December 2020 | Vol 1 | Issue 8

ISSN: 2582-6980

AGRI MIRROR : FUTURE INDIA

AIASA Agriculture Magazine

aiasanewdelhi aiasa5 AIASA www.aiasa.org.in

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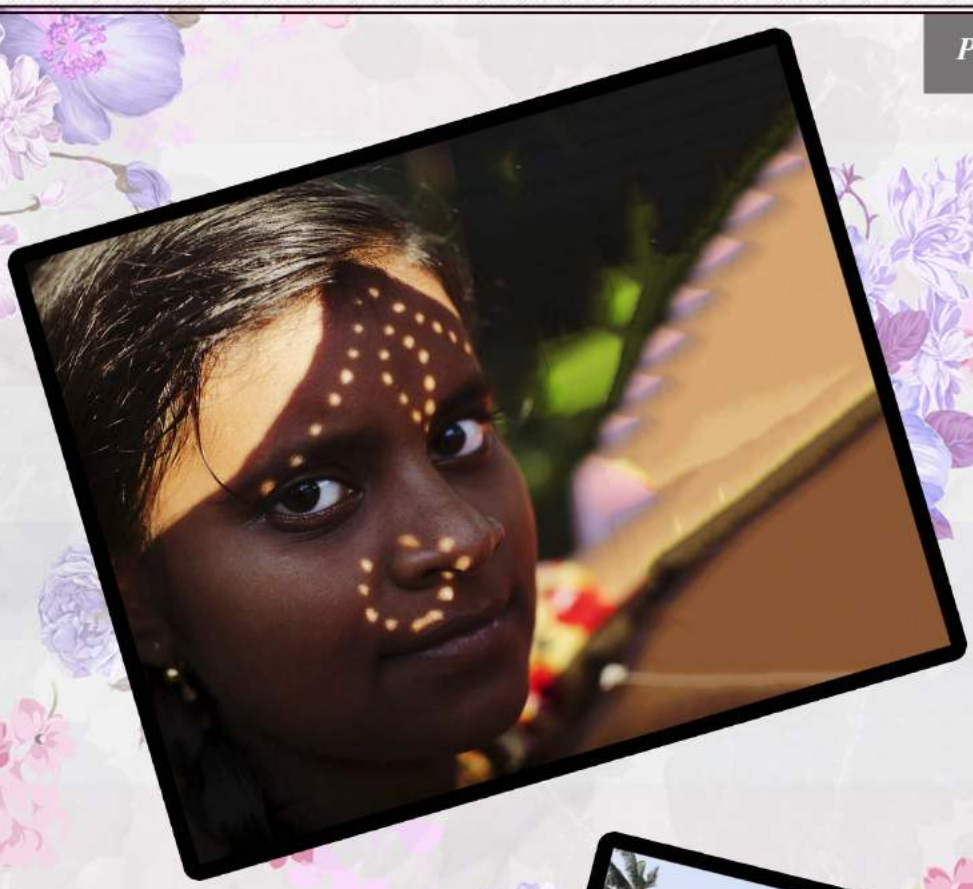

"A VOICE FOR AGRICULTURE"

ISSN: 2582-6980

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ISSN: 2582-6980

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ICT: The Riposte

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Every segment of the society is going to remember this year. Boom! The 2020. With no age limit, it affected all population by means of fewer employment opportunities, limited movement, increased xenophobia, etc. At this time I remember reading a quote by Alvin Toffler that "Technology is a great growling engine of change". Well, during this pandemic, there is no need of a further explanation of this remark. COVID-19 pandemic put many countries including India under lockdown. This affected all the sectors in one way or the other.

In order to utilize the irreversible time, all of us tried our best to get back to 'normal'. But, everything will not get smoothen back easily. At this chance, like any other time, technology became a sudden pillar for the falling trees, a 'riposte', especially in the form of Information and Communication Technology (ICT). Business meetings, academic improvement, etc. used this form of technology to ensure best performance during this pandemic era. The best improvement by ICT during this pandemic was in academic sessions of schools and colleges. Teachers/professors ensured maximum contact with students through online and video calling ICTs. Screen sharing, debates, video with audio, PDF files, etc. helped improve this session a lot during this period. But in order to ensure better results we have to make better use of ICT.

Nothing can replace the direct teacher and student interaction. But our focus here should be to ensure the most quality education that we can provide under current restrictions. In order to compensate the direct presence, the tutor should ensure maximum interaction through easy and effective ICTs. Educators should be given special training to ensure better light towards the young leaves of future. Global Digital Library should be open in order to offer free accessible eBooks on the web, mobile or for printing or downloading. Adding translation options will be an added blessing.

Lectures notes, studying tips, etc. which are already available should be improved and provided as applications in Google Play Store, App Store, Windows Store, etc. with easy access to all. Applications to improve the knowledge, literacy skills, and psychosocial well-being of students will help them shape their future. Students or adults or faculties should never be confused with various platforms in different time for learning or any other academic purposes. Always choose the most effective, easily available, less distractive platforms with efficient learning skills. To ensure better utilization of time and to compensate missed practical skills, students should be engaged with effective, highly related works, presentations, video making etc. This helps them get connected with their field, and of course, their FUTURE.

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There will be a chance of increased anxiety about the future playing games in the minds of students, making them worry more than preparing their life. In order to ensure better mental health and support from their domain itself, they should be provided with continuous support from tutors and other faculties. Conducting valuable 'webinars' with experts and successful personalities can ensure confidence and instill hope in them. Since giving mental support is the best gift to them during a pandemic like this, increasing their hopes will empower them. ICT provides a large amount of platforms to help in this situation which can be handled, consumed or redirected from any corner of the world by anyone. The only thing that matters is "are we ready or not".

Giving the students easy access to useful videos, techniques, references, etc. with the help of ICT helps them a lot to know more about their opportunities and skills to improve their future. Many platforms like YouTube, social media, or other special websites provided by universities or other educational institutions will help them in this regard. As Albert Einstein once said "In the middle of difficulty, lies opportunity", I think the best time to know more about future opportunities is NOW.

ICT in Agriculture field, e-Agriculture, have not only influenced urban areas but also provides network, mobile services and applications to rural areas. Teaching about modern and highly efficient ways of ICT including wireless technologies, Global Positioning System (GPS), Geographic Information Systems (GIS), computer controlled devices, mobile apps, identification systems, E-commerce or online purchase of products for agricultural or other working purpose, etc. will make the future better in these domains. During this pandemic, we have witnessed that offering these services to all is very much possible.

Using of ICTs is not only the easier method during this pandemic, but also is the most economical, with time and space efficient qualities. They provide the information available at any time, almost permanently, to seekers increasing their advantages. Although ICT and social computing can improve the effectiveness of outcomes, the results depend on the approaches used by us. So, initial training should be provided with new innovative approaches to the teachers to experiment with digital and media technologies, and to reflect them along with their own teaching practices.

The new educational panorama requires following a series of measures like providing of professionals to train teachers and other faculty about online teaching and other ICTs to provide better outcome. For doing these activities, firstly, the current context of educational centers caused by the pandemic situation should be analyzed and the consequences of changing the face-to-face teaching styles to online mode should also be considered. Poor knowledge in use of technology, limited facilities for better presentation through ICTs will have a huge impact on teaching, leading to a lack of opportunity to express the highly recommended teaching skills of teachers towards students. Teachers should be aware of creating various communication tools in order to be close with their students in building up their future.

The challenges in traditional agriculture in terms of production, marketing, profit etc. are addressed significantly by using ICT and thus benefitting farmers including small

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landholders. It helps in providing better access to natural resources, markets, banking and other financial services, other improved agricultural technologies etc. Combination of mobile technology and geographic information system provide accurate information about soil, water, nutrient etc. helping farmers or research graduates or students to make or improve their decisions. Purchasing of agricultural inputs and equipment can be conducted online. Any work or field related information can be circulated among farmers, students, workers etc. in the form of video, audio, photo, document or any other presentation files within seconds from anywhere at any time. So, earlier knowledge about modern technology prior to field experience will help the future of important field like agriculture to become more successful. Hence, knowledge of ICT should be provided during graduation time.

