to CDKS.
4. Organization of training programmes (one week/ two weeks) in the area of CDKS so as to provide digital solutions.
5. Design and Development of digital tools, equipment's for students, faculty, farmers **and** entrepreneurs.
6. Initiation and completion of national / international level collaborative work/ MOU with National and International Institutes including IIT Kharagpur and IIT Bombay.

3. List of courses under CDKS:

For Three Certificate Courses following are courses under CDKS:

1. PGD-AGAGV's-201: Agricultural AGV's in CDKS
2. PGD-AGDRONES-201: Agricultural Drones in CDKS
3. PGD-AGBOT-201: Agricultural Robotics in CDKS

Following are the elective courses selected for NAHEP-VNMKV Certificate courses with interdisciplinary faculty involvement and enhancement of skills in handling advanced digital devices such as Agribots, Agri-Drones and Agri-AGVs for productivity enhancement.

1. Geo-Informatics in Agri-Drone Navigation
2. Groundwater Digitization by Geospatial Techniques
3. Internet of Things in Precision Agriculture
4. Climate Resilient technologies in Dryland Farming for enhancing productivity through digitization
5. Geo-Informatics for climate smart Agriculture
6. Digitization in Soil, Water and Plant Analysis
7. Decision Support System (DSS) by using geospatial techniques

4. Activities planned under CDKS:

1. Weed management: Pre emergence weed control by using Agri Drones for different crops.
2. Grafting Robots: Sugarcane planting by using grafting robots.
3. App Development: Different apps development for technologies developed by VNMKV.
4. Sensor Application: Use of advanced sensors for nutrient management, water management, climate studies etc.
5. Precision Agriculture technology: Development of ICT tools for precision agriculture technology.
6. Surveying and mapping using Drones: Agriculture field survey and mapping using drones.
7. Crop health monitoring: Using Camera, Spectroradiometer, remote sensing, GIS and drones crop health monitoring.
8. Organization of trainings, workshops for PG/Ph.D students and faculties

5. Brain Storming Workshops:

Brain storming workshops for PG/Ph.D students, faculties of VNMKV for participation in NAHEP Project activities were organized by NAHEP team at various departments of VNMKV.



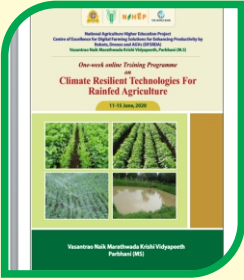

6. Drone Spraying Demonstration:

Drone spraying demonstration was conducted at Dept. of Agronomy for PG/Ph.D students, faculties of VNMKV for introduction about drone application in agriculture.






7. Trainings Conducted:

Sr. No.	National & International training	No. of participants	Duration	Activity
1	One Week Online training organized on “Recent Advances and Instrumentation in Agriculture Meteorology (CDKS Portfolio)”	457	26/5/2020 - 02/06/2020	
2	One Week International online training program is organized on “Biotechnology: It's Application in Modern Agriculture”	480	04/06/2020 – 08/06/2020	
3	One-Week online Training Programme organized on “Application of Remote Sensing & GIS In Digital Agriculture”	450	04/06/2020 - 08/06/2020	

4	One-Week online Training Programme organized on “Climate resilient technology for Rainfed Agriculture”.	452	11/06/2020 - 15/06/2020	
5	One-Week Hands on Training on “GIS and Remote Sensing Applications in Agriculture” jointly organized by NAHEP VNMKV and IIT Bombay	45	20/01/2021- 25/01/2021	

8. Research Facilities available for PG/Ph.D Students and Faculties:

Sr. No.	Name	Features	Product
1.	Agricultural Drones	For spraying and Mapping	
2.	GIS and Drone Data processing Facility	20 Systems with Open Source QGIS Software for data analysis of Satellite data, meteorological data etc PIX4D Software for Drone data processing	 

3.	Multispectral Camera:	It is useful for Drone Image Capturing of Agriculture field & Mapping	 <p>The image shows the Parrot Sequoia multispectral camera system. It includes a main camera unit and a separate sensor module. The sensor module is labeled with 'a) NIR Red Edge 41 mm', 'Green', and 'Red'. Another part is labeled 'b) Sunshine sensor (DLS) 39.6 mm'. A third part is labeled 'c) Parrot Sequoia Board'. The main camera unit is labeled 'Parrot SEQUOIA'.</p>
4.	Realsence Camera	1.Robotic navigation and object recognition, 2.Useful for obstacle avoidance	 <p>The image shows the Intel RealSense camera module, which is a long, thin, black device with two lenses on each end.</p>
5.	LIDAR Camera	Crop Health monitoring, Autonomous harvesting solution	 <p>The image shows a cylindrical LIDAR camera sensor, which is a black and silver device with a lens on the front and a sensor on the back.</p>
6.	ZED2 Camera	Gather real-time synchronized inertial, elevation and magnetic field data along image and depth.	 <p>The image shows the ZED2 camera module, which is a black, rectangular device with two lenses on the front and a sensor on the back.</p>
7.	Stereo Vision Camera	Robotic navigation and object recognition	 <p>The image shows a stereo vision camera module, which is a black, cylindrical device with two lenses on the front and a sensor on the back.</p>
8.	Spectroradiometer	helping us to better understand light quality and intensity,necessary for plant growth	 <p>The image shows a spectroradiometer sensor, which is a black, rectangular device with a lens on the front and a sensor on the back.</p>
9.	Sensors	This is useful for meseasuring NPK,Soil moisture,soilPH	 <p>The image shows a soil sensor mounted on a post in a field. The sensor is a black, rectangular device with a lens on the front and a sensor on the back.</p>
10.	Customized App Development	As per requirement for agricultural operations	 <p>The image shows a hand holding a smartphone with various agricultural app icons on the screen. The icons include a plant, a water drop, a gear, and a location pin.</p>

CDKS Team :

Sr. No.	Name	Designation	Specialization
1	Dr. G.U. Shinde	Principal Investigator	Farm Machinery & Power
2	Dr. U.M.Khodke Associate Dean & Principal	Co- Principal Investigator	Soil & Water Engineering
3	Dr. B.V. Asewar Head, Agronomy	Member	Agronomy
4	Dr. P.H. Vaidya Professor	Member	Soil Science & Agri. Chemistry
5	Dr. M.S. Pendke Senior Scientist	Member	Soil & Water Conservation Engineering
6	Dr. K.K. Dakhore Agrometeorologist	Member	Agrometeorology
7	Dr. V.K. Ingle Assistant Professor	Member	Soil & Water Engineering
8	Prof. S.N. Pawar Assistant Professor	Member	Soil & Water Conservation Engineering
9	Dr. A.U. Waikar	Senior Research Fellow	Irrigation & Drainage Engineering
10	Dr. S.E. Shinde	Junior Research Fellow	Soil Science & Agri. Chemistry