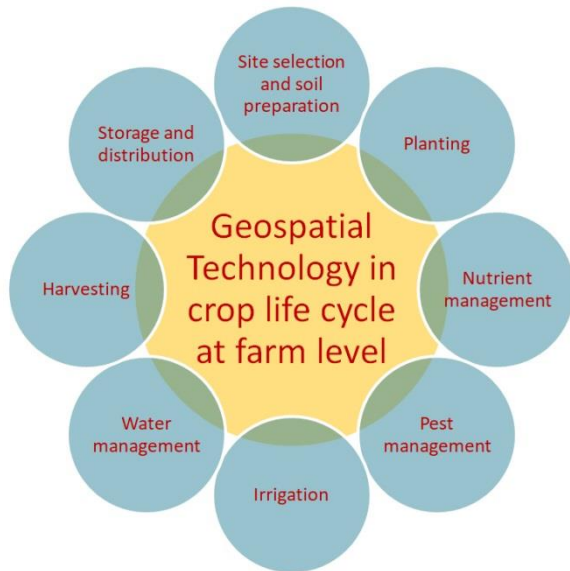




NEWS LETTER

THEME ARTICLE

AROUND THE WORLD



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SPECIAL EVENTS





From the Director General's Desk

Agriculture plays a pivotal role in the Indian economy in ensuring food security for the nation. Agriculture faces many challenges today, including climate change, depleted land quality, water shortages, poor water quality, and economic pressures.

A central issue in agricultural development is the necessity to increase productivity, employment, and income of poor segments of the agricultural population, and by applying geospatial technology in agriculture, this situation can be addressed. GIS tools and online web resources are helping farmers to conduct crop forecasting and manage their agriculture production by utilizing multispectral imagery collected by satellites. The risk of marginalization and vulnerability of small and marginal farmers, who constitute about 85% of farmers globally, also gets reduced. GIS in agriculture helps farmers to achieve increased production and reduced costs by enabling better management of land and input resources.

Technological innovations and geospatial technology help in creating a dynamic and competitive agriculture which is protective of the environment and capable of providing optimal nutrition to the people. While natural inputs in farming cannot be controlled, they can be better understood and managed with GIS applications. GIS can substantially help in effective crop yield estimates, soil amendment analyses and erosion identification and remediation. More accurate and reliable crop estimates help reduce uncertainty.

Agricultural mapping is day by day becoming crucial for monitoring and management of soil and irrigation of farmlands. It is facilitating agricultural development and rural development. Accurate mapping of geographic and geologic features of farmlands is enabling scientists and farmers to create more effective and efficient farming techniques. As farmers are able to take more corrective actions in the form of better utilization of fertilizers, treating pest and weed infestations, protecting the natural resources etc., we are bestowed with more and higher quality food production.

Currently the potential of GIS has not been utilized fully for precision farming in India due to some challenges like small farm holdings, diversity of crops and field to field variability. With the advent of high accuracy Global Positioning System (GPS) there are possibilities automating the farm operations and other mechanization activities on small farms in India. Farmers, however, do now have greater access to computational and geospatial tools that can also at least help mitigate some of these challenges. The present theme article envisages about agricultural Geographic Information Systems using Geomatics Technology which enable the farmers to map and project current and future fluctuations in precipitation, temperature, crop output etc.

देश के लिए खाद्य सुरक्षा सुनिश्चित करने में कृषि भारतीय अर्थव्यवस्था में एक महत्वपूर्ण भूमिका निभाती है। कृषि आज कई चुनौतियों का सामना कर रही है, जिसमें जलवायु परिवर्तन, भूमि की गुणवत्ता में कमी, पानी की कमी, पानी की खराब गुणवत्ता और आर्थिक दबाव शामिल हैं।

कृषि विकास में एक केंद्रीय मुद्दा कृषि आबादी के गरीब वर्गों की उत्पादकता, रोजगार और आय बढ़ाने की आवश्यकता है, और कृषि में भू-स्थानिक प्रौद्योगिकी को लागू करके इस स्थिति को संबोधित किया जा सकता है। जीआईएस उपकरण और ऑनलाइन वेब संसाधन उपग्रहों द्वारा एकत्रित मल्टीस्पेक्ट्रल इमेजरी का उपयोग करके किसानों को फसल पूर्वानुमान करने और उनके कृषि उत्पादन का प्रबंधन करने में मदद कर रहे हैं। छोटे और सीमांत किसानों, जो वैश्विक स्तर पर लगभग 85% किसानों का गठन करते हैं, के हाथिए पर जाने और भेद्यता का जोखिम भी कम हो जाता है। कृषि में जीआईएस किसानों को भूमि संसाधनों के बेहतर प्रबंधन को सक्षम करके बढ़े हुए उत्पादन और कम लागत को प्राप्त करने में मदद करता है।

तकनीकी नवाचार और भू-स्थानिक प्रौद्योगिकी एक गतिशील और प्रतिस्पर्धी कृषि बनाने में मदद करती है जो पर्यावरण की सुरक्षा करती है और लोगों को उत्कृष्ट पोषण प्रदान करने में सक्षम है। जबकि खेती में प्राकृतिक आदानों को नियंत्रित नहीं किया जा सकता है, उन्हें जीआईएस अनुप्रयोगों के साथ बेहतर ढंग से समझा और प्रबंधित किया जा सकता है। जीआईएस प्रभावी फसल उपज अनुमान, मिट्टी संशोधन विश्लेषण और कटाव की पहचान और उपचार में काफी मदद कर सकता है। अधिक सटीक और विश्वसनीय फसल अनुमान अनिश्चितता को कम करने में मदद करते हैं।

मिट्टी की निगरानी और प्रबंधन और खेत की सिंचाई के लिए कृषि मानचित्रण दिन-प्रतिदिन महत्वपूर्ण होता जा रहा है। यह कृषि विकास और ग्रामीण विकास की सुविधा प्रदान कर रहा है। कृषि भूमि की भौगोलिक और भूगर्भीय विशेषताओं का सटीक मानचित्रण वैज्ञानिकों और किसानों को अधिक प्रभावी और कुशल कृषि तकनीक बनाने में सक्षम बना रहा है। चूंकि किसान उर्वरकों के बेहतर उपयोग, कीटों और खरपतवारों के संक्रमण का इलाज करने, प्राकृतिक संसाधनों की रक्षा आदि के रूप में अधिक सुधारात्मक कार्रवाई करने में सक्षम हैं, इसलिए हमें अधिक से अधिक गुणवत्ता वाले खाद्य उत्पादन के लिए सम्मानित किया जाता है।

वर्तमान में जीआईएस की क्षमता का भारत में सटीक खेती के लिए पूरी तरह से उपयोग नहीं किया गया है क्योंकि कुछ चुनौतियों जैसे छोटे खेत जोत, फसलों की विविधता और क्षेत्र से क्षेत्र में परिवर्तनशीलता। उच्च सटीकता वाले ग्लोबल पोजिशनिंग सिस्टम (जीपीएस) के आगमन के साथ भारत में छोटे खेतों पर फार्म संचालन और अन्य मशीनीकरण गतिविधियों को स्वचालित करने की संभावनाएं हैं। हालांकि, किसानों के पास अब कम्प्यूटेशनल और भू-स्थानिक उपकरणों तक अधिक पहुंच है जो कम से कम इनमें से कुछ चुनौतियों को कम करने में मदद कर सकते हैं। वर्तमान थीम लेख में जियोमैटिक्स टेक्नोलॉजी का उपयोग करते हुए कृषि भौगोलिक सूचना प्रणाली के बारे में परिकल्पना की गई है जो किसानों को वर्षा, तापमान, फसल उत्पादन आदि में वर्तमान और भविष्य के उतार-चढ़ाव को मैप और प्रोजेक्ट करने में सक्षम बनाती है।

(Dr. Sagar Hanuman Singh IPoS)
Director General

GEOSPATIAL TECHNOLOGY IN AGRICULTURE

Er. M Udaya Bhanu, Scientific Officer (PHE)

Introduction:

Agriculture plays a pivotal role in the Indian economy in ensuring food security for the nation. The majority of India's poor are found in rural areas. Nearly 70 percent of India's families depend on rural incomes. India is now a net exporter of food. Accelerating the growth of agriculture production is therefore necessary, not only to achieve an overall GDP but to meet the rising demand for food and also to increase incomes of those dependent on agriculture and ensure inclusiveness.

Since most land holdings in India are small, the majority of farmers are practicing subsistence farming, where cultivation techniques are simple and primitive. There is an increased use of mechanized farm equipment like tractor, harvesters and tillers which improve farm productivity. India is one of the largest manufactures of various types of farm equipment. As farm ownership and size is highly influential factor for the Indian agriculture sector, there is a need for new technological innovations, which should guarantee to sustainable approach without reduction in yield. Steady investments in technology development, irrigation infrastructure, emphasis on modern agricultural practices and provision of agricultural credit and subsidies are the major factors contributing to agricultural growth.

Agriculture faces many challenges today, including climate change, depleted land quality, water shortages, poor water quality, and economic pressures. Farmers, however, do now have greater access to computational and geospatial tools that can also at least help mitigate some of these challenges.

Currently the potential of GIS has not been utilized fully for precision farming in India due to some challenges like small farm holdings, diversity of crops and field to field variability. With the advent of high accuracy Global Positioning System (GPS) there are possibilities automating the farm operations and other mechanization activities on small farms in India.

Geospatial technology is a rapidly growing and changing field. The evolution of Geographic Information System (GIS), the Global Navigation Satellite System (GNSS) and Remote Sensing (RS) technologies has enabled the collection and analysis of spatial and non-spatial agriculture data in a more accurate and timely manner.

Geospatial applications in agriculture have grown to stage where they facilitate decision and policy support for food security, poverty alleviation and sustainable development. In India, there is vast potential for the technologies and a good knowledge base has been established over the years. At the farm level decision support near-real time information, soil condition, water use, fertilizer application, pest and weed management are the most important elements of geospatial technology.

The biggest challenges at the organizational level encountered by the respondents are the lack of skilled manpower in India. There is a need for training people all levels in the use and applications of geospatial technologies. The high cost of the hardware and software considered as a serious threat to the geospatial users the agriculture sector, as is the lack of accurate topographic, crop, soil and climate data.

Geospatial Technology in Agriculture:

GIS in agriculture is not a new phenomenon anymore. The agricultural sector is the mainstay of the rural Indian economy around which socio-economic privileges and deprivations revolve, and any change in its structure is likely to have a corresponding impact on the existing pattern of social equality. No strategy of economic reform can succeed without sustained and broad-based agricultural development, which is critical for raising living standards, alleviating poverty, assuring food security, generating a buoyant market for expansion of industry and services and making a substantial contribution to the national economic growth.

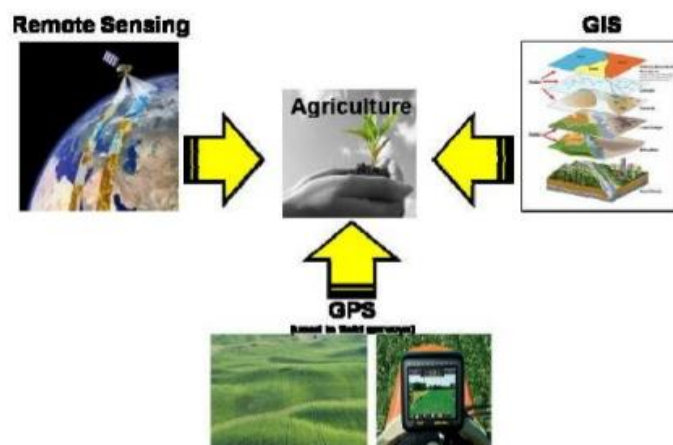
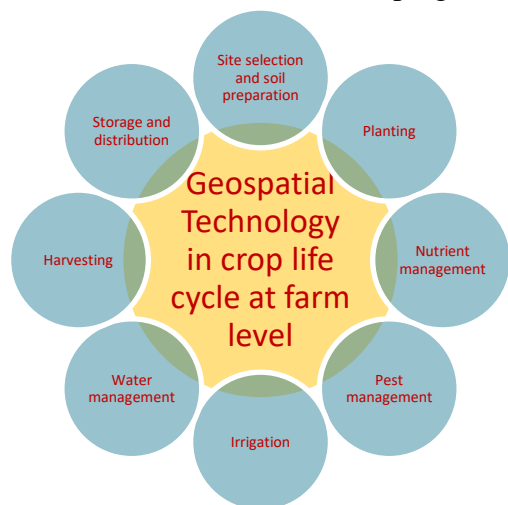


Fig 1: Geospatial Technology in Agriculture

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Sustainable agricultural production depends on the judicious use of natural resources (soil, water, livestock, plant genetic, fisheries, forest, climate, rainfall, and topography) in an acceptable technology management under the prevailing socio-economic infrastructure. Technology plays an important role in the rapid economic growth and social transformation in developing countries.



The future growth in agriculture must come from new technologies which are not only cost-effective but also in conformity with natural climatic regime of the country; technologies relevant to rain-fed areas specifically; continued genetic improvements for better seeds and yields; data improvements for better research, better results, and sustainable planning; bridging the gap between knowledge and practice; and judicious land use resource surveys, efficient management practices and sustainable use of natural resources.

Fig 2: Geospatial Technology in Crop Lifecycle at Farm Level

Table 1: Benefits of usage of Geospatial Technology in crop life cycle at farm level

Steps in crop life cycle	Geospatial Technology at each stage
Site selection and soil preparation	<ul style="list-style-type: none"> • GIS based maps are instrumental for assessing farm topography and demarcation boundaries. • GIS maps made from high resolution satellite imagery support characterization of soil conditions (moisture, type, texture, depth) help in more effective site selection. • Tilling and ploughing equipment and machines make use of GNSS for site specific information. • GPS enabled laser levellers, guided laser beam throughout the field help farmers save (upto 25-30%) of water, reduce weed problems, improve uniformity of crop maturity, reduce irrigation time and the effort required for crop management, all crucial for increasing yield.
Planting	<ul style="list-style-type: none"> • Satellite navigation guides implements like planters and drills, along with machinery like tractors provide mechanical, hydraulic, and/ or electrical power for implements to perform a wide range of crop production operations. • Geospatial technology supports organic farming methods, to find the most profitable and healthy places to plant new crops, or allotting farmland for preservation to secure future food production. • GNSS powered precision seeding is the most widely used method for seed planting. Precision seeding simply

Nutrient management	<ul style="list-style-type: none"> • High resolution satellite imagery can be used to study the reflectance pattern of the crops at different periods of time. • Spatial information enables analysis of different variables that affect crop yields, cause erosion and indicate drought risk. • Hyper spectral remote sensing can be used in soil profiling, resulting in advice on where (and where not) to apply fertilizer. • GPS enabled devices are used for tractor guidance and crop scouting. • GNSS enabled precision farming systems guide tractors for spraying and applying fertilizers in appropriate quantity and location.
Pest management	<ul style="list-style-type: none"> • Aerial application of pesticides, guided by satellite navigation, offers speed of dispersal, accessibility to crops on areas where ground equipment cannot operate, and reasonable cost. • The overall view provided by satellite imagery enables accurate, timely and therefore, better utilization of pesticides. • Satellite applications enable early detection of (some) plant diseases and plagues, such as locust hazard.
Irrigation	<ul style="list-style-type: none"> • Using remote sensing and GIS for mapping of ground water level, land evaluation and suitability analysis. • A detailed analysis of a wide array of agro meteorological data, based on satellite and in-situ information, results in concrete advice on irrigation (timing and quantity).
Water management	<ul style="list-style-type: none"> • GIS based maps allow analysis of drainage and other factors like soil topography which gives an effective solution for removing excess water from the soil, and conversely, water conservation measures in order to enhance crop production. • For better management of water resources, GIS tools used with satellite imagery can help in assessing the water availability, natural vegetation and run-off maps.
Harvesting	<ul style="list-style-type: none"> • Satellite information is used for crop monitoring, resulting in yield prediction starting at an early stage growth, which are regularly updated during the growing season. • Advances of sensor technology enable use of high spatial and spectral resolution in precise crop monitoring and harvesting.
Storage and distribution	<ul style="list-style-type: none"> • Finding the location for warehousing facilities away from the public areas for ensuring crop production. • Analysis of distance to markets, distribution points and logistics.