Even before COVID-19 pandemic, there was already a high growth and adoption of ICTs in education technology. But there has been a significant surge in usage of language apps, virtual tutoring, video conferencing tools and online learning software since COVID-19. Live classes offering platforms like BYJU'S and Alibaba's distance learning solutions gained a lot of attention during this pandemic. Though "something is always better than nothing", it is very important to ensure that the future faces of the world receive the best quality education. Surveys are showing that developments in every sector are faster and efficient through ICTs than was expected initially during this pandemic. So expecting 'more things' than 'something' will be the norm when we introduce ICTs, proving that instead of searching for many other ways to overcome this situation, maximum utilization of technology leads to better results.

Since ICT helped a lot in the current situation, more minds came to know about its importance in the world. It is very well ensured that even after the pandemic people will continue or even enhance the use of ICTs in their fields to ensure better outcomes. Using of these technologies with special skills is going to change the future world. Conclusively, remembering the words of Arne Duncan "Technology alone isn't going to improve student achievement. The best combination is great teachers working with technology to engage students in the pursuit of the learning they need". Let's live with the better present and find the valuable future.

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FISHCO TECH: A Mobile Interface for Aqua Farmers to Acquire Knowledge on Hurdles, Remedies, Guidelines, and Entrepreneurship to Promote the Blue Economy

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Introduction

Aquaculture is a promising source of protein for billions of population. To ensure a food secure future for all, the fisheries and aquaculture sector is the key. The world's appetite for fish products shows no signs of slowing. Reports demonstrate that significant and growing role of fisheries and aquaculture providing food, nutrition and employment. Global aquaculture has grown dramatically over the past 50 years. World aquaculture production attained another all-time record high of 114.5 million tonnes in live weight in 2018.

Digitalization of aquaculture is a relatively novel strategy which is very much relevant in the present scenario. Most of the losses in the sector are due to improper management of pond conditions, especially water quality. By linking these two concepts, I am introducing a mobile interface where the farmers can find immediate solution for all their problems. A cost effective water quality monitoring instrument is provided to the farmers. This instrument is linked with a mobile application which maintains a continuous record of TDS, DO, pH, temperature, salinity, ammonia and nitrite. The application ensures a platform for the farmers to interact themselves, share their queries with experts and find solutions in a less expensive manner without any time delay. Moreover, unemployment in the sector is minimised to a great extent.

Broad objectives

- ✓ To promote the development of viable aquaculture industry to improve the standard of living by considering, discussing, providing advice and articulating the farmer's needs, desires, aspirations, problems and views.
- ✓ To introduce a water quality monitoring system to obtain quantitative information on physical, chemical and biological characteristics of water and to maintain a continuous record.
- ✓ To provide opportunities for discussions and information sharing platform for farmers.
- ✓ To avoid struggles in traditional extension teaching methods and to provide first-hand information to the farmer.
- ✓ To disseminate the latest appropriate technologies and farming innovations to the members.
- ✓ To assist in the education and training of farmers.
- ✓ To publicize the successes as well as failures of culture.

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- ✓ To subscribe, assist, subsidize, affiliate and cooperate with all organizations and institutions, interested or involved in the promotion of aquaculture.
- ✓ To negotiate and secure facilities on beneficial terms for the members about insurance against hazards and other risks affecting aquaculture.
- ✓ To eradicate the problem of unemployment in the fisheries sector.

Precise objectives

The prime objective is to enhance the relationship between researchers and farmers through digitalization. The integrated process of information gathering, analysis, planning, consultation, decision making, and allocation of resources is done via a single mobile application. A continuous record of TDS, DO, pH, temperature, salinity, ammonia, nitrite are done and any undesirable change is informed at the instant and the solution is also provided. It is to promote the responsible aquaculture practices through education, advocacy and demonstration. Farmers obtain immediate solutions for their problems from experts. The farmers can interact among themselves and also with the experts in the field. Online training programmes are provided. This will reduce the expenditures of extension activities. The gap between the researchers and farmers are minimized. Latest technologies and innovation are outstretched at the farmers in a very proper time. This helps the farmers to adopt the technologies in a very early stage itself. The successes, as well as the failures of every farmer, are reported. This enables other members to stick on to the right method. All the organizations involved in the promotion of aquaculture are affiliated with the application. So the establishment of a direct link between the best seed hatcheries and feed factories with the farmer is made possible. The information regarding insurance policies for the possible hazards, incentives for the eligible, loans for the required are provided at the exact time.

Abstract

Fisheries and aquaculture industry remain unchanged as an inevitable source of food, income, nutrition and livelihood for hundreds of millions of people around the world. It has been regarded as one of the fastest-growing agricultural business sectors of the world. But it faces a lot of problems in the present scenario. The major problem is the lack of knowledge about scientific farming. The farmer is not able to access the correct information. There is no proper management (water quality parameters, soil quality, species apt for culture) of a pond. If anyone interested, he/she has to pay a lot beginning a farm. Moreover, the farmer is not aware of the incentives, insurance policies and loans provided by the government. A beginner is unaware of the best seed hatcheries and feed factories. He/she doesn't know what are the ideal speciessuitable for his/her pond. In some instances, extension teaching methods may not perform and they are unable to provide what is required by the farmers.

In this context, this mobile application has a great role. A multiparameter portable meter is the main component. This is given to the farmer after registration by the team. A small amount of registration fee and price of the instrument is applicable. After registering, a unique mail id and password are given. Only those registered farmers can enjoy the benefits of the application.

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A low-cost smartphone-based embedded system design to measure different water quality parameters. Developed system measures pH, TDS, temperature, DO, salinity, ammonia and nitrite. The device requires low power and uses a smartphone for data storage and analysis. The application stores water quality parameters on the smartphone, transfers to the cloud with location information, predicts water quality index and also provides facility to integrate water quality data with Google map for rapid judgement and analysis at district, state and country level.

The device is composed of three parts;

1) Water quality sensors: Senses pH, TDS, temperature, DO, salinity, ammonia and nitrite.

2) Smart water meter: signal conditioning and readout, microcontroller unit, Bluetooth unit.

3) Smartphone-based App interface: Data acquisition, storage, calibration, transferring to the cloud.

Hardware development

Embedded processing unit has been designed and developed to acquire the data from off the shelf available sensors. A signal conditioning unit is used to measure the resistance variation of the TS sensor along with an analogue front end circuit for pH sensor. The signals from the sensors are collected, converted into readable form. The analogue data is converted into digital form using an Analogue Digital Converter (ADC). The data is transferred into an 8 bit microcontroller unit.

Data acquisition and processing are done here. This data can be either stored in an E2PROM in the instrument itself or it is transferred to a smartphone by using a classical Bluetooth module. A battery charging circuit is also in the embedded system. It uses a 7.5 volt rechargeable battery with 8-10 hours capacity or portable batteries. A 5 volt regulator is also used.

Software development

Software initializes water quality sensors, analogue to digital converter, E2PROM, Bluetooth module, serial port and also checks all the sensors connections along with the battery level. A menu-driven programme has been developed to operate a smartphone-based water quality measurement system. It consists of testing and calibration sub-modules for testing water samples and calibration sensors respectively. The smartphone-based application provides facility to select the sensor type and calibration method and further uploads the calculated calibration co-efficient of linear models to the device. The device saves calibration co-efficient in E2PROM as a backup and also updates its prediction models with new calibration coefficient. Measurement mode consists of various sub-modules for data acquisition, storage, water quality parameters prediction and data transfer to the phone. Predicted parameters converted into a single data chunk with start, stop and a parity bit for transferring data to the smartphone without any error. Also includes I2Cbased E2PROM read and write a module to recall the stored calibration coefficient. All modular programmes have been linked to the main menu programme to operate a smartphone-based water quality measurement system.