At the national level and in agro-ecological zones, countries can utilize geospatial technology for the below mentioned applications:

At the national level

- Parcel identification and measurement, geo-statistics and crop identification, field survey, subsidy and policy monitoring and control
- National crop and yield monitoring

- Transport infrastructure and transport to market (food chain management)
 - Land rights
 - Market information
- At the level of agro-ecological zones or watersheds
- Site evaluation (sustainable land use, suitability analysis)
 - Regional crop and yield monitoring
 - Water management
 - Weather prediction

Remote Sensing in Agriculture:

Remote sensing (RS) is the acquisition of information about an object or any phenomenon without making any physical contact with the object. It is a phenomenon that has numerous applications including photography, surveying, geology, forestry and many more. But it is in the field of agriculture that remote sensing has found significant use. There are very many applications of remote sensing in the agricultural sector.

Application of RS technologies in agriculture started with the first launch of the Landsat Multispectral Scanner System (MSS) satellite in 1972. Bauer and Cipra used Landsat MSS to classify the Midwestern US agricultural landscapes into corn or soybean fields. However, until recently, the use of satellite-based data for precision agriculture been sparse and limited only to the large-scale monitoring and mapping of agricultural health due to the limited availability of high spatial (>5 m) and temporal (daily) resolution satellite data. With technological advancements in global positioning systems (GPS), machinery, hardware and software, cloud computing, and Internet of Things (IoT), RS technologies can now be used at a scale much smaller than a field. Some of this is evident from a long list of satellite sensors with high spatial and temporal resolutions that have been deployed on earth orbits over the decades since 1999 (Figure 3).

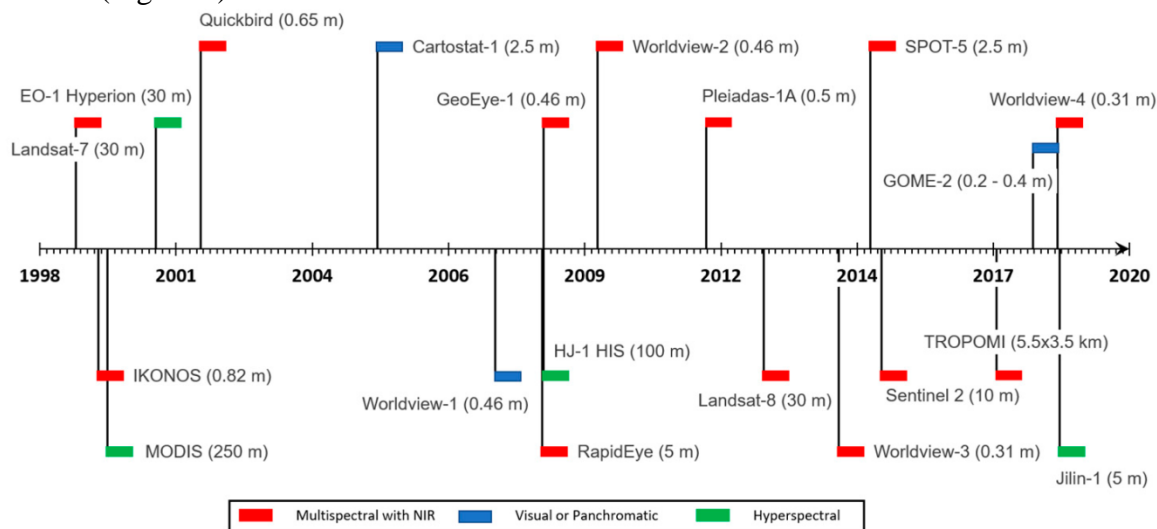


Fig 3: List of satellite sensors and their spatial resolutions since 1999

Various RS platforms are currently used, including handheld, aircraft and satellite, which can be used to collect data at different spatial, temporal, and spectral resolutions. The most appropriate resolutions required for precision agriculture depend on multiple factors, including management objectives, crops and their growth stages, the size of a field, and the ability of a farm machinery to vary inputs (fertilizer, pesticides, irrigation). For instance, ability to detect crop emergence is highly dependent on higher spatial resolution data (<0.1 m) that can help differentiate crop characteristics (i.e., leaves, area) at stand level than that required for crop yield estimation; multispectral imagery helps assess crop health patterns that visible (VIS) imagery cannot detect, and thermal energy is useful for detecting pest pressure, soil moisture and crop water stress that the naked eye cannot detect. Unlike visible and infrared (IR) – based RS, microwaves are less prone to atmospheric attenuation and can help determine the biophysical properties of crops and soil under any day and night conditions.

Monitoring agriculture through RS is a broad topic, and several studies have provided reviews of RS techniques and applications in agriculture from multiple angles, sometimes based on specific applications. For example, estimation of soil properties, soil moisture, yield prediction, disease and pest management, weed detection, methods, sensors (visual, multispectral, thermal, microwave, hyperspectral), RS platform (satellite, unmanned aerial system (UAS), or specific location (eg., country or continent).

Global Navigation Satellite System in Agriculture:

GNSS are the collection of localization systems that use satellites to know the location of a user receiver in a global (Earth-centered) coordinate system and this has become the positioning system of choice for precision agriculture technologies. Presently, there are two Global Navigation Satellite Systems (GNSS) that are fully operational and commercially available to provide all-weather guidance virtually 24 hours a day anywhere on the surface of the earth.

The basic principle of operation on which GNSS systems is based is often referred to as resection (also called triangulation), and it involves estimating the distances from at least three satellites orbiting the Earth along different and sufficiently separated trajectories to determine the position of an object in 2-D along with the uncertainty in measurement. Typically, each GPS satellite continuously transmits at least two carrier waves consisting of two or more codes, and a navigation message. GNSS receivers measure the time it takes for the signal to travel from the transmitter on the satellite to the receptor in the receiver antenna and use that time to calculate the distance (or range) between them. To perform a positioning or navigation task, a GNSS receiver must lock onto the signals from at least three satellites to calculate a two-dimensional (2D) position (latitude and longitude). If four or more satellites are in view, the receiver can determine three-dimensional (3D) position (latitude, longitude, and altitude) of the user.

The Global Positioning System constitutes of three major segments,

- Space Segment
- Control Segment
- User Segment

1. Space Segment

The space segment comprises of 24 to 32 satellites located in six orbital planes at 55° inclination to the equator in the geosynchronous orbits. These Satellites are above 20,000 km altitude from the Earth. Only twenty-one satellites are enough for covering the entire world, and the other satellites are acting as spares. Also, the four satellite visibility to the receiver alone is sufficient for locating the position the receiver in the world, by identifying its geo-coordinates (Latitude, Longitude, Altitude, Time).

2. Control Segment

Control segment contains a Master Control Station (with an alternative Master Control Station) and six dedicated Monitoring Stations. The accuracy of the entire GPS is proportional to the proper functioning of the Master Control Station.

3. User Segment

In our day-to-day life, almost everything is equipped with a GPS receiver. For example,

- Smartphones
- ATM
- Aircraft
- Cars
- Military Vehicles, etc.,

And, these GPS receivers falls under the User Segment. Around 1 Billion people are using Google Maps, which means there are that many GPS receivers available and still more receivers used in other applications.

Smart farming

Farming is getting smarter with the availability of advanced technologies like precision equipment, the Internet of Things (IoT), sensors and actuators, geo-positioning systems, Big Data, Unmanned Aerial Vehicles, robotics etc.

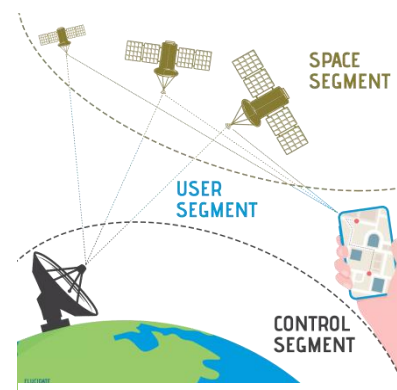


Fig 4: GPS Segments

Sensors in fields, on tractors and on satellites high above farms are constantly collecting data. Advanced technologies are able to turn this data into information that farmers and land managers can use to make more informed and timely decisions. This, in turn, boosts productivity and reduces environmental impacts.

A concept in agriculture that is gaining wide popularity due to the plethora of benefits it offers is that of precision agriculture. It enables farmers to collect timely geospatial information on soil-plant requirements and prescribe and apply site-specific treatments to increase agricultural production and protect the environment. Precision agriculture is tied up with high technology tools that are more accurate, cost-effective and user-friendly.

Aerial technologies are also helping farmers make better choices by using unmanned aerial vehicles (UAVs) as well as satellite technologies. For decades, Landsat and other more recently developed multi-spectral satellites, such as Advanced Space borne Thermal Emission and Reflection Radiometer (ASTER), have been used to provide Normalized Difference Vegetation Index (NDVI) data. This allows farmers to monitor the health of their crops and estimate harvest for wide areas.



Fig 5: Precision farming - Drone

On the other hand, small, cheap drones are often used to provide more fine-scale assessment, including data on plant height, count and biomass estimates, indication of disease, presence of weeds, plant health, field nutrients, and volumetric data using simple cameras that can create photogrammetric data.

Powerful modeling tools, such as Decision Support System for Agrotechnology Transfer (DSSAT) and Soil-Water-Air-Plant (SWAP), have also become incorporated with common and open source GIS tools such as GRASS, enabling farmers and analysts to forecast water availability and crop health without great expense. These tools are increasingly incorporated with high performance computing (HPC) or cloud-based computing, enabling large-scale analyses for large areas in the tens of thousands of hectares to be estimated.

Many transformations to technologies and techniques used benefit agricultural decisions. Farmers have a greater variety of data to choose from to help with decisions needed that not only benefit them but also can have a positive impact on the environment. Costs and technology access may limit some farmers from benefiting changes occurring for modern agriculture; however, many of these technologies are declining in cost and, in fact, many of the tools, such as GIS and some of the satellite data, are free to use. Improving how agriculture is done will increasingly be more critical as we try to be more effective in how we use landscape resources to mitigate negative impacts on the economy and climate.

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Around the World

DRONE TECHNOLOGY IN SUSTAINABLE AGRICULTURE

M Udaya Bhanu, Vidhu Kampurath, Govind Maurya and Haneefa Begum

Plant Health Engineering Division

Food is one of the basic needs of human beings as it provides energy and nutrition. The demand for food is increasing exponentially across the world. There is a greater need than ever before for farmers and agronomists across the globe to improve resource management in response to tightening budgets, while the “farm to fork” movement has seen rising pressure for enhanced product traceability, as consumers become more interested in the origin of the goods they purchase and how they were grown. Products can be accurately traced from farm to fork using GPS locations for every point in the journey, rather than more traditional time and labor-intensive data collection. Furthermore, climate change continues to create new layers of complexity for the agriculture industry in protecting the security of the supply chain. A landmark report published by the Intergovernmental Panel on Climate Change (IPCC) states that sustainable land management could be key to reversing the impact of climate change on land degradation – a significant consequence of human and agricultural activity and extreme weather conditions, in which the quality of land and soil is polluted or degraded.

To balance feeding the planet with reducing global emissions, ambitious plans have been put in place. Precision agriculture practices, which can help farmers make better informed decisions, have evolved significantly over recent

years. The information gathered by drones on farms is often used to better inform agronomic decisions and is part of a system generally referred to as ‘precision agriculture’. The use of drones in the agriculture industry is steadily growing as part of an effective approach to sustainable agricultural management that allows agronomists, agricultural engineers, and farmers to help streamline their operations, using robust data analytics to gain effective insights into their crops. The use of global positioning system (GPS) technology, together with geographic information system (GIS) tools, form a large part of these precision agriculture practices allowing fine-scale monitoring and mapping of yield and crop parameter data within fields. These provide more intense and efficient cultivation methods, which can help farmers adjust fertilizer prescriptions or identify crop diseases before they become widespread. With more data at their fingertips, farmers can make decisions based on economic and environmental factors – for example, by optimizing fertilizer treatment and applying only the right amount at the right time, significant cost and environmental savings can be made. Drone is helping agriculture become a data-driven industry.

Some of the significant areas of Drone in agriculture are:

Scouting/ Monitoring Plant Health: Drones with ‘regular’ cameras or those equipped with special imaging equipment called Normalized Difference Vegetation Index (NDVI) use detailed colour information for monitoring plant health which helps farmers to monitor crops timely. Many farmers are already using satellite imagery to monitor crop growth, density, and colouration, but accessing satellite data is costly and is not effective especially during cloud cover and poor light conditions. Satellite imaging may offer to the meter accuracy, but drone imaging is capable of producing accurate image location to the millimeter. As drones fly close to fields, even after planting, areas with stand gaps can be spotted and replanted as needed, and disease or pest problems can be detected and treated for right away.



Monitoring Field Conditions: Drone field monitoring is also being used to monitor the health of soil and field conditions. For example, DJI Phantom 4 Pro, provide real-time and precise analysis of soil's overall health. Drones can provide accurate field mapping including elevation information that allow growers to find any irregularities in the field. Having information on field elevation is useful in determining drainage patterns and wet/dry spots which allow for more efficient watering techniques. Some agricultural drone retailers and service providers also offer nitrogen level monitoring in soil using enhanced sensors. This allows for precise application of fertilizers, eliminating poor growing spots and improving soil health for years to come.



Planting & Seeding: One of the newer and less wide spread uses of drones in agriculture is for planting seeds. Seattle-based startup started in 2016. Automated drone seeders are mostly being used in forestry industries right now, but the potential for more widespread use is on the horizon. Planting with drones means very hard to reach areas can be replanted without endangering workers. They are also able to plant much more efficiently with a team of two operators and ten drones capable of planting 400,000 trees a day.



Spray Application: Drone use to apply spray treatments is already widespread in south-east Asia, with South Korea using drones for approximately 30% of their agriculture spraying.



Drone sprayers are able to navigate very hard to reach areas, such as steep tea fields at high elevations. Drone sprayers save workers from having to navigate fields with backpack sprayers, which can be hazardous to their health. Drones sprayers deliver very fine spray applications that can be targeted to specific areas to maximize efficiency and save on chemical costs. Currently drone sprayer regulations vary widely between countries. In Canada, they are not currently legal as more testing needs to be done to understand the impact of spray drift. Some regulation proposals recommend that only

trained professionals be tasked with flying spray drones as is the case with Yamaha, who does not sell the spray drones they manufacture, but leases spray drone services complete with licensed operators.

Security: Drone security is a fast growing industry apart from agriculture but is also extremely useful to farm management. Using drones to monitor the far reaches of a farm without having to get there saves valuable time and allows for more frequent monitoring of hard to reach areas. Drone cameras can provide an overview of farm operations throughout the day to ensure operations are running smoothly and to locate equipment being used. Security drones can be deployed to monitor fencing and perimeters of more valuable crops like cannabis instead of employing more security personnel. Drone cameras are also being used in exciting ways to protect farm animals by locating missing or injured herd animals in far off grazing areas. Monitoring remote areas, which used to take hours of walking can now be completed in a few minutes.

Drone Pollination: Some of the newer uses for drone use in agriculture are still in testing and development. One of the most publicized (and often fictionalized) uses is pollinating drone technology. Researchers in the Netherlands and Japan are developing small drones that are capable of pollinating plants without damaging them. The next step is to create autonomous pollinating drones that will work and monitor crop health without constant instruction from operators.



Drone AI: Another drone technology in development also involves machine learning. Improving Artificial Intelligence (AI) in drones is important to be able to make them more useful to smaller farmers in developing nations. Current drone technologies are more effective in monitoring well known crops like corn which are planted in large monocultural field patterns. Drone monitoring programs, as they stand, have a hard time recognizing areas with increased crop diversity, less well known produce, and grains which look similar throughout their growth stages and so are less effective in monitoring crop growth and health. More work is needed to be able to train AI systems to recognize less common crops and more diverse planting patterns.

Drone Irrigation: New research out of Australia is also creating exciting opportunities for drone use in agriculture.



As climate change increasingly affects drought conditions, creating more efficient irrigation solutions is vital. Using microwave sensing, drones are able to capture very accurate soil health information including moisture levels without the plants getting in the way. This means water can be distributed in a field in the most efficient way in an effort to conserve resources.

Key considerations for the adoption of drones:

Once it is decided to employ drones in agricultural management, there are several factors to consider before investment. Rotary drones and fixed-wing drones are two types of UAVs that each bring distinct advantages. A rotary system, such as a quadcopter or multicopter, is ideal for mapping and inspecting small areas, thanks to its ability to take high resolution imagery at closer range, using mm per pixel. The take-off and landing area can also be very small, which suits more urban areas. In contrast, a fixed-wing drone is often more suitable and beneficial for agricultural applications, where mapped areas are usually large and take-off and landing space is not limited. Its

endurance and high cruising speed allows a greater area of land to be mapped up to 2.6x faster, with an object resolution of cm/inch per pixel, and users also benefit from its ability to withstand high wind resistance – an important factor when mapping large areas of open land – as well as reduced labor costs.

In addition to the choice of device, agricultural professionals must also consider the benefits of using a third party to assist with flying the drones, or whether it is more beneficial to train a team in-house. Companies are increasingly opting to use drones in-house, due to the long-term cost benefits and potential return-on-investment. Advances in technology now means that UAVs can also be seamlessly integrated with existing farm management information systems (FMIS), to reduce time spent planning and in the field. Helping to streamline workflows further, partnerships between hardware and software manufacturers can also support agricultural professionals with the processing and analysis following data collection – all in one system.

This allows agricultural professionals to fly the drone and process the images using accompanying software, before exporting the data directly to an application map for use on farming equipment, such as sprayers. These measures enable precision application and ensure less wastage of materials, which can help save costs.

Training Programs

Plant BioSecurity Division

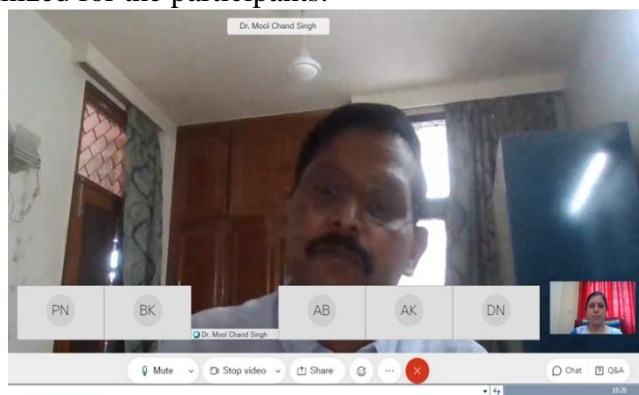
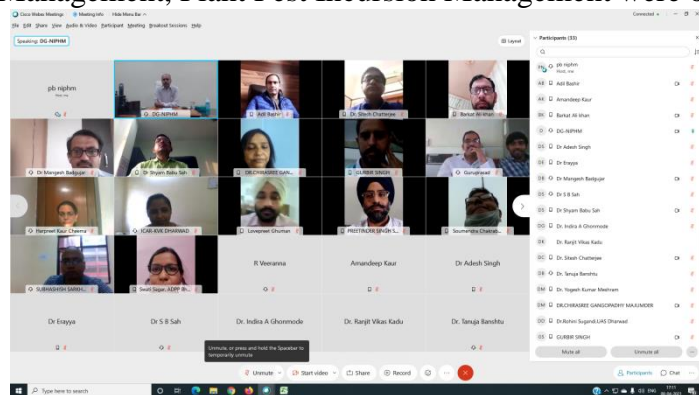
S No.	Name of The Programme	Duration	Date	
			From	To
I	Plant Biosecurity Division (PBD)			
1	Invasive Alien Species: Introduced and Emerging Pests	3 Days	06.04.2021 to 08.04.2021	
2	Fruit fly: Surveillance and Management	5 Days	19.04.2021 to 23.04.2021	
3	Plant Quarantine Procedures for Import and Export	5 Days	26.04.2021 to 30.04.2021	
4	Fruit fly: Surveillance and Management	3 days	28.04.2021 to 30.04.2021	
5	Fumigation as a Phytosanitary Treatment (Methyl Bromide and Aluminium Phosphide Fumigation) (Payment Programme)	15 Days	03.05.2021 to 17.05.2021	
6	Stored grain pest detection, identification and management	5 Days	03.05.2021 to 07.05.2021	
7	Customized training programme on WTO and Agri Exports for PAGREXCO officials (paid programme)	3 Days	19.05.2021 to 21.05.2021	
8	Awareness programme on Post Entry Quarantine (PEQ)	2 Days	12.05.2021 to 13.05.2021	
9	Pest surveillance	5 Days	31.05.2021 to 04.06.2021	
10	Phytosanitary Inspection for Phytosanitary Service Providers for Inspection of Plants/Plant Products & other regulated articles in export (Payment Programme)	30 Days	15.06.2021	14.07.2021
II	Vertebrate Pest Management (VPM)			
1	Certificate Course on Urban Integrated Pest Management (Payment program)	15 Days	14.04.2021 to 28.04.2021	

2	Rodent Pest Management	5 Days	17.05.2021 to 21.05.2021
3	"Vertebrate Pest Management – Wild boar, Monkey and Birds"	3 Days	16.06.2021 to 18.06.2021
III	PBD Farmers Programmes		
1	Preparation of low cost bottle trap and lures for fruit fly trapping	1 Day	21.05.2021
2	Integrated Management of Stored Grain Pests	1 Day	22.05.2021
3	"Export products from Maharashtra: Procedure and Benefits" to the progressive farmers of Latur District	1 Day	19.06.2021
4	Integrated Fruit fly management strategies to the farmers of Khowai district, Tripura	1 Day	22.06.2021
5	Low cost bottle trap for fruit fly management in collaboration of Krishi Vigyan Kendra, Rewa, District, Madhya Pradesh	1 Day	24.06.2021
IV	VPM Farmers Programmes		
1	Rodent Pest Management	1 Day	07.05.2021
2	Vertebrate Pest Management for the farmers of Thiruvarur District, Tamil Nadu in association with KVK- Needamangalam- Thiruvarur, Tamil Nadu	1 Day	18.06.2021
3	Vertebrate Pest Management to the farmers of Virudhnagar District, Tamil Nadu in collaboration with Department of Agriculture, Virudhnagar, Tamil Nadu	1 Day	25.06.2021
4	RPM training to farmers of Khowai district, Tripura	1 Day	29.06.2021
5	Vertebrate Pest Management to the farmers of Virudhnagar District, Tamil Nadu	1 Day	28.06.2021
V	Webinar		
1	National Webinar on "Sustainable bird management in horticultural and agricultural ecosystem"	1 Day	30.06.2021

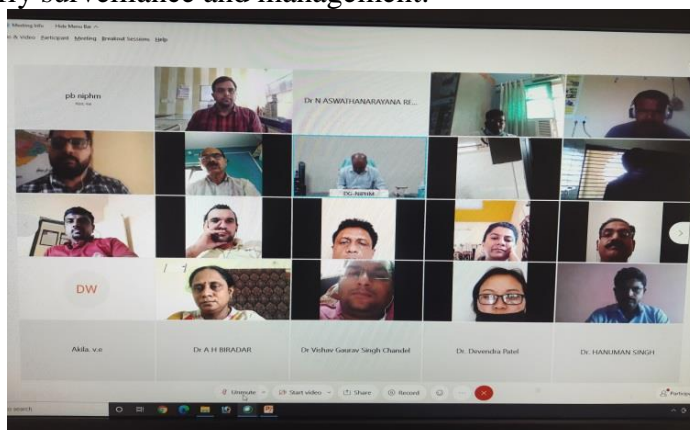
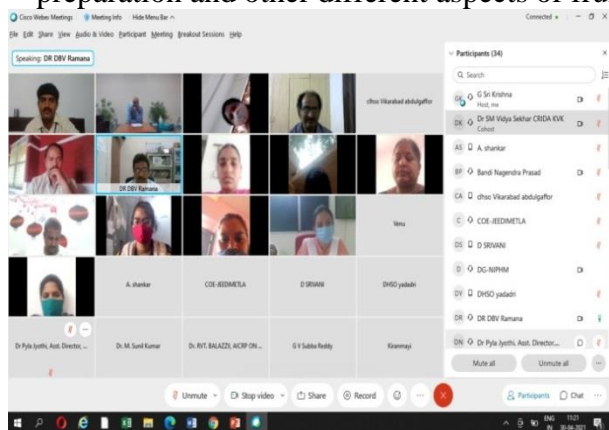
I.

1. Invasive Alien Species: Introduced and Emerging Pests : An online programme of 3-Days was organized from **06.04.2021 to 08.04.2021** and attended by **49 officials** from different departments. Invasive alien species are species that are introduced, accidentally or intentionally, outside of their natural geographic range and that become problematic. They are often introduced as a result of the globalisation of economies through the movement of people and goods, for instance via shipping, consignments of wood products carrying insects, or the transport of ornamental plants to new areas. Different relevant sessions on Plant Biosecurity and Emerging Challenges, Regulation with reference to Invasive Species- CBD, IPPC and IUCN, Looming Threats to South

Asian Regions, Introduced Insect Pests and their Impact, Invasive Alien Weeds-Prevention and Management, Introduced Pathogens and their Impact, Invasion of Alien Insect Pests and Bio control Intervention for their Management, Plant Pest Incursion Management were organized for the participants.



2. Fruitfly Surveillance and Management: Two' online training programmes on Fruit fly was conducted from **19.04.2021 to 23.04.2021 (5 Days)** and **28.04.2021-30.04.2021 (3 Days)** in collaboration with KVK and CRIDA, Hyderabad. The programme was attended by **47officers** and **61 officers** respectively. Experts have been invited and different lectures were organized for identification & detection of fruit fly species, lure preparation and other different aspects of fruit fly surveillance and management.



3. Plant Quarantine Procedures for Import and Export: A 5-Days online programme during **26.04.2021 to 30.04.2021** was organized and wherein attended by 45 officers. All the officers from different departments get well versed with national procedures and regulations for import and export of agri commodities as per the requirement of the country and obligation towards IPPC and other organizations involved in global trade. The participants of the programme attended the session on plant biosecurity challenges, SPS agreement, international conventions, National regulations, SOPs on export and import, procedure for export and import of agriculture commodities through different provided scenario exercises for export and import of seeds, plants, grains, fruits, GMOs, germplasm and bio-control agents.

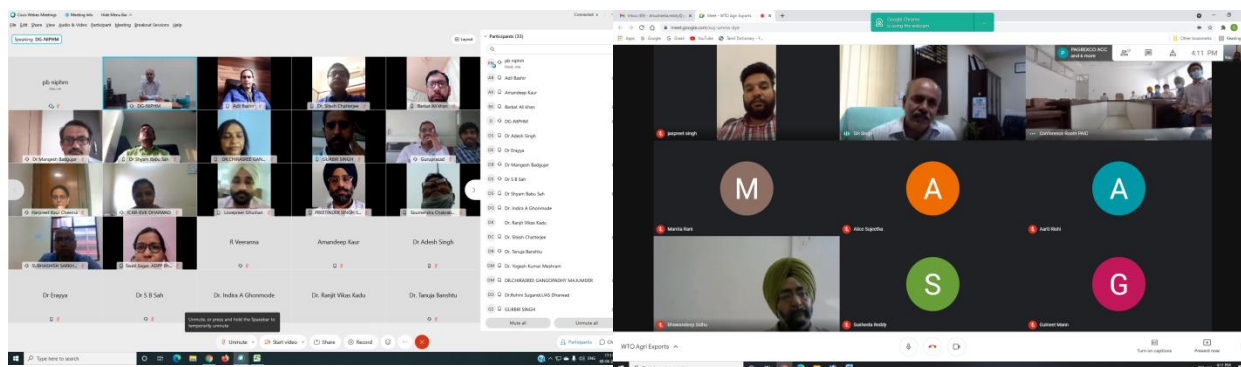
4. Fumigation as a Phytosanitary Treatment (Methyl Bromide and Aluminium Phosphide Fumigation) - Payment Programme: An on Campus 15-days programme from 03.05.2021 to 17.05.2021 was organized for 20 participants at NIPHM, Hyderabad. The participants got familiarized with physical and chemical properties of Phosphine and Methyl bromide, safety precautions to be followed while handling fumigants, mode of action of fumigants, principles of fumigation, monitoring the fumigant concentration, appropriate use and maintenance of fumigants and safety equipments. The participants were made to understand the guidelines laid in NSPM-11, 12 (MBr fumigation) and NSPM-22 (Phosphine fumigation) to conduct appropriate fumigation procedures as well as the accreditation procedure of fumigation operators prescribed

by the DPPQ&S. The trainees gained hands-on practical experience in creating gas-tight enclosure, laying gas supply and monitoring lines, use of vaporizer, fan, leak detector and gas concentration monitor.



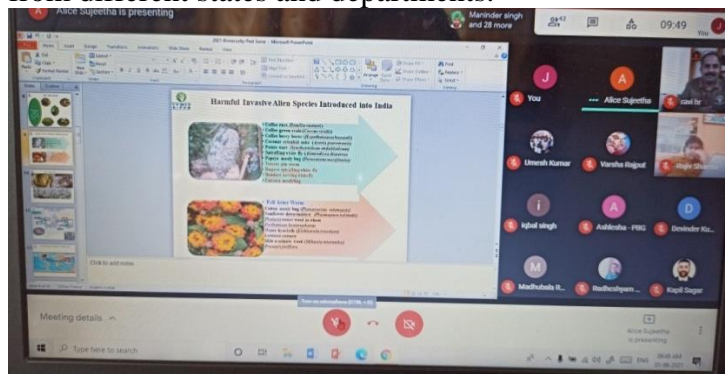
5. Stored Grain Pest Detection, Identification and Management: A 5-days online programme was conducted during the period from **03.05.2021 to 07.05.2021** and **25 participants** get trained in stored grain pest detection, their identification and management practices. The participants learnt inspection & sampling methods to detect insect pests & identification of different stored grain insect pests by using various identification keys and online tools. The participants get acquainted with importance of specific pests which hamper the exportable commodities from India and use of approved fumigants for quarantine purposes *i.e.* Methyl bromide and Phosphine.

6. Customized training programme on WTO and Agri Exports for PAGREXCO officials (Payment Programme): A 3 Days online programme from **19.05.2021 to 21.05.2021**. Different lectures were scheduled in such a way that all the **24 officers** get well acquainted with national procedures and regulations for import and export of agri commodities as per the requirement of the country and obligation towards IPPC and other organizations involved in global trade.



7. Awareness programme on Post Entry Quarantine (PEQ): A 2-Days online programme from **12.05.2021 to 13.05.2021**. The said programme was attended by **13 officials** belongs to different states. In accordance with provisions of Chapter IV of Plant Quarantine (Regulation of Import into India) Order, 2003, the importer shall be required to establish the post-entry quarantine facilities such as an isolated field/nursery/glass house/screen house/ poly house etc., that are duly certified by the Inspection Authorities (IAs) notified in Schedule-XI Part-I and Part-II in accordance with guidelines prescribed by PPA for importing plants and plant materials that require post-entry quarantine. The importer shall establish these facilities sufficiently in advance so that the same may be ready for use at the time of arrival of consignment but not latter. During the programme the officials got well versed with Different regulations and legislations in accordance with IPPC, different types of PEQ facilities and their requirement, conditions from growing planting materials and most significantly supervision of Inspection Authority etc.

8. Pest surveillance: A Five Days online programme was organized from **31.05.2021 to 04.06.2021**. Pest Surveillance plays a substantial role in promoting plant health which has become a trade policy issue. Pest surveillance provides insights into the health status of a country's agriculture and strengthens the stakeholder's preparedness for preventive actions both in addressing the problems due to domestic pests of serious concern as well as in protection of native agricultural biodiversity from the incursion threats of exotic pests. The programme was attended by **48 officials** from different states and departments.



9. Phytosanitary Inspection for Phytosanitary Service Providers for Inspection of Plants/Plant Products & other regulated articles in export (Payment programme): As per the requirement of NSPM-23 the 4th batch of Phytosanitary inspection training of Phytosanitary Service Provider (PSSP) is being organized at NIPHM for 30 from **15.06.2021 to 14.07.2021** and **13 eligible aspirants** are attending the programme at NIPHM, Hyderabad.



II. VPM Training Programs

1. Certificate Course on Urban Integrated Pest Management (Payment programme): A fifteen days on campus programme from **14.04.2021 to 28.04.2021** was organized at NIPHM. A total of **17 participants** from the pest control industry have attended the programme. The programme was organized with an objective to build technical manpower to undertake commercial urban pest control services in human habitations, institutions and industrial premises for structural pest management professionals.