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Android based smartphone app interface development

Smartphone-based android application is used to communicate with the device using Bluetooth protocol. A classical Bluetooth module (HC-05) has been used to establish communication between the handheld device and the smartphone. The application displays water quality parameters (TDS, DO, pH, temperature, salinity, ammonia and nitrite) and battery level. It has the facility to connect the smartphone with Google firebase cloud and save water quality parameters (TDS, DO, pH, temperature, salinity, ammonia and nitrite). There is also an option to share continuously stored data through SMS, email, WhatsApp etc.

The data regarding water quality parameters (TDS, DO, pH, temperature, salinity, ammonia and nitrite) are stored in the smartphone of the farmer continuously. The optimum range of all parameters (TDS, DO, pH, temperature, salinity, ammonia and nitrite) is provided; the results are compared and first aid treatment measures areadvised. This application ensures several services for farmers. Farmers get a platform to interact with the experts directly. There will be an opportunity to attend online classes which are carried out by experts. An option for clearing the doubts of a farmer is included. A rough evaluation of disease by posting images is also done. An emergency call centre facility is provided to contact the required in case of a disease outbreak. Organizations, institutions, nongovernmental organizations; who are involved in the promotion of aquaculture are added. It helps the farmer to get the best for his needs.

The exact location of hatcheries which provide best seeds, feed factories which ensures proper growth, industries which manufacture mechanical aids (aerators, sluice gates, nets) required for the operation are included. So, it enables the farmer to reach the correct place without wandering. All the latest technologies are introduced first to the farmers. Demonstrations of the techniques are also done via an online portal. The farmers can publish their success as well as losses in culture. This makes other farmers foresee the possible risks in the field. In the extract, the app reduces the distance between researchers and farmers, making things more transparent and thereby take part in raising the standard of living of common man. Moreover, qualified professionals get an opportunity to interact with the farmers, researchers and can improve their knowledge level.

Methodology

- An approached farmer interested in aquaculture is provided with a water quality parameter checking instrument which can connect to the smartphone.
- The farmer is advised to download the application.
- A unique user id and password are given to the farmer to login to the app.
- The farmer has to dip the instrument to the pond for a while. The Bluetooth connectivity of both phone and instrument is checked before employing. The data is continuously transferred to the phone. The farmer is advised to check the parameters (TDS, DO, pH, temperature, salinity, ammonia and nitrite) four times a day (morning, noon, evening, night).
- If any problem detected according to the water quality, first aid solutions are given by the app.

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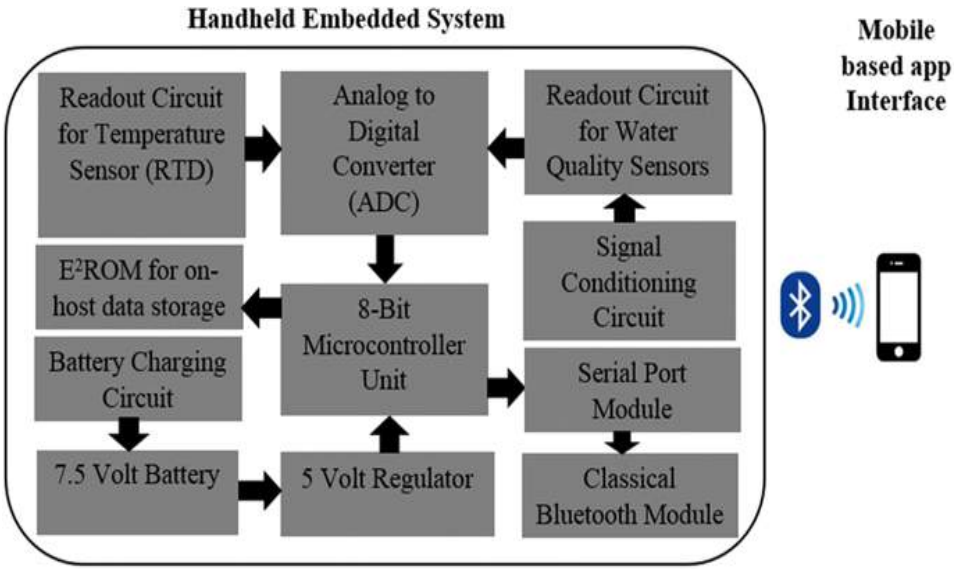

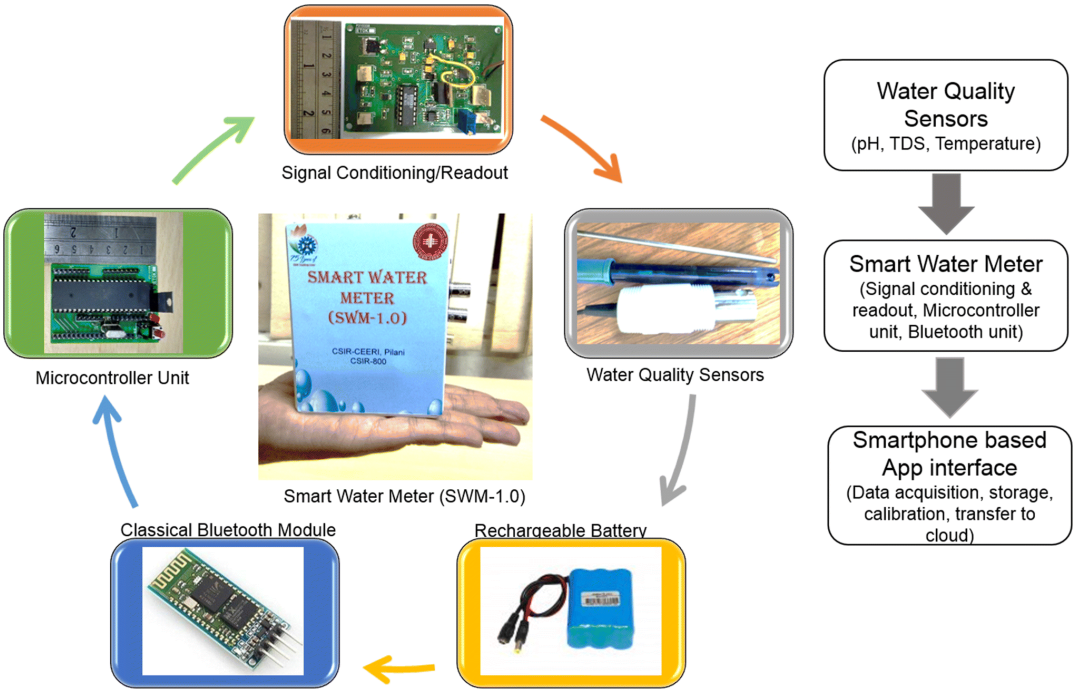

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If the farmer requires any immediate action, a 24-hour help desk is working.

- When the farmer uploads an image indicating the diseased situation, identification of the disease is done by the app.
- Individual video chats with linked experts are made possible,
- Details about scheduled online classes are provided.

Input calculations of:

- Pond area and volume
- Disinfection
- Liming
- Biomass
- Feeding rationing
- Feeding management
- Aeration
- Mineral

- There is a risk assessment option which helps the farmers to detect disease conditions in the pond by answering successive questions (like a key).
- Details about the best seed hatchery and feed factory are given which is easily accessible to the farmer.
- Latest news and events regarding financial assistance (loans and incentives) by various agencies are informed.
- Successful farming reports in different locations are selected and published.
- As a whole self-assessment of farm conditions, first aid treatment, getting the best farm requirements, interaction with experts, avoiding the drawbacks of traditional extension activities are made possible by a single application.