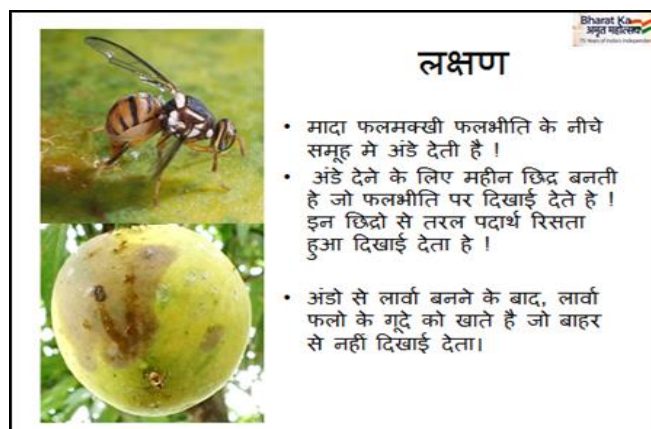
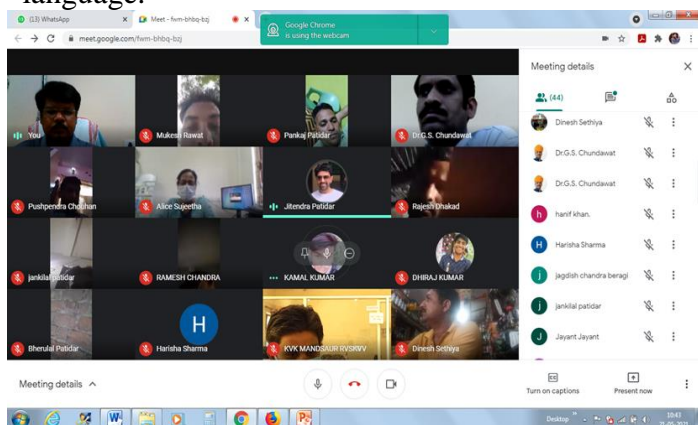
2. Rodent Pest Management: Thirty officers have attended 5 days training programme on rodent organized from **17.05.2021 to 21.05.2021**. The participants were trained on various aspects like biology, ethology and integrated rodent management principles. The participants acquired skills in safe and judicious preparation and application of poison baits. Participants were exposed to crop fields and carried out exercises on diagnosis of rodent pest species, measurement of their infestation and crop damage. Participants were also involved in preparing action plans for organizing mass rodent control campaigns for endemic districts of their jurisdictions.

3. Vertebrate Pest Management - Wild Boar, Monkey and Birds: A three days online programme from **16.06.2021 to 18.06.2021** was conducted to discuss different measure to manage the vertebrate pests at various levels. The programme was attended by total of **49 officers** from different states and departments. Risk Assessment and management of vertebrate Pests in agriculture and horticulture ecosystem plays vital role to strengthen the agriculture sector.

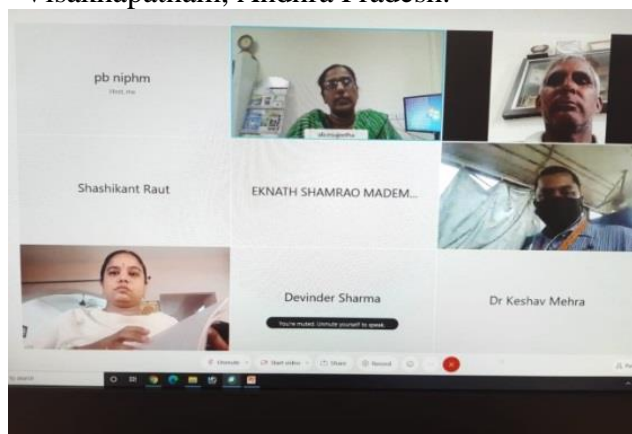
III.FARMERS TRAINING PROGRAMMES: During 1st quarter total 10 farmers training programmes were conducted for the farmers of Andhra Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu and Tripura.

Plant Biosecurity Division

1. Preparation of Low Cost Bottle Trap and Lures for Fruit Fly Trapping: Under Kisan Goshti, an online training cum interaction session on management of fruit flies in orange, mango, guava and sweet lime was held on **21.05.2021** to the farmers of Mandsaur district, Madhya Pradesh. The importance of fruit flies, their biology, damage symptoms, crops affected, management of fruit flies through integrated approaches, preparation of low cost fruit fly trap and lures were explained to the farmers in Hindi language.



2. Integrated Management of Stored Grain Pests: A Farmers training cum interactive session through phone in phone programme was conducted in association with Agriculture Department, Yelamanchili, Andhra Pradesh on **22.05.2021**. The programme was attended **18 farmers** of Yelamanchili, Visakhapatnam, Andhra Pradesh.

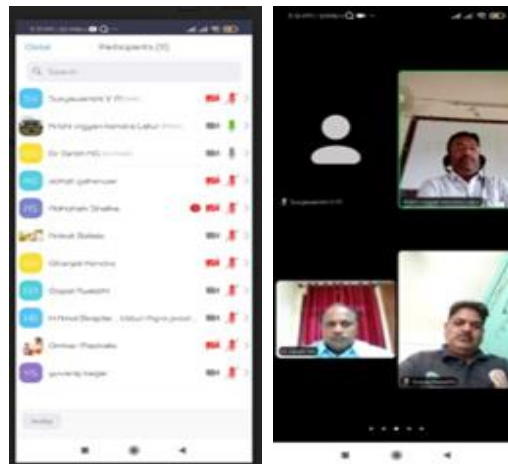


3. Export products from Maharashtra: Procedure and Benefits: An online training jointly with KVK Latur, Maharashtra for the progressive farmers on exports of produce and their promotions on 19.06.2021 was organized. About 13 farmers have attended the programme and sessions were handled in Marathi to give more clarity on the quires of the farmers.

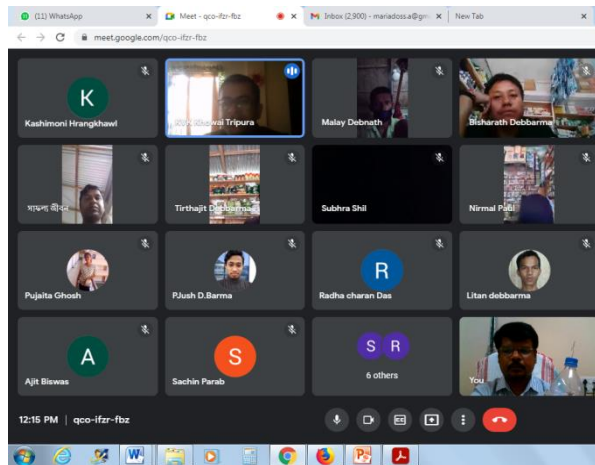
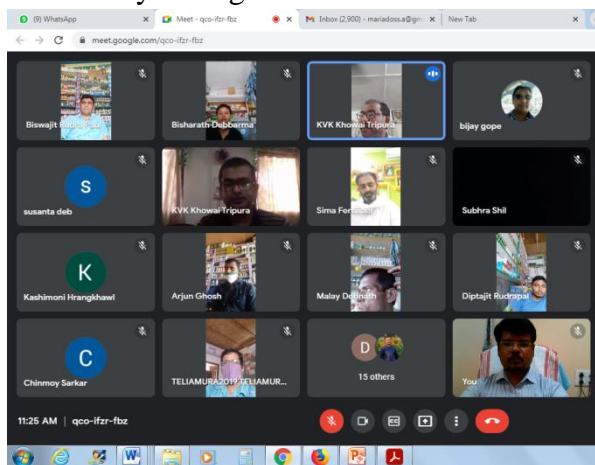
कृषीमाल निर्यात पद्धती व फायदे



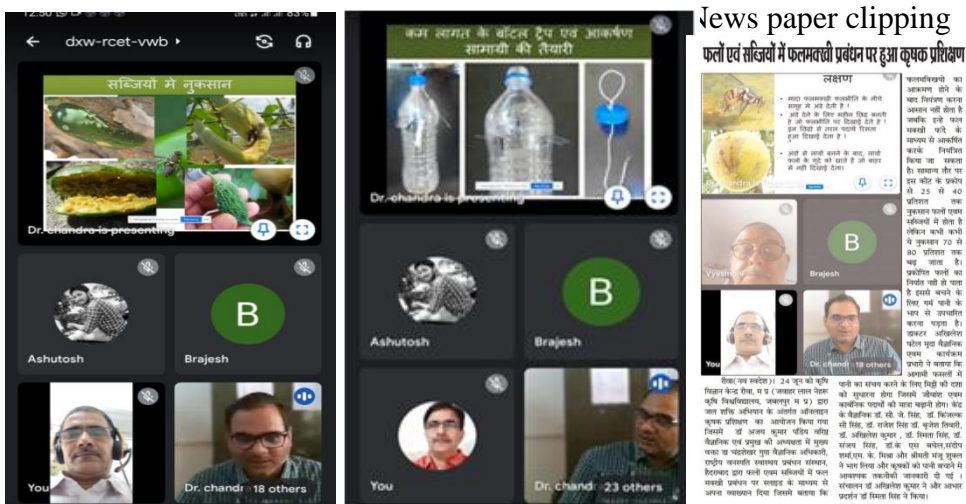
राष्ट्रीय वनस्पती आरोग्य व्यवस्थापन संस्था (NIPH) हैदराबाद व कृषी विज्ञान केंद्र लातूर यांच्या संयुक्त विद्यमाने एकदिवसीय ऑनलाईन प्रशिक्षण कार्यक्रम आयोजित करण्यात आला आहे.



4. Integrated Fruit fly management strategies to the farmers of Khowai district, Tripura: This programme was conducted to the farmers of Khowai district, Tripura in collaboration with KVK, Khowai on **22.06.2021** and **30 farmers** were attended the online programme and discussion was done on effective fruit fly management.

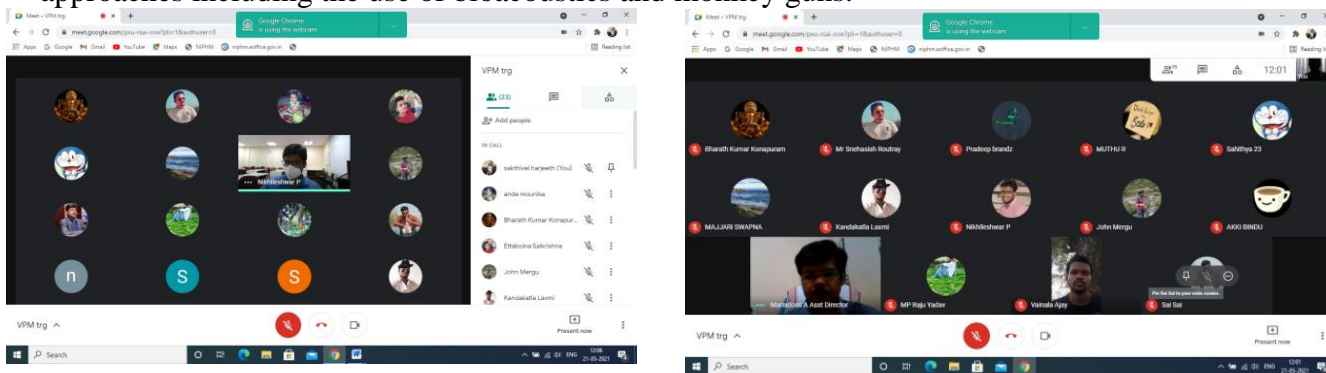


5. Low cost bottle trap for fruit fly management in collaboration of Krishi Vigyan Kendra, Rewa, District, Madhya Pradesh: An online training program in collaboration with Krishi Vigyan Kendra, Rewa, District, Madhya Pradesh was conducted on **24.06.2021** and around **49 farmers** were attended. The program aimed to provide the guidance on the damages caused by fruit flies, benefit of continuous trapping of fruit flies from flowering to harvest, preparation of low cost bottles trap, Methyl Eugenol and Cue Lures by farmers themselves, installation of fruit fly traps in mango orchard and vegetable gardens *etc.* Emphasis was given on reduction in production cost while using low cost bottle trap by farmers.



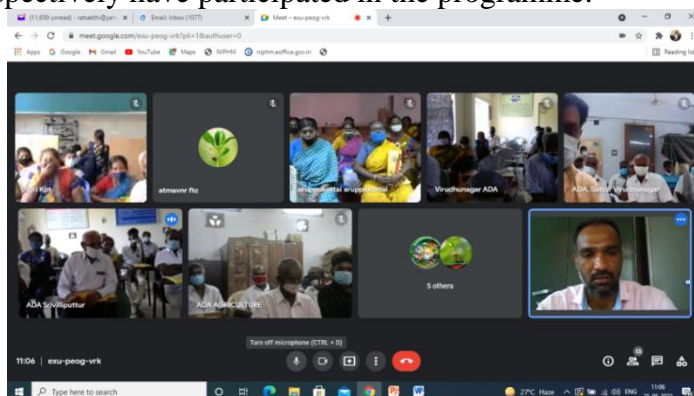
IV. Vertebrate Pest Management

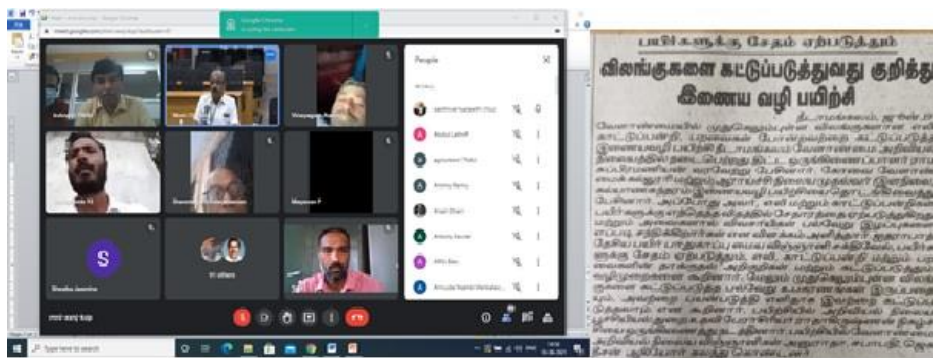
1. Vertebrate Pest Management: An online training cum interactive session on was organized to the farmers of Warangal District, Telangana on **21.05.2021** under Kisan Goshti. The session was conducted in Telugu language and explained about the economic importance of vertebrates (rodents, wild boar and monkeys), their biology, damage symptoms, losses and its managements by adopting integrated approaches including the use of bioacoustics and monkey guns.



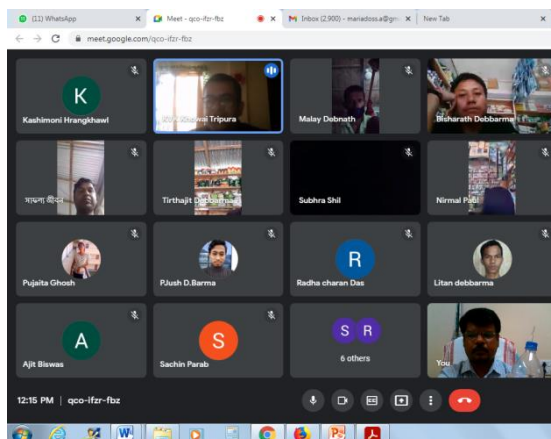
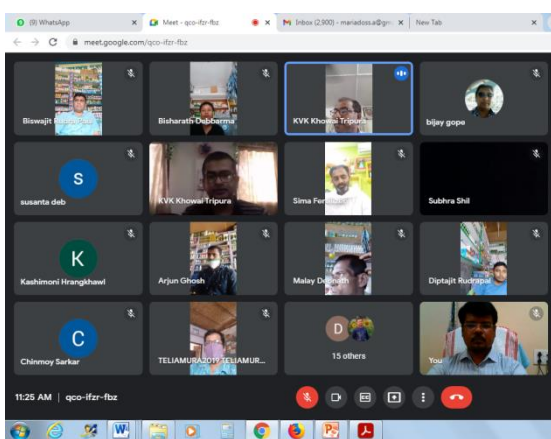
2. Vertebrate Pest Management for the farmers of Thiruvaur District, Tamil Nadu: In association with KVK- Needamangalam- Thiruvaur, Tamil Nadu an Online training programme to the farmers of Thiruvaur District, Tamil Nadu was organized on **18.06.2021**. Total **100 farmers** were attended the training and different issues and technologies were discussed and demonstrated through virtual platform.

3. Vertebrate Pest Management to the farmers of Virudhnagar District, Tamil Nadu: In collaboration with Department of Agriculture, Virudhnagar, Tamil Nadu two online training programme were conducted to the farmers of Virudhnagar District, on **25.06.2021** and **28.06.2021** A total of **120 farmers** and **80 farmers** respectively have participated in the programme.