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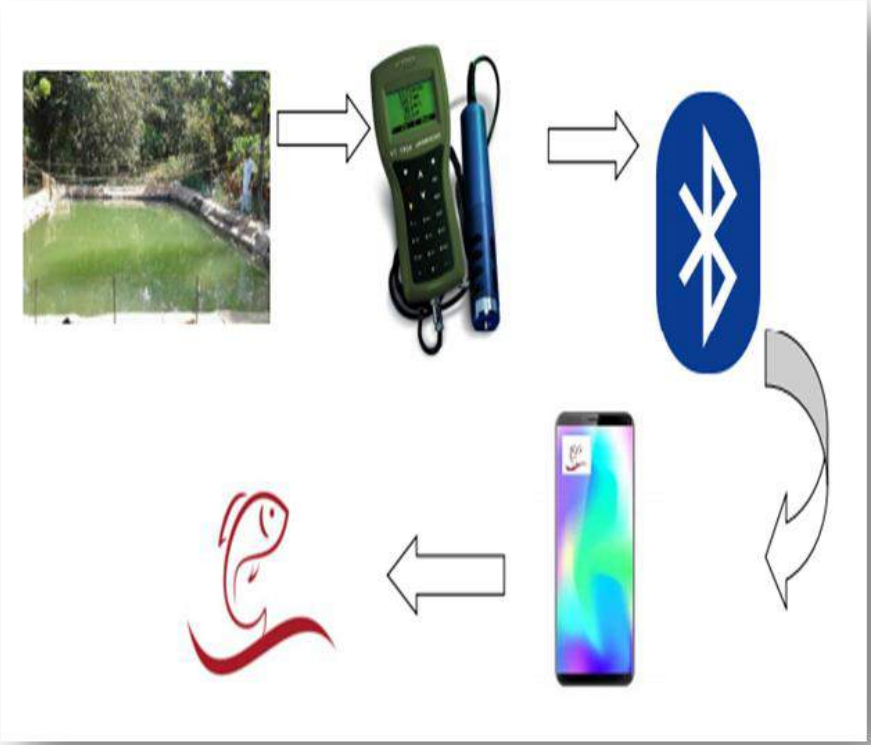
Time frame

- Literature study: 2 months
- Field study : 2 months
- Mechanical support: 2 months
- Designing support (instrument): 2 weeks
- Digital support: 2 months
- Designing support (app): 1 month
- Training: 3 months

9. Estimate

- Cost of Instrument to the single beneficiary:Rs. 25,000 approx. each
- The development cost of a Mobile App:Rs. 20,000 approx.
- Launching and promotion of App: Rs. 10,000/-



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App interface

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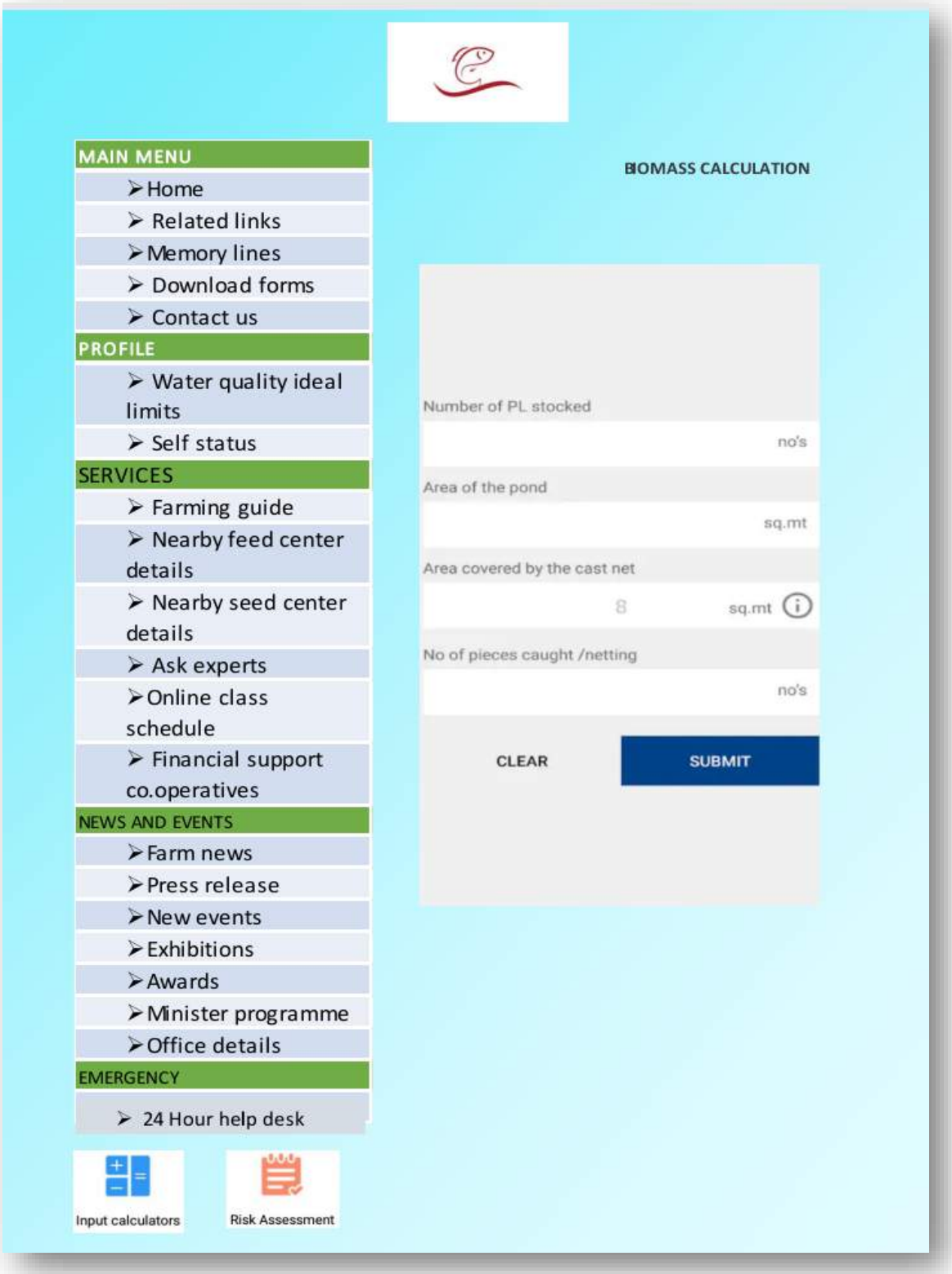

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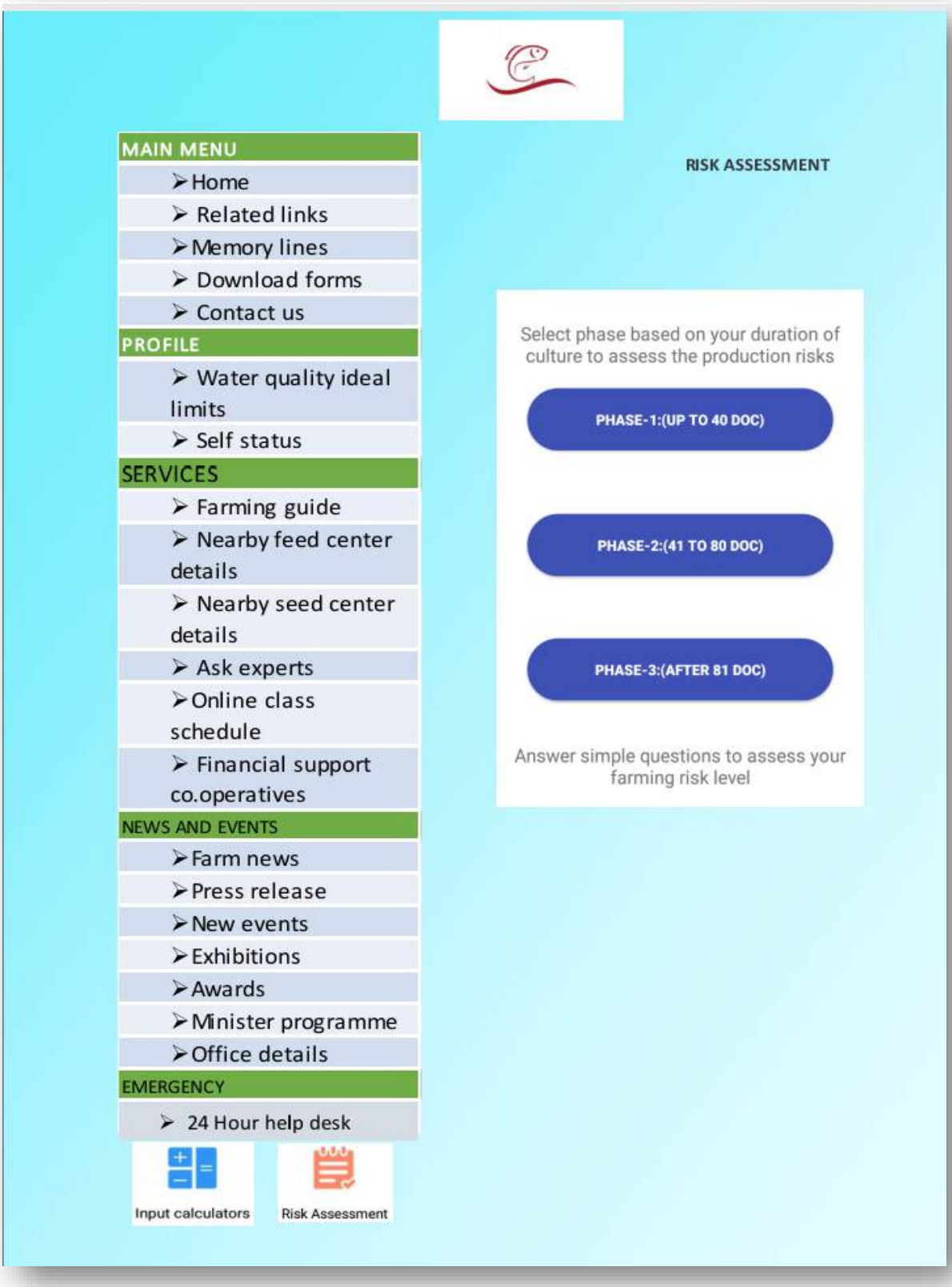

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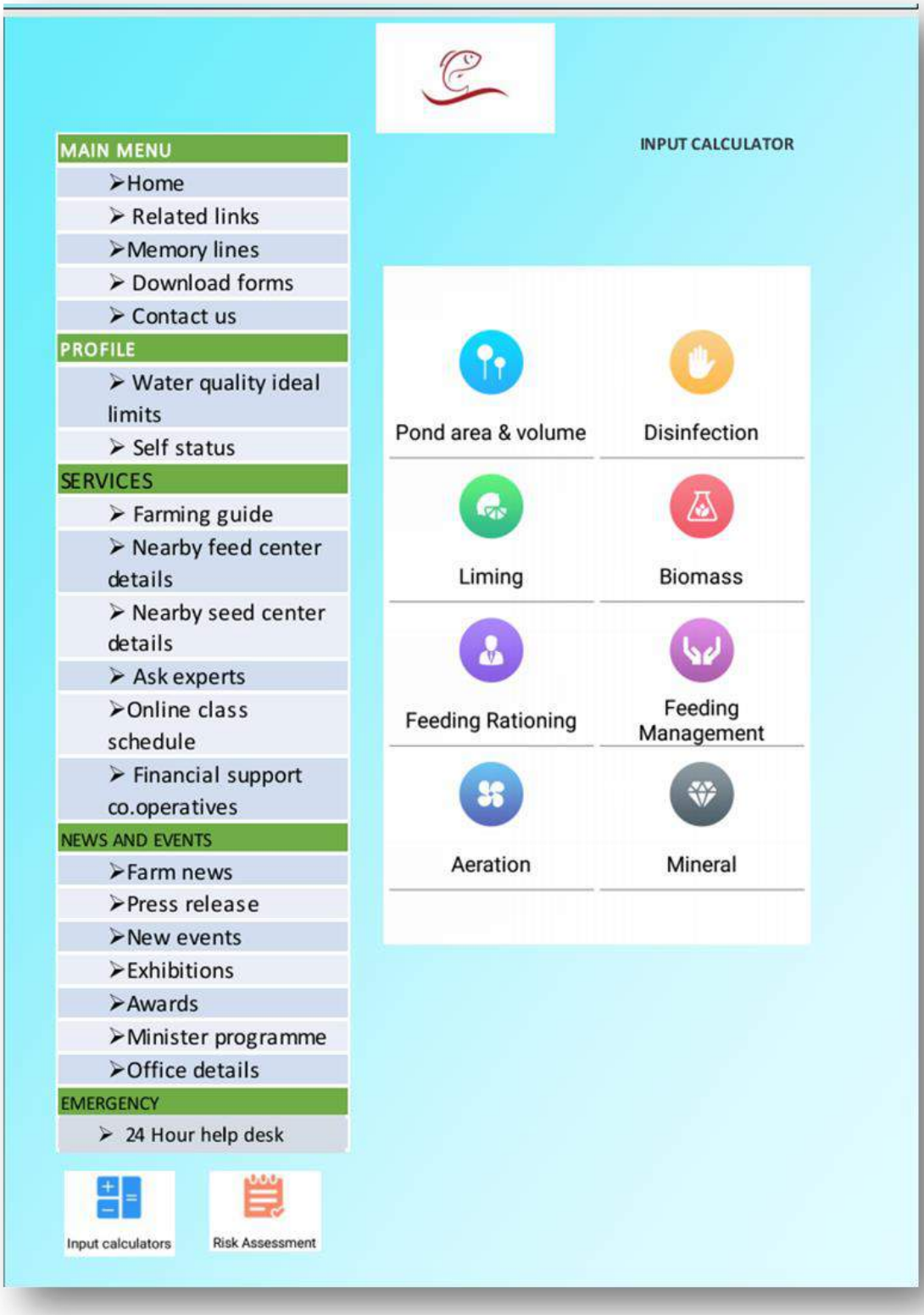

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Problem statement in one line

Fish farming without proper knowledge and guidelines, improper maintenance of water quality parameters without a continuous record, time delay in getting solutions from experts for the problems encountered and unemployed youth in fisheries sector.

Who is affected by the problem?

Fish farmers are the main victims of all these problems. They not only suffer from huge losses but also lose their confidence in aquaculture. Newly graduated fisheries professionals are also sufferers. Moreover, the whole fish production is affected, which compromises an excellent source of protein for world's appetite.

Root causes of the problem

Root cause of the problem is the distance between experts and farmers. Proper guidance is not secured by all farmers. They are unaware of the importance of maintaining a continuous record of water quality parameters like DO, TDS, pH, temperature, salinity, ammonia and nitrite. Farmers often lacks the ability to deal with the problems arise. Rather than these, there is no digital platform for the farmers to interact among themselves.

Motivation/rationale for solving the problem

While analysing the facts and root causes in aquaculture, it is understood that the progress and the promotion of this production sector are required to develop an urgent user's friendly solution with much ease by catering to all categories of people involved in it.

Existing solutions similar to idea; what are the limitations of existing solutions

Traditional extension teaching methods and allied services provided by the various departments/ institutions/agencies on their scheduled programmes or individual approach or visit are existing solutions. The training classes are not accessible to all farmers effortlessly on their demand. It requires waiting and attends such programmes on time and respective venues. Continuous monitoring and keep the record of various parameters and difficulties in self-assessment of pond conditions on time is not possible without consulting an expert. Information on the availability of feed and seed available centres and other accessories cannot be provided.

Conclusion

Aquaculture is a promising source of protein for billions of population.To ensures a food secure future for all, the fisheries and aquaculture sector is the key. The world's appetite for fish products shows no signs of slowing. Reports demonstrate that significant and growing role of fisheries and aquaculture providing food, nutrition and employment. Digitalization of aquaculture is a relatively novel strategy which is very much relevant in the present scenario. Most of the losses in the sector are due to improper management of pond conditions, especially water quality. So in general, this mobile interface will assist a farmer incapable to do a successful venture by himself. It will help the aquaculture managers to reduce crop loss, eradication of frauds in seed and feed supply by the digitalization of the

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various activities and mould to a stable and promising aquaculture production sector to achieve forecast goals towards ‘blue revolution’.