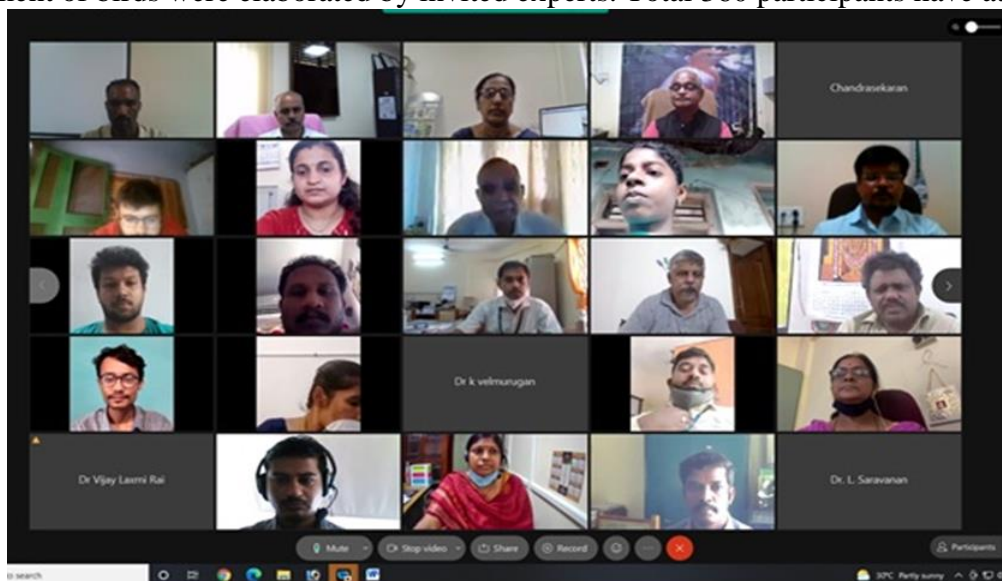


4. Rodent Pest Management training to farmers of Khowai district, Tripura: An online program for the farmer was organized on **29.06.2021** and approximately **30 farmers** have participated in the programme to have clarity on various aspects and technologies related to rodent pest management.



V. WEBINAR

a. National Webinar on “Sustainable Bird Management in Horticultural and Agricultural Ecosystem”: One day national webinar was organized on **30.06.2021** and different aspects pertaining to management of birds were elaborated by invited experts. Total **360 participants** have attended the webinar.



Forthcoming Training PBD & VPM (July-September, 2021):

S No	Division	Name of the programme	No. of Days	From	To
1.	PBD	Storage Pest Management and Fumigation (exclusive payment program for CWC)	15 Days	20.07.2021	03.08.2021
2.		Forced Hot Air Treatment (FHAT) (Payment Basis)	05 Days	26.07.2021	30.07.2021
3.		Fumigation as a Phytosanitary Treatment (Methyl Bromide and Aluminium Phosphide Fumigation) (Payment Basis)	15 Days	26.07.2021	09.08.2021
4.		Storage Pest Management and Fumigation (exclusive payment program for CWC)	15 Days	17.08.2021	31.08.2021
5.		Pest Surveillance	05 Days	23.08.2021	27.08.2021
6.		Fruit fly: Surveillance and Management	05 Days	30.08.2021	03.09.2021
7.		Quarantine Pests: Detection and Identification	21 Days	07.09.2021	27.09.2021
8.		Quarantine Insects: Detection and Identification	05 Days	13.09.2021	17.09.2021
9.		Storage Pest Management and Fumigation (exclusive payment program for CWC)	15 Days	14.09.2021	28.09.2021
10.		Quarantine pathogens: Seed Health Testing and Molecular Diagnostic Techniques	05 Days	20.09.2021	24.09.2021
11.		WTO and Agri Exports (off campus for officers)	03 Days	28.09.2021	30.09.2021
12.		Agri Export promotion jointly with APEDA (Farmers training program)	01	20.07.2021	
13.		Awareness programme on Storage Pest Management (Farmers training program)	01	27.09.2021	
1.	VPM	Rodent Pest Management in Food Grain Warehouses	05 Days	05.07.2021	09.07.2021
2.		Non-Insect Pest Management – Mites, crabs, snails, slugs and avian	03 Days	14.07.2021	16.07.2021
3.		Certificate Course on Urban Integrated Pest Management (Payment Basis)	15 Days	02.08.2021	16.08.2021
4.		Rodent Pest Management	05 Days	23.08.2021	27.08.2021
5.		Rodent Pest Management (off campus) – Assam / Tripura (off campus for officers)	05 Days	13.09.2021	17.09.2021
6.		Rodent Pest Management (Farmers training program)	01	1 st Week July, 2021	

7.		Rodent Pest Management (<i>Farmers training program</i>)	01	01 st Week July, 2021
8.		Rodent Pest Management (<i>Farmers training program</i>)	01	1 st Week August, 2021
9.		Vertebrate Pest Management (<i>Farmers training program</i>)	01	2 nd Week of September, 2021

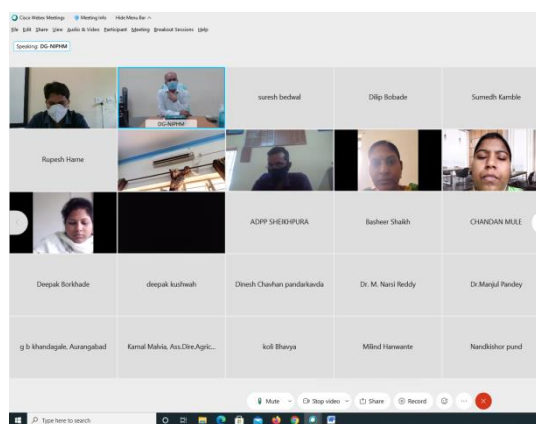
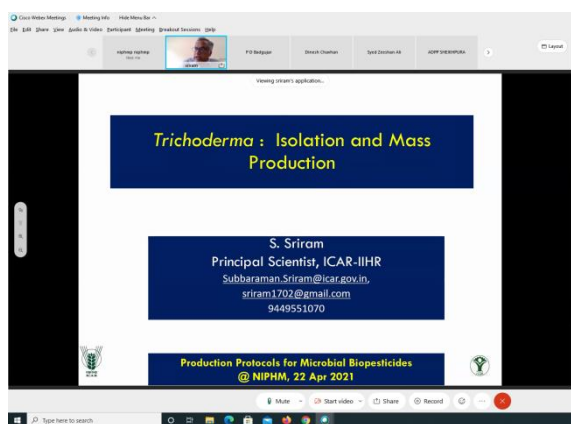
Plant Health Management Division

S No	Name of the programme	No. of Days	From	To
I. Officers programme				
1.	Production Protocol for Microbial Bio pesticides	05	19.04.2021	23.04.2021
2.	Training Course for officials working with Project on Climate Resilient Agriculture (PoCRA)	05	26.04.2021	30.04.2021
3.	On- Farm Production of Bio-control Agents and Microbial Bio-pesticides	05	17.05.2021	21.05.2021
4.	Production Protocol for entomopathogenic nematodes	05	04.06.2021)	04.06.2021)
II. Farmers training programme				
1.	Integrated Pest Management in Horticultural Crops	01	20.05.2021	-
2.	Biological control and its importance in agriculture'	01	20.05.2021	-
3.	On-farm production of biocontrol agents and microbial biopesticides	01	11.06.2021	-
2.	Organic farming and certification	01	18.06.2021	-
3.	Farmers interaction on use of biofertilizers and biopesticides in polyhouse conditions	01	24.06.2021	-
III. Special training programme				
1.	Training on Plant Health Management	21	23.03.2021	11.04.2021

I. Training programme report (officers)
1. Production Protocol for Microbial Biopesticides

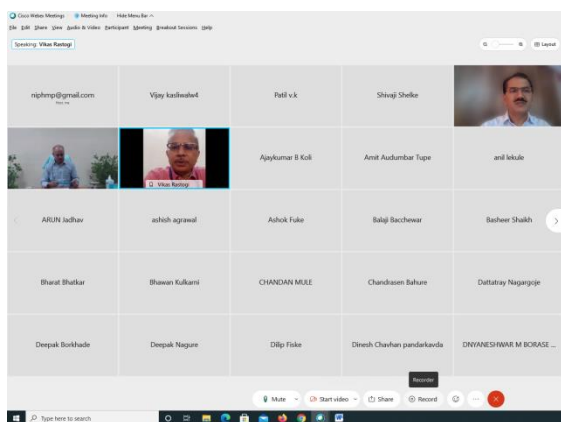
Mass production and commercializing the microbial Bio-pesticides is necessary to overcome the negative and harmful effects the chemicals more prominent in our current scheme of disease management. The successful development and commercialization of the bio-control fungi will effectively reduce the use of hazardous chemicals and ultimately it may eliminate them. Commonly used bacterial and fungal bio-pesticides are manufactured as carrier based as well as in liquid form. To ensure the use of Microbial

Biopesticides by farmers and production at farm level, NIPHM has developed on farm production technique of Microbial bio-pesticides. This training may helpful to the trainees to Produce Biopesticides as commercial level and on-farm level. As approved by the competent authority, an online training programme on Production Protocol for Microbial Bio-pesticides from 19.04.2021 to 23.04.2021 (5 days). In this programme total of 49 officials from different organizations from states has participated through virtual mode. In this training programme different concepts like introduction to biological control of plant pathogens, establishment of microbial bio-pesticide laboratory, requirements to get accreditation as per ISO-17025, use of EPF's in plant health management and their mass production techniques, preparation and Maintenance of pure cultures of fungus and bacteria, isolation, identification and production of *Trichoderma*, host rearing for production of NPV, mass production of bacterial Biopesticides, Botanical pesticides in insect pest management, On-farm production of biofertilizers are undergone.



2. Training Course for officials working with Project on Climate Resilient Agriculture (PoCRA)

An online training programme Training Course for officials working with Project on Climate Resilient Agriculture (PoCRA) from 26.04.2021 to 30.04.2021(5 days). In this training programme a total of 80 extension officials from Maharashtra, who are working as FFS coordinators in different districts under PoCRA. During inaugural session, honourable Director General NIPHM, Dr.Sagar Hanuman Singh, IPos and Shri Vikas Rastogi, IAS, Projector Director, PoCRA are participated and delivered inaugural speech. After that, Dr. Vijay Kolekar has delivered role of FFS in PoCRA. In this training following topics are covered. Introduction to FFS Methodology, AESA Methodology for FFS, Integrated pest management through FFS, Significance of Climate resilient technologies under changing climate scenario-By guest speaker, Ecological Engineering for Pest Management, Designing and Development of FFS Curriculum for FFS establishment, Facilitation skills and Group Dynamics in FFS, Observation based Advisories for farmers, On farm production of biofertilizers, Use of NPV and EPF in pest management, On farm Production of biopesticides – *Trichoderma*, *Pseudomonas*, On farm production of Biocontrol agents).



3. On- Farm Production of Bio-control Agents and Microbial Bio-pesticides

An online training program on “on-farm production of bio-control agents and microbial biopesticides” conducted from 17 to 21 May 2021 by NIPHM. A total of 09 participants from different organizations have attended this program. During this training programme different concepts like classes on biological control: Introduction to biological control, Principles and concepts, parasitoids as biocontrol agents, role of Ecological engineering in pest management, host *Corcyra* mass production, *Trichogramma* mass production, Mass multiplication of predators (*Coccinellids*, green lacewing and anthocorid bugs, on-farm mass production of biopesticides (*Trichoderma & Pseudomonas*), on-farm mass production techniques of EPF, on farm production of biofertilizers etc. were conducted.

4. Production Protocol for entomopathogenic nematodes

An online training programme on “Production Protocol for Entomopathogenic Nematodes” ‘was organized at NIPHM from 31.05.2021 to 04.06.2021 (5 days). The participants have under gone various aspects of “Production Protocol for Entomopathogenic Nematodes” aspects such as introduction to biological control - principles and concepts, on-farm mass production of host insect, *Corcyra cephalonica* and Wax moth, introduction to Entomopathogenic nematodes, entomopathogenic nematodes as best tool for insect management, on-farm production of entomopathogenic nematodes, formulation of Entomopathogenic nematodes, morphological and molecular identification of Entomopathogenic nematodes, Success stories of use of EPN for the management of soil insect’s pests, application methods of EPN.

II. Training programme report (Farmers)

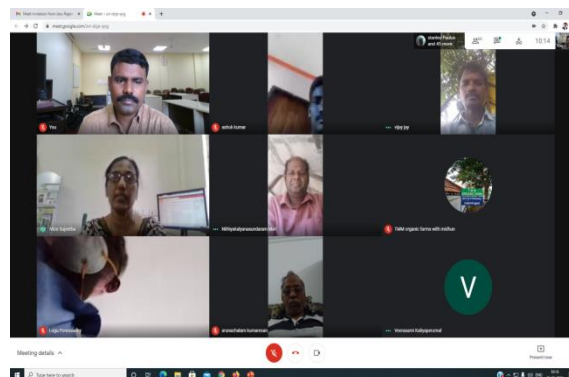
1. Farmers meeting on integrated pest management in horticultural crops

Under 75 year of Independence Day celebrations (Azadi ka Amrit Mahotsav), organized interactive session with farmers at Nalgonda on 20.05.2021, association with F3 - Farmer Producing Company Limited. For this programme 25 Progressive farmers and Madnal Horticulture officer and NABARD AGM were attended. During interactive meeting, farmers are got knowledge about different topics such as IPM tools in horticultural crops, Biocontrol (Predators and Parasitoids) agents in horticultural crops, *Trichoderma* and *Pseudomonas* uses in horticultural crops, role of Mycorrhiza in horticultural crops, Fruit fly lure preparation and fruit fly management, Ecological Engineering methods in horticultural crops. All the farmers are shared their experiences and clarified their doubts.



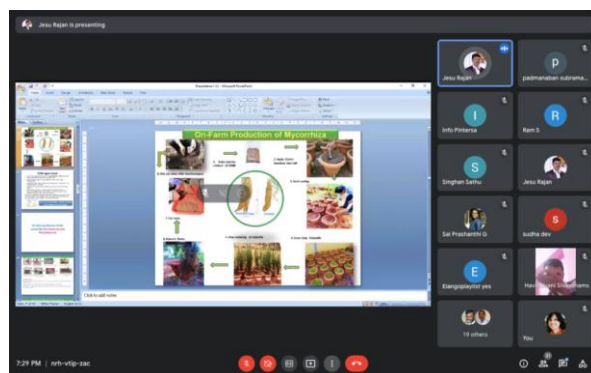
2. Training cum interaction on Biological control and its importance in agriculture

Under 75 year of independence day celebrations (Azadi ka Amrit Mahotsav), an online training cum interaction session on ‘Biological control and its importance in agriculture’ conducted on 20th May, 2021 through online mode by NIPHM. A total of 98 participants from different districts of Tamil Nadu have attended in this program. The training was conducted in Tamil language. In the meeting, importance and field application techniques of different biological control agent’s viz., parasitoids, predators, entomopathogenic fungus, entomopathogenic nematodes, biopesticides (*Trichoderma* & *Pseudomonas*) and biofertilizers were explained to the farmers and also interacted with farmers related to on-farm techniques of biocontrol agents and field application methods..



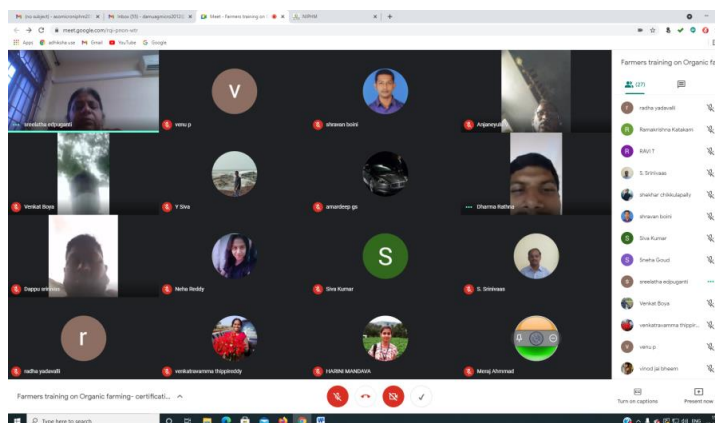
3. On-farm production of bio-control agents and microbial bio-pesticides

A farmer training cum interaction session on ‘On-farm production of biocontrol agents and microbial biopesticides’ conducted on 11th June 2021 through online mode by NIPHM. A total of 34 participants from the Nilgiris districts of Tamil Nadu have attended this program. The training was conducted in the Tamil language. In the training, importance and field application techniques of different biological control agent’s viz., parasitoids, predators, entomopathogenic fungus, entomopathogenic nematodes, biopesticides (*Trichoderma* & *Pseudomonas*), and biofertilizers were explained to the farmers and also interacted with farmers related to on-farm techniques of biocontrol agents and field application methods.