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Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Apps For Real Time Weather Based Advisories

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In recent years, technology in agriculture has rapidly changed the regular practices and by using innovative technology as a scalable and sustainable resource. Farmers are now taking their agricultural practice to new heights, keeping the farm to fork in the future. Smart Phone has quickly become one of the most widely using thing among the people for sending data, voice and some other useful facilities. Numerous apps for various technology has provided to farmers and specific insights into predicting weather patterns, identifying crop pests, analyzing crop inputs and other agricultural related informations makes the farmers to move over enhance farming.

Meghdoot – Agromet advisory

Agromet Advisory Services provide a very special kind of inputs to the farmers as advisories that can make a tremendous difference to the agriculture production by taking the advantage of benevolent weather and minimize the adverse impact of malevolent weather. This has a potential to change the face of India in terms of food security and poverty alleviation. Agrometeorological service rendered by India Meteorological Department, Ministry of Earth Sciences is a step to contribute to weather information based crop/livestock management strategies and operations dedicated to enhancing crop production in a sustainable manner. The app requires a registration process to use the app's features. Needs register with name, phone number, preferred language, state and district.

- Warnings of localized weather phenomena and intensities updated every 3 hours
- The app givses weather feeds from the past ten days, forecasts for the next seven days
- App include forecast information like Maximum and minimum temperature, Rainfall, Relative humidity, wind direction, wind speed, cloud details.
- Provide weather based location specific crop and livestock advisories to farmers.
- Advisories are updated for every Tuesday and Friday in Regional language.

Damini – Forewarning of lighting activities

Lightning is a phenomenon that has not only fascinated but also scared mankind. Recent data suggests, lightning alone account for about 2000 to 2500 deaths every year in India. Thunderstorms and lightning being the quickly evolving meteorological phenomenon, the exact forecast of these events is a challenge. Indian Institute of Tropical Meteorology, Pune under the Ministry of Earth Sciences has installed a Lightning Location Network with

ISSN: 2582-6980

about 48 sensors over various parts of the country and is connected to central processing unit at IITM, Pune. This network provides exact information about lightning strikes and movement of thunderstorm path. The network is being expanded with addition of more sensors to increase accuracy and reliability. Using this network, by Earth System Science Organization - IITM has developed a Mobile App called Damini. This App gives exact location of current lightning strikes, probable locations of impending lightning area of around 20 km and movement and direction of thunderstorm. Damini also lists precautionary steps to be taken during lightning and some general information on lightning. Damini App would indeed help in getting advance information about impending lightning activity. The alert will be sent 30 minutes to 45 minutes before the event and this will help people to get into the safer locations. Presently, the warnings are being given in Hindi and English. Both apps can be downloaded freely from Android play store and iOS.

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Asafoetida – An Implicit Nutraceutics

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Introduction

The Hing farming is being practiced for centuries. The hing is being cultivated and harvested from ancient times. The first cultivation of hing plant was started in late 12th century. The hing is scientifically named as "Asafoetida". The hing is referred as food of the gods and the devil's dung. The hing is in the form of dried latex gum, which is discharged from the herb called Rhizome. This herb is perennial herb and grows at the height of 1 – 1.5m in length. The hing is a combination of two to three spices.

For the first time ever, Asafoetida commonly called as Hing is started to be cultivated in India. And credit goes to the efforts by the Council of Scientific and Industrial Research (CSIR) and the Institute of Himalayan Bio-resource Technology (IHBT). This is one of the Prime spice used in Indian Kitchen in daily use. And this Hing is being cultivated by Farmers of Palampur in Lahaul valley in Himachal Pradesh .

Annual Import of Hing

According to the Records, India imports nearly 1200 tonnes of this palatable spice, and this spice is being imported from Afghanistan, Iran, Uzbekistan. And costs around $100 million per year, Hing is also used for medicinal use in India since historic times. According to the saying ofShri Narendra Modi (Prime Minister) "Atamnirbhar Bharat", now it is the time for India to start Cultivating Hing in India so that we can even save money and we can be independent. Because as per the records, locally growing hing can help India to save more than 900 crore rupees, which is eventually a huge amount.

ISSN: 2582-6980

Sanjay Kumar, Director, CSIR- IHBT Said, "it will cost farmers nearly Rs. 3 lakhs per hectares over next five years and give them a net return of minimum Rs. 10 lakhs from fifth year onwards. In collaboration with State Government, we will provide support to farmers with finance and technical know- how. It will be a game- changer for a farmers in Colder regions of the nations."

Cultivation Areas for Hing in India:

Hing crop needs dry and cold conditions for the growth. That is the reason to choose the cold desert of Himachal Pradesh, Uttarakhand and Arunachal Pradesh are ideal regions for the Cultivation of the Hing.

Presently, IHBT has marked 300 hectares, for the Cultivation and will be further expanded to more areas, once farmers successfully finish one cycle of five years and check results.

Basic Uses of Hing

The basic uses of Hing are:- Cooking and Medicine.

Uses of Hing in Cooking:

The hing is used in cooking as it helps to solve indigestion problems. The food also do not get contaminated easily. The hing is used in pickles for flavour and also as a preservative. The Hing is used along with Turmeric; it is used as standard ingredient in curries, sambhar and dal. It is also used in Kashmir cusinies like mutton dishes etc.

Uses of Hing in traditional Medicine:

The hing is widely used in medicines because it is considered to have antibiotic properties. The roots are claimed to help the patients fighting along with the Influenza and it also has the property of antiviral and keeps flu virus easily. It helps in fighting against indigestion.

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Cultivation and Harvesting techniques of Hing Farming:-

Hing Cultivation can be done as kitchen gardening on or commercial purposes can be done:-

1) Soil and climatic conditions:- The hing should be cultivated on mix of sandy or loamy or clay. The Hing can tolerate all pH levels like acidic and basic type. The soil should be well drained, as it is known that hing is grown best in cold and dry conditions.
2) Planting Location:- place where sunlight directly interacts with land is selected. It can't be grown in a shady region.
3) Spacing for Hing farming:- A distance of 5 feet between each crop should be maintained.
4) Propagation and planting method:- Seeds must be implanted in the early spring season, as the seed is exposed to moist and cold climatic conditions, so the germination starts. Seeds should be selected properly for maximum yield. The seed must be implanted in the soil with the distance of 2 feet between each seed. The plants propagate through seeds. These seeds can be initially grown in greenhouse and then can be transferred to soil at seedling stage. This crop is self fertile and can also propagate through pollination by insects.
5) Irrigation for Hing:- Irrigation is required only during the process of germination. Water logging can harm the crops, and water is given only after checking the moisture levels of the crop with finger.
6) Harvesting of Hing:- As the crops grow into trees in five years, the latex gum material is obtained from the roots, the roots of the plants are then exposed to the surface by cutting the plants very close to the roots, which then secrets the milky juice from the cut area. March and April are best months for harvesting.
7) Packing of produce:- The Marketing is most important part of hing , as it is an aromatic material it should not be let loose and possibly packed immediately. Air tight containers are used to store.

Conclusion

Despite not being an producer of Asafoetida, Hing is the staple ingredient of India and Indians consume 40% of World's total production. The Hing is most important ingredient used in as medicine and in cooking; it is also being used as pest repellent. Growing of Hing in India is the best step towards Atamnirbhar Bharat of the Government.

Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Benefits of Mulberry Tea

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Introduction

Mulberry tea is a natural, caffeine-free drink that is packed with vitamins and minerals and is used to prevent and treat many health conditions, including cold symptoms, weight loss, blood vessel problems, and diabetes. Mulberry tea which is extracted from the leaves of the mulberry tree. It is an inherent to Asia but now it is cultivated worldwide. Black mulberry and White mulberry are the most known species among the 10 species. The leaves are harvested in autumn and dried for making tea. The records of 3000 years of cultivation of mulberry trees are found in China. The mulberry tree was used by an ancient Chinese for food, papermaking, silkworms and its medicinal qualities.

Benefits of Mulberry Tea

Mulberry tea leaves contain 25 times more calcium than milk. Not only that, mulberry leaves have ten times more iron than spinach, and over twice the fiber of green tea.

Lowers Blood Glucose Levels

The increase in blood vessels causes the Type 2 diabetes. The presence of gallic acid in mulberry tea reduces the blood glucose. The diabetic patients who drank the mulberry extract, their glucose spikes was reduced after consumption in the first two hours.

Weight loss

The mulberry tea prevents from the absorption of carbohydrates due to the presence of moranoline (1-deoxynojirimycin). It helps the body to flush out the carbohydrates and starches from the body so that it does not turn to glucose. The hunger is reduced by diminishing blood sugar levels. This leads to achieve the weight loss.

Blood vessel health

The mulberry tea helps to reduce the chances of atherosclerosis by lessening the oxidation of cholesterol in blood vessels which is due to the presence of flavonoids and quercetin in mulberry leaves. It helps to prohibit the oxidative stress reactions.

Fantastic Beverage

The mulberry tea can be enjoyed hot as well as cold. It is available in loose leave as well as prepackaged. The tea bags should be steeped for at least 3-5 minutes and loose tea should be steeped for at least 8 minutes. The carbohydrates blocking effects should be maximized by avoiding the tea sweetening.

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Contains Vitamin and Minerals

The presence of Vitamins and minerals helps in the production of red blood cells, manages reproduction and growth, energy production, manages thyroid activity, eliminates acne, conserves the nervous system, healthy eyes, minerals absorption, preserve the digestive tract and assists in healthy pregnancy. The following vitamins are also part of the leaves mulberry nutrition profile.

- **Vitamin A** - Promotes good vision and healthy skin, for more try carrots
- **Vitamin B1 & B2** - Involved in metabolism and nerve function
- **Vitamin C** - For a healthy immune system and skin, for even healthier skin try coconut oil
- **Bioflavonoids** - Supports a healthy heart
- **Amino acids** - Assists in the use of proteins and nutrients
- **Calcium, potassium, magnesium, and phosphorus** - Builds healthy bones, for more minerals try brazil nuts
- **Iron** - Promotes healthy blood, for more iron try arugula
- **Zinc** - Needed for good reproductive health immune health

Fights Diabetes

The mulberry tea prevents diabetes by restricting the high amount of monosaccharide to enter into the circulation. The weight problems are also eliminated as it blocks the unwanted excessive sugars from entering to the blood stream. The mulberry leaves prevents from the type 2 diabetes by maintaining the control over blood sugar level.

Fights Atherosclerosis

The mulberry leaf tea helps to prevent the cholesterol-rich plaque buildup in the arteries which is also known as atherosclerosis. It restricts the oxidation of LDL cholesterol. The study on humans and mice states that the primary agents are astragalin and isoquercitrin.

Vision

The mulberry tea possesses the high content of Vitamin A which helps to enhance the eye sight and eliminate the eye strain. It helps to prevent from eye sight loss and retina degeneration. It also helps to get rid of blemishes and dark spots on the skin. The skin issues could be treated by soaking the mulberry tree leaves for about thirty minutes in the hot water. It can also treat dry skin. The mulberry leaves if added to hot bath and saunas helps to open the pores as well as detoxify the body. It boosts the hair growth and makes it healthy.

Antioxidant

The Mulberry tea possess compound 1- deoxynojirimycin or DNJ which provides an anti-diabetic effects and antioxidant properties and lessens the cholesterol and inflammation.

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The antioxidant such as beta carotene and ascorbic acid helps to prevent the cellular damage caused by free radicals.

Blood Tonic

The mulberry tea boosts the circulation, cleanse the blood and strengthen the system. It calms the nerves and enriches the blood. It purifies the liver and reinforces the kidneys. It also speeds up the recovery process. It reduces the bad cholesterol and prevents the blood flow blockage which helps to eliminate heart attacks and strokes. It boosts the immunity and balance the internal production.

Conclusion

Mulberry leaf tea extract is available in a 30:1 concentrate standardized to contain 2% moranoline content from Natural Factors. The recommended dosage is 100 mg two to three times daily. Mulberry leaf tea extract has no known toxicity.

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Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Significance of Chelation Reaction in Soils

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Introduction

Micronutrient deficiencies are major constraints in crop production in the present day agricultural programmes. Micronutrient fertilizers are gaining importance day by day and would play a major role in bringing stability and sustainability in the production of food grains, pulses and oilseeds in the coming decade. The three main classes of micronutrient sources are inorganic, synthetic chelates and organic complexes.

Inorganic sources such as sulphates of Cu, Mn, Fe and Zn are the most common metallic salts used in the fertilizer industry because of their ready plant availability and water solubility. In the past 35-40 years, it has been recognised that compounds containing chelated metals could supply many of the micronutrient requirements of plants. These chelates find use in a wide variety of agricultural crops. Applications for chelates vary from fertilizer additives, seed dressing to foliar sprays and hydroponics.

Definition of Chelates

The word chelate is derived from the Greek word for “claw”. In fertilizer technology, it refers to inorganic nutrients that are enclosed by an organic molecule.

Characteristics of chelates

- This compound are true chelating agent, it must have certain chemical characteristics.
- Chelating compound must consist of at least two sites capable of donating electrons (coordinate covalent bond) to the metal it chelates.
- For true chelation to occur the donating atoms must also be in a position within the chelating molecule so that a formation of a ring with the metal ion can occur.
- Typical structure of chelates with known organic acids like citric acid, tartaric acid, gluconic acid and glycine.

Chelates and Chelating Agents

A chelate describes a kind of organic chemical complex in which the metal part of the molecule is held so tightly that it cannot be 'stolen' by contact with other substances, which could convert it to an insoluble form. This is especially true for many soil types in India. Chelating agents are organic molecules that can trap or encapsulate certain metal ions like

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Ca, Mg, Fe, Co, Cu, Zn and Mn and then release these metal ions slowly so that they become available for plants to take them up. A chelate refers to a ring system that results when a metal ion combines with two or more electron donor groups of a single molecule. Actually unidentate water molecules, which are coordinated with a metal ion, are replaced by the most stable bi-, tri or poly dentate groups of the chelating agent (Singh and Sinha, 1999).

This results in the ring formation. Metals bound in chelate rings have essentially lost their cationic characteristics. In this form they are less prone to precipitation in some chemical reactions. This is the characteristic feature that makes these compounds useful in agriculture. The plant availability of certain micronutrient fertilizers reduces by transformation of the added micronutrient into forms that plants are unable to absorb. For example, if the inorganic iron salt (iron sulphate) is supplied to some soils, much of the iron is transformed into forms that are not readily assimilated.

They are converted to 'plant unavailable' forms. This problem can be overcome by using chelates. There are many naturally occurring chelating agents that are products of organic matter decomposition such as organic acids, amino acids, ligninosulfonates, ligninipolycarboxylates, sugar acids and derivatives, phenols, poly flavonoids, siderophores and phyto siderophores.

Many chelating agents have been developed synthetically. Both classes of chelating/complexing agents increase micronutrient solubility. One of the most important characteristics of chelating agents used is the relative stability of various metal chelates, especially if one is considering synthetically developed chelates. In other words, it is the degree of affinity of a given agent for a metal.