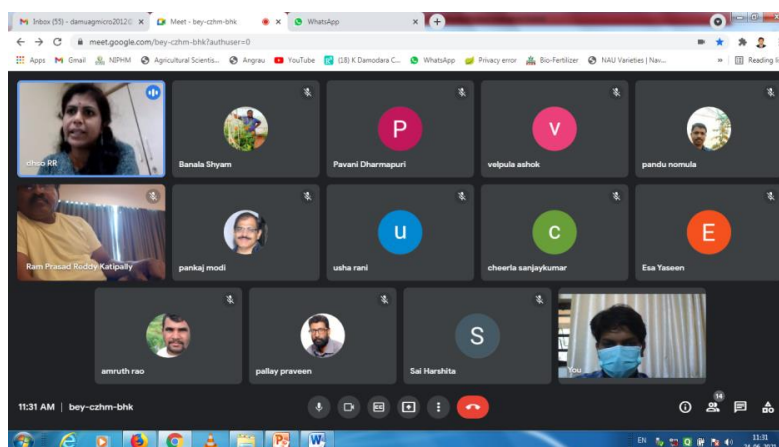
4. Organic farming and certification

An online training programme on Organic farming and certification is organized on 18.06.2021. A total of 25 farmers from Andhra Pradesh and Telangana progressive farmers have participated. In this training programme, the concept and principles of organic farming and the certification process are mainly covered. Further, the topics like the importance of bio inputs in organic farming are explained and shown some technology videos of NIPHM developed on-farm production of biofertilizers and biopesticides.



5. Farmers interaction on use of bio-fertilizers and bio-pesticides in polyhouse conditions

As approval of the competent authority, an online interactive meeting with polyhouse farmers of Rangareddy district has been conducted on 24.06.2021. A total of 12 progressive polyhouse farmers are attended and shared their experiences. In this programme state horticultural staff of Rangareddy district are participated. During this programme NIPHM staff interacted with farmers and guided the importance of biofertilizers and biopesticides in different polyhouse crops as an Integrated Nutrient Management approach.



III. Special training programmes

1. Training on Plant Health Management

As approved by competent authority, payment training programme on Plant Health Management is organized physical mode from 23.03.2021 to 11.04.2021(21 days). In this training programme a total of 30 under graduate students from different campuses of agricultural college are participated. During these training programme basic concepts like AESA and Ecological Engineering for pest management, biocontrol agents, biofertilizers, biopesticides, organic farming, plant parasitic nematode management, EPF& NPV theory rodent management classes are explained. Majorly focussed on on –farm production techniques like on-farm production of

biofertilizers and application methods, hands on training of mass production of *Trichoderma* & *Pseudomonas*, mass production of predators and parasitoids, field release of beneficial insects, polyhouse cultivation methods, vermicompost preparation, fermenter operation mechanism and production aspects, and also two field visit made, AESA field visit and progressive polyhouse farmers near by the institute.



Forthcoming Training PHM (July-September, 2021):

S No	Name of the programme	No. of Days	From	To
I. Officers				
1.	International webinar on Desert locust <i>Schistocerca gregaria</i> (Forskål) International scenario and a potential threat to India	1	02.07.2021	-
2.	AESA and Ecological engineering in pest management	5	05-07-2021	09-07-2021
3.	Production Protocol for Predators and Parasitoids	5	12-07-2021	16-07-2021
4.	Bi-annual subcommittee meeting of National Network of Plant Health Experts	1	21.07.2021	
5.	On farm production of Biocontrol agents and Microbial Bio-pesticides	5	26.07.2021	30.07.2021
6.	Crop pest surveillance and Advisory Project (CROPSAP) training programme	5	02.08.2021	06.08.2021
7.	Production Protocol for bio fertilizers	5	23.08.2021	27.08.2021
8.	Locust pest management	5	06-09-2021	08-09-2021
9.	On-Farm production of biocontrol agents and microbial Biopesticides	10	13-09-2021	22-09-2021
10.	Training for Tobacco Board senior Grading officers	3	27.09.2021	29.09.2021
II. Farmers training programmes				
1.	On-farm production of Biocontrol agents for promotion of sustainable agriculture	03	05.07.2021	07.07.2021
2.	On-farm production of Biocontrol agents for promotion of sustainable agriculture	03	16.08.2021	18.08.2021
3.	On-farm production of Biocontrol agents for promotion of sustainable agriculture	03	01.09.2021	03.09.2021

Pesticide Management Division

Sl. No.	Name of the programme	No. of Days	From	To
1.	Pesticide Formulation Analysis	60 days (offline)	19 th April 2021	17 th June 2021
2.	Inspection and Sampling under Insecticide Act, 1968(ISPP)	3 days (online)	3 rd May 2021	5 th May 2021
3.	Laboratory Quality management System and Internal Audit as per ISO/IEC 17025:2017	5 days (online)	17 th May 2021	21 st May 2021
4.	Laboratory Quality management System and Internal Audit as per ISO/IEC 17025:2017	5 days (online)	7 th June 2021	11 th June 2021

I. Training Programs:

1. Pesticide Formulation Analysis:

Pesticide Management Division has conducted sixty days training program on “Pesticide Formulation Analysis” from 19th April to 17th May, 2021”. A total of 13 trainees were participated from State Agriculture Department, Andhra Pradesh. The aim of the training is to build the capacity of Analysts undertaking the Quality Control analysis of Pesticide Formulations on different analytical technique such as volumetric analysis, Chromatographic and Spectroscopic techniques using High Performance Liquid Chromatography (HPLC), Gas Liquid Chromatography (GLC), UV-Vis Spectrophotometer and Fourier-transform infrared spectroscopy (FT-IR) as per Bureau of Indian Standard method.



Pesticide Analysis by HPLC- technique



Pesticide Analysis by GLC- technique



Pesticide Analysis by Volumetric-technique

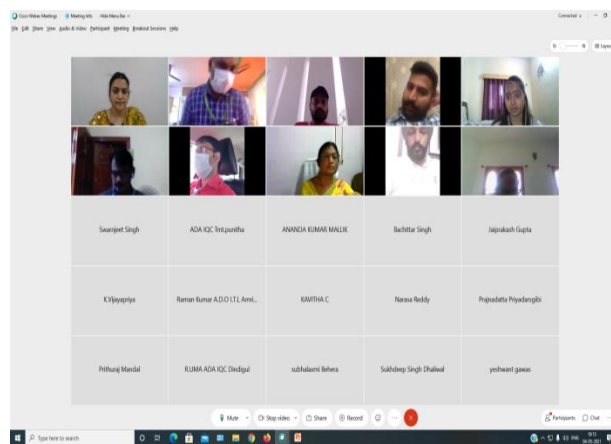


Participants evaluation on performance

2. Inspection and Sampling under Insecticide Act, 1968:

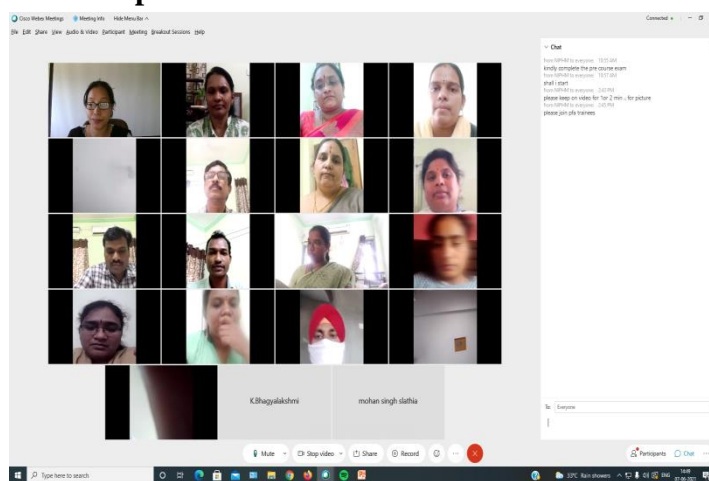
Three days online training programme on “**Inspection and Sampling under Insecticide Act, 1968**” was conducted from 3rd to 5th May, 2021. A total of 37 officials/insecticide inspectors were attended the programme from State department of Agriculture.

The training focuses on various salient features of the Act and Rules, insecticide registration procedure, the duties and responsibilities of Insecticide Inspectors, procedures of inspection and sampling of Pesticides from the markets and manufacturing industries as per BIS method for sampling of pesticides to build the capacity of Insecticide Inspectors for enforcement of the Insecticide Act 1968..



3. Laboratory Quality management System and Internal Audit as per ISO/IEC 17025:2017:

The analyst required knowledge on general requirement for the competence of testing and calibration laboratories in accordance with ISO/IEC 17025:2017 and procedure to conduct internal audit for laboratory accreditation. The program is mainly for analyst/officials working in the laboratory. In this context, an online training program for 5 days on “**Laboratory Quality management System and Internal Audit as per ISO/IEC 17025:2017**” was conducted from 7th to 11th June 2021. A total of 27 participants were participated from different state laboratories.



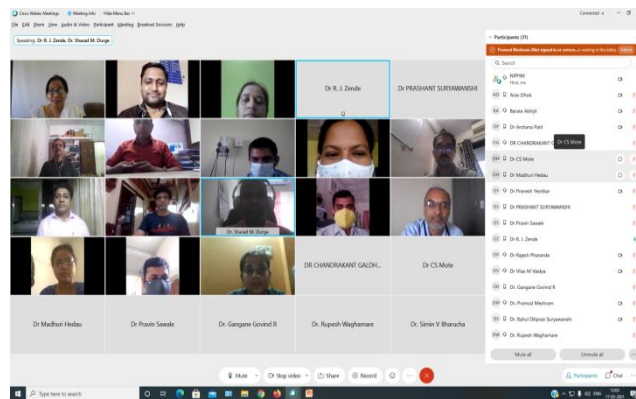
II. Farmers Training:

Pesticide application techniques and safe disposal of containers

In connection with “**Aazadi Ka Amruth Mahotsav**”, a program “**Pesticide application techniques and safe disposal of containers**” was conducted on 19.05.2021 in collaboration with PHE division for farmers of Sitapur, Uttar Pradesh.

III. Special training programme:

A 5 days special programme on “Laboratory Quality Management System and Internal Audit as per the ISO/IEC-17025:2017” was also conducted through online platform from 17th to 21st May, 2021 for faculties of Maharashtra Animal & Fishery Sciences University (MAFSU), Nagpur on request basis. A total of **29 faculties** from different constituent colleges of MAFSU were participated in the programme.



Forthcoming Training PMD (July-September, 2021):

Sl. No.	Title of the Programme	Duration	From	To	Eligibility Criteria
1.	Pesticide Formulation Analysis (PFA)	60 days	09.08.2021	07.10.2021	Analysts working at SPTLs / RPTLs/CIL and other Government Labs engaged in Pesticide Formulation Analysis with educational qualification of Graduate in Chemistry / Agril / Hort
2.	Inspection, Sampling and Prosecution Procedures under Insecticide Act, 1968(ISPP)	5 days	20.09.2021	24.09.2021	Agricultural / Horticultural Officer (or) equivalent position) working in State Department (or) designated Insecticide Inspector (Central /State)
3.	Laboratory Quality System Management and Internal Audit as per ISO/IEC 17025: 2017	5 days	27.09.2021	01.10.2021	Science Graduate with knowledge in laboratory activities, working in analytical Laboratories of state govt. / central govt. / ICAR / Govt. Universities.

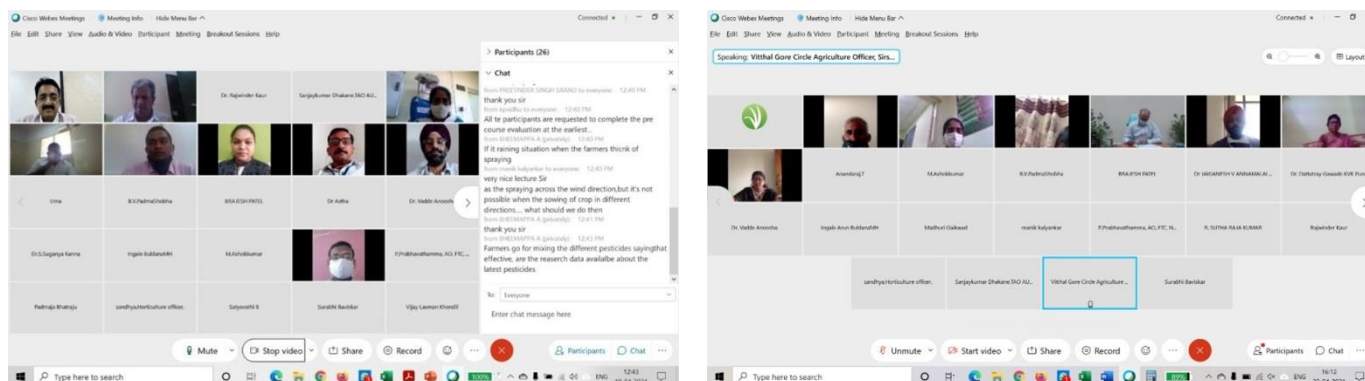
Plant Health Engineering Division

S No	Name of the programme	No. of Days	From	To
1.	Pesticide Application Techniques & Safety Measures	05	19.04.2021	23.04.2021
2.	Remote Sensing and Geographical Information Systems Applications in Agriculture	03	18.05.2021	28.05.2021

I. Training Programs

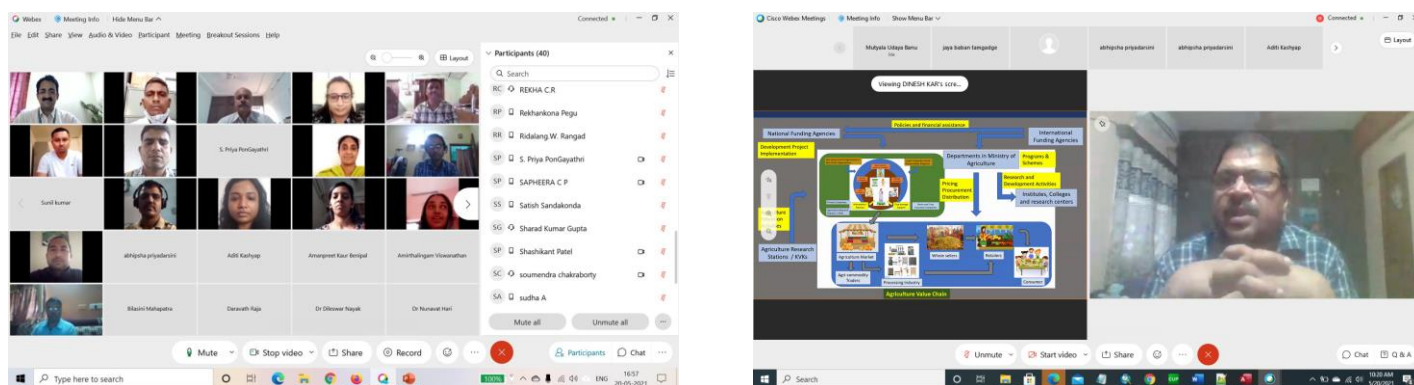
1. Pesticide Application Techniques & Safety Measures:

The success of pest management operations depends on proper technique of application of pesticide and the equipment used. Selecting the right equipment for pesticide application is vital for successful pest control to ensure safe and judicious use of pesticides. In this context, a five-day training programme on Pesticide Application Techniques and Safety Measures was organized. Thirty-two participants from 10 states attended the programme.



2. Remote Sensing and Geographical Information Systems Applications in Agriculture:

A 3-day online training programme on “Remote Sensing and Geographical Information Systems Applications in Agriculture” was organized from 18th to 20th May 2021. Forty Six participants fulfilled the training requirements and successfully completed the training program. These participants were drawn from 16 states across India. Eminent speakers from various reputed institutes were invited to brief the participants with the case studies and their research works. The officers were enriched with knowledge on various topics like Remote sensing and GIS applications in disease/ pest management, GPS applications, Precision farming in Agriculture, Geospatial application in agriculture and Artificial Intelligence for crop production through Plantix.



II. Special training programmes: *Kisan Gosthi*

The division conducted four special programmes for farmers (Kisan Gosthi) on the eve of *Aazadi ka Amruthu Mahaotsav – 75 years of Independence*.

S No.	Category	Date	Topic	Collaboration	No. of Participants
1	Farmers	19-05-2021	Pesticide Application Techniques & Safe Disposal of Containers (कीटनाशक अनुप्रयोग तकनीक और कंटेनरों का सुरक्षित निपटान)	PMD Division & Krishi Vigyan Kendra - 2, Sitapur, Uttar Pradesh	59

2	Farmers	20-05-2021	Precautions and procedures for beehive management during rainy season	ICAR-Krishi Vigyan Kendra, CPCRI, Kasaragod, Kerala	38
3	Farmers	21-05-2021	Protected Cultivation-Design, Management and Pest & Disease Control	Mitraniketan Krishi Vigyan Kendra (ICAR), Vellanad, Thiruvananthapuram, Kerala	97
4	Farmers	21-05-2021	Maintenance and Use of Drip and Sprinklers (ड्रिप एवम स्पिंकलर के रखरखाव एवम उनके उपयोग)	Department of Agriculture, Bemetara Dist, Chhattisgarh	15
Total participants					209

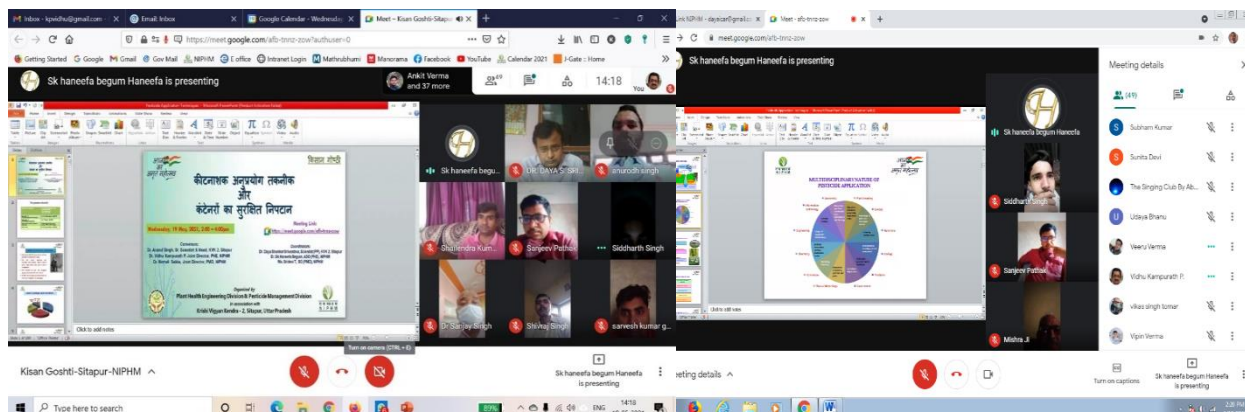
1. Programme 1: Date – 19th May 2021, 02.00 – 04.00 PM

PHE & PMD divisions of NIPHM jointly conducted an online farmer interaction programme on “Pesticide Application Techniques and Safe Disposal of Containers” in association with KVK-2, Sitapur, Uttar Pradesh on 19th May 2021. Total fifty-nine farmers (57 male & 2 female) attended the programme. Er. Sk Haneefa Begum, ASO(PHE) with the help of Dr. Daya S Srivastava, Scientist (PP), coordinated this programme.

Dr. Anand Singh, Sr. Scientist/ Head, KVK gave the welcome address. He narrated the good association with NIPHM for knowledge sharing and field related issues. Dr. Vidhu Kampurath P, JD (PHE) introduced the programme and emphasized the need of the topic to the farmers group.

First session on “Pesticide Application Techniques” was taken by Er. Sk Haneefa Begum, ASO (PHE). In this session, the farmers were explained about the good spraying practices of when to spray, how to spray, and direction of spray in detail. Farmers were given with details of various user-friendly equipment that can be used for effective spraying in the field. The farmers were also briefed about the types of nozzles and the importance in selecting a nozzle. They were also explained how to calibrate a nozzle to know its wear and tear.

Second session, “Safe Disposal of Containers” was taken by Mrs. T Sridevi, SO (PMD). In this session, farmers were explained with different approved pesticides and compatibility of the chemicals and insecticide rules. Reading the label of containers and time importance of spraying also was explained in detail. The safe disposal methods of containers after the use of pesticides were also explained to farmers. Queries from farmers were addressed. The whole programme was conducted in Hindi.

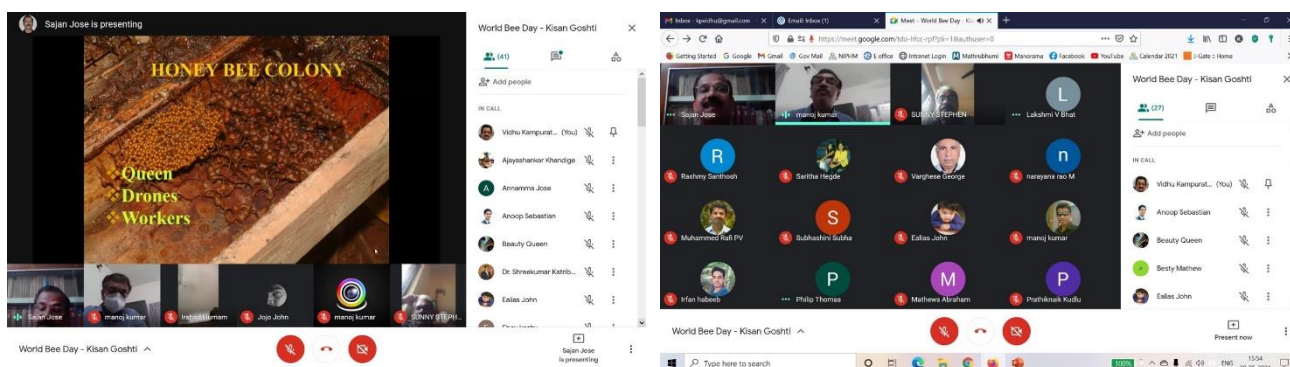


2. Programme 2: Date – 20th May 2021, 02.00 – 04.00 PM

On the eve of World Bee Day, on 20th May 2021, a training cum interaction session was convened for farmers of Kerala on precautions and procedures for honeybee hives during rainy season, in collaboration with ICAR - Krishi Vigyan Kendra, CPCRI, Kasaragod, Kerala. Dr. Sajan Jose K., Subject Expert, Rubber Board led the class. The speaker, who obtained his doctoral degree for the work on stingless bee of Kerala, is also a bee farmer who maintains 250 colonies of Indian bees.

The programme was introduced by Dr. Vidhu Kampurath, JD, NIPHM with an elaboration on why Bee Day is being organized across the globe. Nearly 90% of the world's wild flowering plant species depend, entirely, or at least in part, on animal pollination, along with more than 75% of the world's food crops and 35% of global agricultural land. Not only do pollinators contribute directly to food security, but they are key to conserving biodiversity. To raise awareness of the importance of pollinators, the threats they face and their contribution to sustainable development, the UN designated 20 May as World Bee Day.

The expert on his lecture emphasised the detailed procedure to raise the beehives with low-cost technologies and the precautionary measures needed during rainy season. The method of extraction of honey in an effective way, possible methods to multiply the hives effectively etc were highlighted. More concentration was on stingless bees as they are more easily managed and low cost in nature. All the queries related to the subject were answered. The session was attended by 38 farmers. The Head, KVK, Dr. Manoj Kumar TS, thanked the attendees.

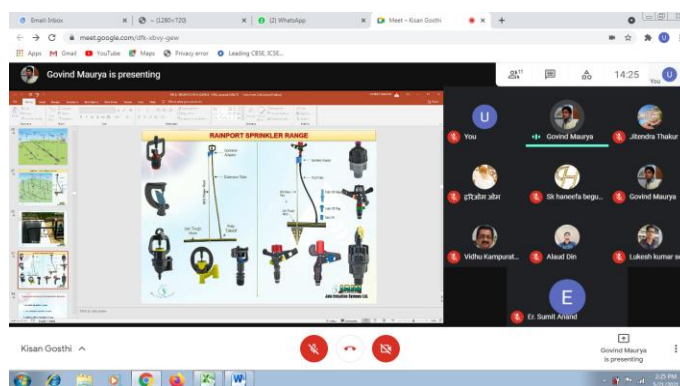
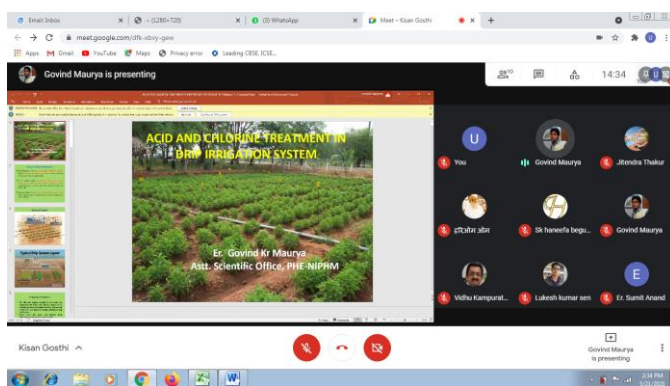


3. Programme 3: Date – 21st May 2021, 01.00 – 02.30 PM

One day online “Kisan Gosthi cum training” on “Maintenance and Use of Drip & Sprinklers” was conducted to Block Saja Bametera district of Chhattisgarh State farmers with the association of Sh Jitendra Thakur, SADO, Bametera, Chhattisgarh. Total 15 farmers attended the program. Er Govind Kumar Maurya, ASO-PHE, who coordinated the programme, advised the farmers on different aspects such as Importance of timely irrigation, types of efficient irrigation methods for different crops, Micro irrigation such as drip irrigation, sprinkler irrigation, rain guns and their maintenance.

At first, Importance of Irrigation, purpose of irrigation, advantages of irrigation, Harmful effects of irrigation if not done properly, Suitable time for Irrigation were explained to farmers. Then types of Irrigation methods were detailed. When we are using traditional irrigation Methods, lot of water is getting wasted, which is not required by a plant. So as to minimize wastage of water, one of the alternate technologies is micro-irrigation. Drip irrigation, sprinkler irrigation and Rain Guns are methods of Micro irrigation. Components of Drip Irrigation unit were briefly explained such as main, sub main, laterals, pumping unit, Filters, distribution lines, filters etc.

A brief explanation of Sprinkler Irrigation was given to farmers. Advantages of sprinkler irrigation unit were also explained. Components of sprinkler Irrigation unit such as pumping unit, pipe network- mains, sub mains, laterals and sprinkler head, filters, couplers, valves, risers, bends are explained to the farmers. The programme was organized on the eve of Aazadi ka Amruth Mahotsav – 75 years of Independence, by the Plant Health Engineering Division of NIPHM. Er. Udayabhanu, SO (PHE) convened the programme and Er. Govind Maurya, ASO (PHE) coordinated the programme. The whole programme was conducted in Hindi.



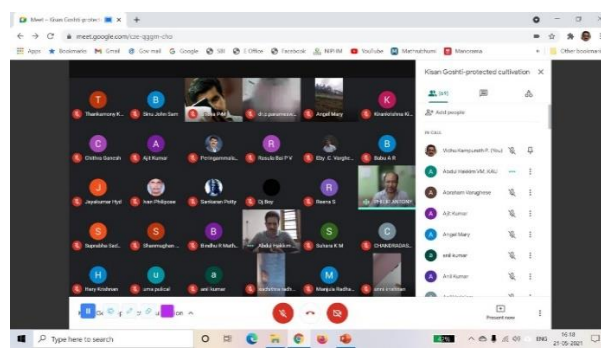
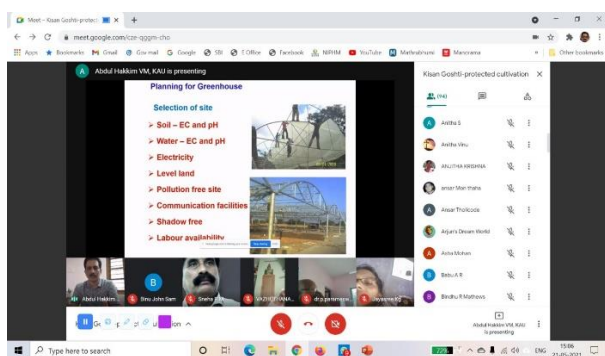
4. Programme 4: Date – 21st May 2021, 02.00 – 04.00 PM

A farmer interaction programme on protected cultivation was organized on the eve of *Aazadi ka Amruth Mahotsav – 75 years of Independence*, by PHE division of NIPHM. The programme was organized in collaboration with Mitranikethan Krishi Vigyan Kendra (ICAR), Thiruvananthapuram. Two expert lectures were organized in the event. The basic construction details of various structures used for protected cultivation, their maintenance issues and solutions etc. were detailed by Dr. Abdul Hakkim V M., Professor of College of Agriculture, Padannakad, Kerala. The insects and pest issues and their remedies were then taken up by Dr. Jesurajan, Scientific Officer, NIPHM. A total of 97 farmers attended the programme.

The interaction was initiated by Dr. Vidhu Kampurath, JD, NIPHM. The participants and experts were welcomed by Dr. Binu John Sam, Sr. Scientist & Head, Mitranikethan KVK (ICAR). The programme was conducted in Malayalam and English languages.

Dr. Hakkim explained the various designs of greenhouses. The peculiar climate of humid tropical nature of Kerala is not suitable for greenhouses, he explained. However, rain shelters can be effectively constructed at land or on terrace to get all benefits of protected cultivation. The rain shelters may not provide complete protection from all the insects and pests, but they will certainly provide a reasonable income if proper selection of site, materials and crop are done inside the shelters.

A detailed explanation of various pest and diseases that are common in greenhouses were narrated by Dr. Jesurajan. He provided information on various biocontrol agents that are effective in controlling the pests in protected cultivation. The bigger threat of nematodes inside the greenhouses also were discussed.



Forthcoming Training PHE (July-September, 2021):

S.no	Title of the Programme	Division	From	To	Eligibility criteria	Course Coordinator & e-mail
1.	Pesticide application techniques and safety measures	PHE	12.07.2021	16.07.2021	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs	Er. Haneefa Begum asopeniphm2-ap@nic.in
2.	Pesticide application techniques and safety measures Exclusive programme for EEI, Nilokheri	PHE	03.08.2021	07.08.2021	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs	Er. M. Udaya Bhanu sopeniphm2-ap@nic.in
3.	Irrigation systems and advancements	PHE	10.08.2021	12.08.2021	Extension officers from State Dept. of Agri./ Horti., soil survey, soil conservation, Watershed Project, Scientists of ICAR/ SAUs , etc. working on GIS	Er. Govind Maurya asopeniphm1-ap@nic.in
4.	Pesticide application techniques and safety measures	PHE	13.09.2021	17.09.2021	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs	Er. M. Udaya Bhanu sopeniphm2-ap@nic.in
5.	Post-harvest management and storage techniques	PHE	20.09.2021	24.09.2021	Extension officers from State Agriculture and Horticulture departments, Scientists of ICAR, SAUs and officials from KVKs, DPPQs. NGOs	Er. Haneefa Begum asopeniphm2-ap@nic.in

- Shri N Venkatesh, IAS has been selected for the post of Registrar at NIPHM on deputation basis for a period of two years. He has assumed charge on 22.04.2021 (F/N).
- SBI-ATM was installed in the Foyer of MG-Block (Training) which was inaugurated by DG-NIPHM in the presence of guest of honour DG-MANAGE & Chief Manager-SBI, PJTS Agri University branch on 28th May 2021.



- A Memorandum of Understanding (MoU) was signed between NIPHM and SKLTSHU on 23.06.2021. The purpose of MoU is to have collaboration in the area of knowledge sharing in the field of plant health management, partnership in workshops/seminars/conferences, training students of UG and PG. NIPHM-SKLTSHU collaboration will help for promotion of on farm production of biocontrol agents and their usage in horticulture crops and protected cultivation



MOU between Sri. Konda Laxman Telangana State Horticultural University SKLTSHU and NIPHM

- The 7th International Day of Yoga was celebrated by NIPHM Rajendranagar. Due to ongoing COVID-19 pandemic, the International Day of Yoga was organised through virtual mode enabling participants to join from their respective homes along with their families and some of the staff/trainees/participants attended the yoga session physically at NIPHM on 21.06.2021 by following covid-19 appropriate behaviour. The occasion was graced by Director General, NIPHM as chief guest.



Donated groceries to M/s. Aadharana Trust, Kismatpur, Hyderabad



The staff of NIPHM has voluntarily contributed and donated groceries to M/s. Aadharana Trust, Kismatpur, Hyderabad on 03.06.2021 for helping the trust in pandemic situation. The staff/children of M/s. Aadharana Trust has highly appreciated the gesture of the staff of NIPHM.



The staff of NIPHM voluntarily contributed and donated Medicines for Covid-19 patients to M/s. Helping Hand Foundation, located at Masjid-e-Muhammadii Mosque, Hyderabad on 29.06.2021. The staff of M/s. Helping Hand Foundation has highly appreciated the gesture of the staff of NIPHM.

Research & Development

1. Deciphering The Mechanism of Resistance to Root Lesion Nematode in Chickpea by Using Genetic and Genomic Approaches

Soil samples were analysed received from the farmer's field to get Root lesion nematode (*Pratylenchus thorni*) for the chickpea germplasm screening. We could not get the required species of nematodes for the experiments same is discussed with other collaborators from JNKVV Jabalpur MP/ TNAU Coimbatore and planned to send the Technical assistant (Nematology) after appointing to collect the soil samples infested with root lesion nematode in chickpea crops with office permission.

2. AICRP on Biological Control of Crop Pests (ICAR-AICRP-BC)-NIPHM, Hyderabad (Volunteer Centre)

Evaluation of NIPHM white media for production of *Nomuraea rileyi* (*Metarhizium rileyi*) NIPHM MRF-1 strain for management of Maize Fall Army worm (*Spodoptera frugiperda*)

This project aimed for the production of *Metarhizium rileyi* two media viz. NIPHM White media and broken rice were used. To standardize the production technology, the media under test were made into six treatments (Broken rice (without yeast extract), Broken rice (with yeast extract), 1% NIPHM white media, 2% NIPHM white media, 3% NIPHM white media, 4% NIPHM white media) and for each treatment two replications were maintained.



3. IPM model villages under Tamil Nadu Irrigated Agriculture Modernization Programme (TN-IAMP)

NIPHM and Department of Agriculture, Tamil Nadu has entered into a MoU for take up project on ‘*Model IPM village*’ under the scheme of TNIAMP with objectives like to provide technical assistance to all beneficiary farmers in 20 IPM villages under the Lower Palar Sub basin for establishment of cost effective sustainable Bio-control Agents’ production units in Kancheepuram District, Tamil Nadu, to train the farmers in understanding of Good Practices in production and quality maintenance, to provide the mother culture and media initially based on the existing norms of the institution, to prepare the Standard Production Protocol Manual in Tamil on ‘On-Farm Production of Bio-control agents’.

In continuation of the principle training during March 2021, the senior consultant nominated by our office sensitized the IPM village farmers in all the 20 IPM villages on the activities of bio inputs production, incubation and on the methods of application to the field through necessary media as per protocol. Necessary standard production protocol on bio fertilizer and bio pesticide leaflets were also prepared in tamil and supplied to all the IPM village farmers and were sensitized. The bio inputs thus prepared, after application to the field are being inspected and farmers are then and there sensitized on the use of the bio inputs based on the results that they obtain in their respective fields. Thus the field trials have been conducted in 4 block clusters of 20 IPM Villages.





4. How Safe are your Veggies:

PTC, PMD, NIPHM is accredited by National Accreditation Board for Testing and Calibration (NABL) in accordance with the standard ISO/IEC-17043:2010 with certificate number PC-1023. NABL assessors audited/assessed the laboratory on 24th and 25th April, 2021 through ONLINE in accordance with the standard ISO/IEC 17043:2010 for renewal of certificate and to continue NABL accreditation service. Final reports of PT programme on carbendazim WP, ethion technical and chlorpyrifos EC were sent to 85 participants. Proficiency testing samples viz. pretilachlor EC, imidacloprid and tricyclazole technical were sent to 74 participants including 4 private participants after homogeneity study during the period.

The Pesticide Formulation and Residue Analytical Centre (PFRAC) of Pesticide Management Division under Central Sector Scheme “*Monitoring of Pesticide Residues at National Level (MPRNL)*” collected and analyzed about 421 samples (Fruits, vegetables, cereals, pulses, milk and water) for pesticide residues. Sixty samples viz. green chilies, mango and okra were analyzed under “*How Safes are Your Veggies*”. During the period, 65 samples were tested for heavy metals. A total of 35 tobacco samples received from Tobacco board were also analyzed. Bio pesticide samples, 65 numbers received from insecticide Inspector were tested for pesticide contamination. A total of 33 samples viz. pretilachlor EC, imidachloprid and tricyclazole technical for homogeneity studies under Proficiency Testing - pesticide formulation analysis programme were analyzed during the month.



Sample extraction (Pesticide Residues Analysis)



Pesticide Analysis

5. Nozzle wear study with municipal water as carrier:

The main aim of the project is to know standardize the operational hours of nozzle for optimum use of nozzle. The wear and tear due to continuous usage of nozzle will affect the flow from the sprayer, which adversely affect the application. For this, different types of nozzle such as Plastic hollow cone nozzle, Plastic hollow cone nozzle, Plastic flat fan nozzle, Brass hollow cone nozzle, Brass flat fan nozzle flower nozzle along with

pesticide Tricyclazole 75 % WP and different water carriers such as bore water and municipal water were taken for the study. A setup was fabricated and continuous recirculation of formulation to create the similar effect of spray in the field. The spray pattern and discharge rate of nozzles along with wear of nozzle at particular time intervals were continuously monitored. Whenever the discharge rate and flow pattern of the nozzle changes to more than 10% of initial value, replacement of the nozzle is recommended.

6. Construction and Evaluation of Zero energy cool chamber

In agriculture, post-harvest handling is the important stage of crop to maintain the quality and quantity produce. Storage structures and cold chamber play key role in the post-harvest management. The post-harvest losses of developed countries are 5-20% and developing countries are about 20-50%. For solving storage problems at farm level, Zero Energy Cool Chamber which is an eco-friendly storage system that doesn't require any type of energy has to be adopted. This system is developed by IARI. Zero Energy cold chamber maintains about 90 to 95% relative humidity throughout the year and it also effective during summer months and the chamber can keep the temperature 10-15⁰C cooler than the outside temperature. This project has been initiated at the Institute to demonstrate and utilize for the products that are being raised in-house.

Extension Activities / Village Adoptions

1. Awareness programme on promotion of export of horticulture produce for officers:

A one day interactive session was held for Dept. of Horticulture officials, Telangana where all the officials' viz., DDHs, ADHs, HOs of Telangana state has participated in this programme Interacted on different aspects on promotion of export of horticulture produce and on Good Agriculture practices of horticultural crops grown in Telangana by Director, PBD, Girish, DD & Pyla Jyothi, AD. Totally 40 officers from Dept. of Horticulture attended the program.



2. As per the request from Dept. of Horticulture officials viz., DHSO's and HO's total 04 books on package of practices, pests and nutrients management of major horticulture crops grown in Rangareddy, Warangal Urban, Warangal Rural and Suryapet were prepared and launched both in english and telugu languages and handed over the same to Director of Horticulture, Telangana by NIPHM faculty.



- Continuous monitoring of the activities of PHC at Amadapur and pursued the information of crop seeds sown in Kharif season for demonstration of seed treatment.

Communicating with the farmers of PHC selected districts (Rangareddy, Warangal Rural, Warangal Urban, Suryapet) on different aspects/giving advisories on the queries raised by them related to plant Health viz., nematode management, IPM in vegetable crops and other queries raised in the whatsApp groups of farmers of said districts.

Visits were made at different crop fields, viz. Cucurbits, chilli, tomato and jasmine fields at Burjiguda village for detection of pests and also to collect the specimens. Effective and fruitful Interaction was held with the farmer of the said field. During the visit different pests like fruit fly, leaf miner in cucurbits, chilli mites, thrips, borers in chilli crop, borers in tomato crop and red spider mites were detected in jasmine crop.



- Under the village adoption programme NIPHM team visited KVK, Ekalavya Foundation, Thuniki, Medak district, Telangana state on 16.06.2021. The purpose of the visit is to provide technical guidance for the construction of the proposed biocontrol lab at the KVK premises. A meeting was held with the following members followed by the visit to the proposed building identified for Biocontrol laboratory.

Ms. N. Lavanya SO (BP&BC) and KVK staff, Shri. Venugopal Reddy, Chairman, Ekalavya Foundation, Mr. Ravi, Senior Scientist (Ento) & Head i/c and Mr. Chandra Sekhar, Civil Engineer. The Chairman conveyed that the budget will be sanctioned at the earliest to construct the BC lab. He requested NIPHM technical inputs for their initiative which will benefit the farmers. The identified 2 rooms building was visited by SO (BP&BC) along with KVK staff and suggested suitable modifications for the lab. The KVK staff along with their engineer proposed to visit the NIPHM BC lab to finalize the equipment and space for their lab during next week. SO (BP&BC) requested to send weekly updates on the establishment of BC lab and also suggested arranging a demonstration plot at KVK.



- A collaborative training programme for the farmers / officers of Mehaboobnagar district is planned in association with KVK, Mehaboobnagar. An awareness programme on better spraying practices is being taken up in the adopted village at Mahaboobnagar.

Faculty Achievements

- Dr. Vidhu Kampurath, Er. Udayabhanu and Er. Govind Maurya, staff of division division, attended a National webinar on Advances in Water Resources Engineering- In connection with National Technology Day 2021, on 11.05.2021, hosted by CWRDM.
- Dr. Vidhu Kampurath, JD (PHE) attended Webinar series in connection with the National Technology Day 2021, organized by KSCSTE in association with A P J Abdul Kalam Technological University on 11th, 12th, 14th and 15th May 2021.
- Dr. Vidhu Kampurath, JD (PHE) attended National webinar on Agricultural Education in India, hosted by Vignan's Foundation on 16th May 2021.
- Dr. Vidhu Kampurath, JD (PHE) attended a webinar on Entrepreneurial Opportunities in Farm Mechanisation, hosted by ABI KAU on 27th May 2021.
- Dr. Vidhu Kampurath P, JD PHE attended webinar on “Nature & Pandemic-the way ahead in restoring ecosystem, on 4th June 2021, conducted by Malayala Manorama daily.
- Dr. Vidhu Kampurath P, JD PHE attended World Environment Day talk conducted by Institution of Engineers (India) on 5th June 2021.
- Faculty participated in World Environment day event by planting a tree in the campus.
- Er. M Udaya Bhanu, SO(PHE) attended World Food Safety Day 2021 by PHD Chamber of Commerce and Industry on 7th June 2021.
- Dr. Vidhu Kampurath P, JD PHE attended and contributed in National Seminar on Resilience and Cope-up Strategies in Pandemic through Agricultural Engineering Interventions, on 9th June 2021, hosted by CIAE Bhopal and DST New Delhi.
- Dr. Vidhu Kampurath P, JD PHE attended Prof. K. N. Nag Memorial International Webinar Series “My Professional Journey- Experience Sharing & Lessons of Life” on 13th June 2021.
- Dr. Vidhu Kampurath P, JD PHE attended JCR Training programme on “Journal certification for scientific publications - part 1 on 15th June 2021 and part 2 on 17th June 2021.
- Er. Sk Haneefa Begum ASO(PHE) attended webinar on " Maize processing and business opportunities" PM FME scheme by PMU, NIFTEM on 15th June 2021.
- All faculty participated in the International Yoga Day by involving in Yoga activity conducted at the institute on 21st June 2021.
- Dr. Vidhu Kampurath P, JD PHE attended the webinar on "Promoting Women's Health by introducing yoga in daily life" on 21st June 2021, conducted by National Commission for Women, New Delhi.

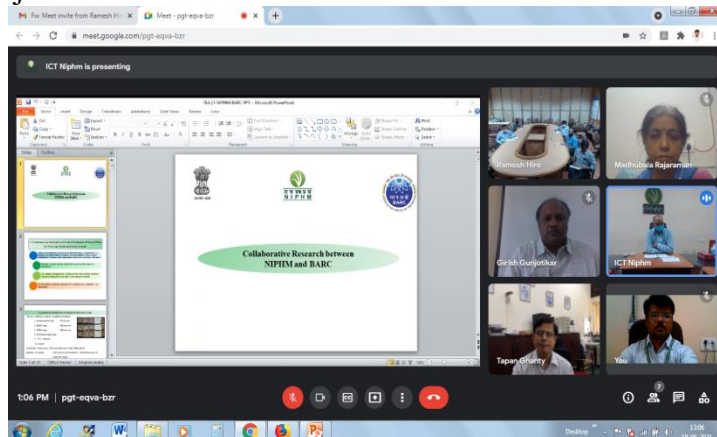
Other Activities

1. World Environment Day was observed @ NIPHM and plantation drive was conducted in the campus involving officers and staff



2. **Online course on Plant Biosecurity (MOOCs):** The 5th batch is commenced from April 1st to June 30th 2021 and 19 participants are attending the programme. The programme is being conducted as per the schedule. Registrations for 6th batch are open through NIPHM web portal.

- Massive Open Online Course (MOOCs) in Rodent and Household Pest Management:** The 3rd programme is commenced from 1st April, 2021 to 30th June, 2021 and 33 participants are attending the same. The programme is being conducted as per the schedule. Registrations for 4th batch are open through NIPHM web portal for the aspirants.
- Farmers Advisory Cell:** A total of 350 farmers and stakeholders contacted on phone seeking information related to different training programmes, organic farming, vermicomposting and NIPHM media requirement.
- BARC Review Meeting:** An online meeting with BARC officials was held on 18.06.2021 to extend the collaborative research study and appraisal of current projects.



- Production of vermicompost and manure:** Arrangement was done for production of vermicompost at residential quarters of NIPHM, Hyderabad. The vermicomposting process has been initiated in the month of April, 2021 for effective utilization of household green waste of the residents.



Publications/ Guest Lectures / Invited faculties

- Farmers friendly post-harvest machinery compendium – A collection of various machinery useful for post harvest operations, developed across India. The machines are listed crop wise with description, photos and details of manufacturers.
- Dr. Vidhu Kampurath P attended the Board of Studies Meeting of B Sc Agricultural Science programme of VFSTR Deemed University as Subject Expert on 19th June 2021.
- Dr. Vidhu Kampurath P, JD PHE gave an invited lecture on "Designing Tasks/Activities for Accelerated Learning: Problem Solving /Project Based Learning for Engineering Students" in the Faculty Development Programme at VFSTR Deemed University on 26th June 2021.

मैं आभारी हूँ....!

मैं आभारी हूँ एनआईपीएचएम, जो मुझे तेरा प्यार मिला,
सुख में, दुःख में, हार-जीत में, एक नहीं सौ बार मिला !

तेरे सभी प्रभाग कार्यशील एवं तर्कपूर्ण है,
जो पौध संरक्षण में कृषकों को ज्ञान देते है !

यहाँ मृदा स्वास्थ्य पर वनस्पति स्वास्थ्य प्रबंधन प्रभाग,
कृषि, खाद्य सुरक्षा पर नए - नए तरिके सिखाता है !

पारंपरिक उत्पादन में कृषि स्थिरता एवं खाद्य सुरक्षा के लिए,
पादप जैव सुरक्षा का सर्वोच्च स्थान है !

यहाँ आधुनिक उपकरणों से सुसज्जित, पीड़कनाशी प्रबंधन है,
जो फसलों के नुकसान को कम कर, आमदनी बढ़ाता है !

यहाँ उपकरणों का सही चयन एवं तकनीकों का इस्तेमाल हमें,
वनस्पति स्वास्थ्य अभियांत्रिकी से मिलता है !

बंजर सी धरती से सोना उगाने का महत्व रखता हूँ,
इसलिए एनआईपीएचएम से वास्ता रखता हूँ !

शुक्र गुजार हूँ तेरा.... और सदा रहूँगा. . . .
मैं कोई और नहीं, मैं तेरा किसान हूँ !!

रचना एवं प्रस्तुति

राठौड़ मोहन नारायण

हिंदी अनुवादक - एनआईपीएचएम

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