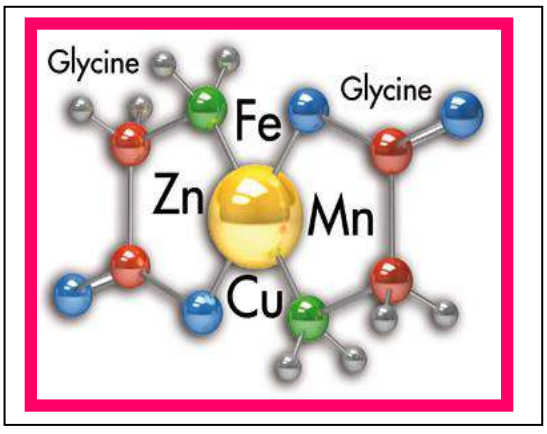
Types of chelate

Natural (Produced from plant itself)

- Plant roots can release exudates that contain natural chelates.
- The nonprotein amino acid, mugineic acid, is one such natural chelate called phytosiderophore (phyto: plant; siderophore: iron carrier)
- Produced by graminaceous (grassy) plants grown in low-iron stress conditions.
- The exuded chelate works as a vehicle, helping plants absorb nutrients in the root-solution-soil system.

Table 1: Natural Chelating Agents

Name	Formula	Abbreviation
Citric acid	$C_6H_8O_7$	CIT
Oxalic acid	$C_2H_2O_4$	OX
Malonic acid	$C_3H_4O_4$	MAL



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Malic acid	$C_4H_6O_4$	MA
Tartaric acid	$C_4H_6O_6$	TAR
Humic acid	-	-
Fulvic acid	-	-
Phenols	-	-
Poly flavonoids	-	-
Ligno sulphonates	-	-

Table 2: Synthetic Chelating Agents

Name	**Formula**	**Abbreviation**
Cyclohexane diamine pentaacetic acid	$C1_4H_{22}O_8N_2$	CDTA
Diethylene triamine pentaacetic acid	$C_{14}H_{23}O_{10}N_3$	DTPA
Ethylene diamine diaminedi-o-hydroxyphenyl acetic acid	$C_{18}H_{20}O_6N_2$	EDDHA
Ethylene glycol bis (2-aminoethyl ether) tetraacetic acid	$C_{14}H_{24}O_{10}N_2$	EGTA
Hydroxy ethylene diamine triacetic acid	$C_{10}H_{18}O_7N_2$	HEDTA
Nitrilo-triacetic acid	$C_6H_9O_6N$	NTA
Pyrophosphoric acid	$H_4P_2O_7$	PPA
Triphosphoric acid	$H_5P_3O_{10}$	TPA
(*Source*: Tewari et al., 2018**)**		

Biological Chelating Agents

Apart from the synthetic chelating agents, there are compounds that occur naturally like fulvic acid that function as "natural" chelating agents. Plants growing naturally depend on fulvic acid and other chelating agents found in nature to enable absorption of trace elements. Fulvic acid results from the decomposition of organic matter into humus. The humus is acted upon by microbes to produce humic acids.

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The humic acids are further processed by micro-organisms into fulvic acids. Like some synthetic chelating agents, Fulvic acid forms four-point bonds with the elements it chelates, but unlike the synthetic agents it can be absorbed into the plant. This adds to the mobility of the nutrients within the plant. The nutrients chelated by fulvic acid can move more freely which prevents a number conditions like localized calcium deficiency which happen due to low mobility of nutrients.

The Significance of chelation process in soil

Plants require certain minerals and nutrients in order to convert water and carbon dioxide into glucose and oxygen.

1. **Increase the availability of nutrients**

In high pH soils, metal ions, such as zinc, magnesium and iron, are positively charged and react with negatively charged hydroxide ions, which are abundant in these soils. This makes the metals unavailable to plants. chelating agents help plants growing in these soils by protecting the chelated ions from reacting with chemicals like hydroxide to ensure that the ions are available to be taken up by plants. Within the structure of the chelate, the mineral is suspended between two or organic and amino acids (Tewari *et a*l. 2018).

2. **Prevent mineral nutrients from forming insoluble precipitates.**

The chelating agents of the metal ions will protect the chelated ions from unfavorable chemical reactions and hence increase the availability of these ions to plants.

One example is iron in high pH soil In high pH soil, iron will react with hydroxyl group (OH^-) to form insoluble ferric hydroxide ($Fe(OH)_3$) which is not available to plants.

$$Fe^{+3} + 3\ OH \text{-------} \rightarrow Fe(OH)_3$$

Soluble Insoluble

Chelation will prevent this reaction from happening and hence render iron available to plants.

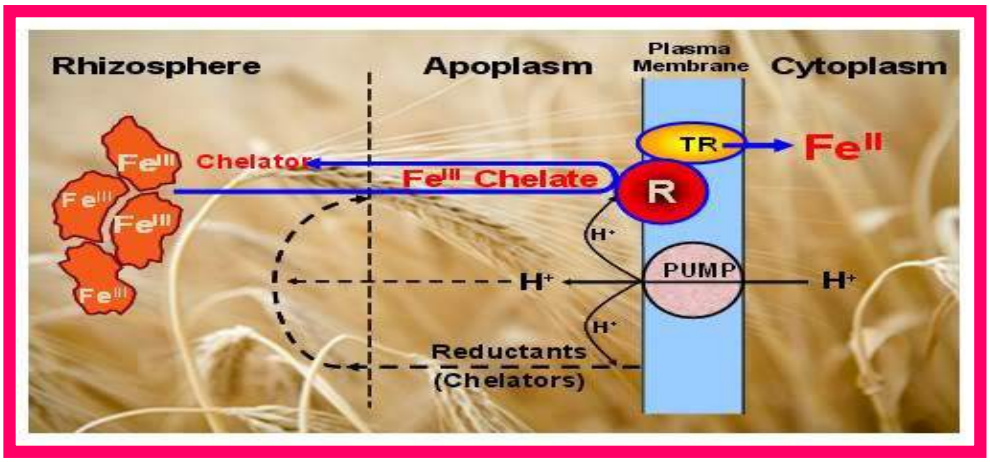

Fig. 1: Cycling of chelating Iron in soil

3. **Reduce toxicity of some metal ions to plants**

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Chelation in the soil may reduce the concentration of some metal ions to a non-toxic level. This process is usually accomplished by humic acid and high-molecular-weight components of organic matter. Brian Campbell in 2010 found that the organic matter application reduces the copper toxicity in tomato plants through chletaion

4. **Prevent nutrients from leaching**

Metal ions forming chelates are more stable than the free ions. Chelation process reduces the loss of nutrients through leaching

5. **Increase the mobility of plant nutrient**

Chelation increases the mobility of nutrients in soil. This increased mobility enhances the uptake of these nutrients by plants.

6. **Suppress the growth of plant pathogens.**

Some chelating agents may suppress the growth of plant pathogens by depriving iron and hence favor plant growth.

Table 3: Nutrient content of different chelating agents

Name	Nutrient content (%)	pH stability range
Iron EDTA	13	Acidic - neutral(1.5-6.5)
Iron EDTA	6	Slightly acidic- alkaline (1.5-6.5)
Iron DTPA	10	Neutral
Zinc EDTA	14	Acidic alkaline(2-10)
Copper EDTA	14	Acidic alkaline91.5-10)

Advantages of Chelates over Tradition Forms

1. The chelated forms of micro nutrients have a number of advantages over more traditional forms of trace elements such as oxides and sulphates.
2. Much lower quantities are necessary compared to inorganic compounds because they are completely assimilatable by crops. Chelates are thus cost effective even though they are a little more expensive.
3. Chelates are much more easily absorbed by plant roots or leaves because chelates are of organic nature. The chelation process removes the positive charge from the micro nutrients following the neutral or slightly negatively charged chelates to slide through the pores on the leaf and root surface more rapidly. Since these pores are negatively charged, positively charged micro nutrients would normally be 'fixed' at the pore entrance would be difficult to be assimilated by plants. When neutral chelated micronutrients are used there would be no such restriction barriers.
4. Chelates are more easily translocated within the plant as their action is partly systemic. Chelates are easily assimilated within the plant system.

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5. The chances of 'scorching' of crops while using chelates is less because they are organic substances.
6. Under alkaline conditions, chelated iron, zinc, manganese and copper is a better way to provide micronutrients to a crop.
7. Chelates are compatible with a wide variety of pesticides and liquid fertilizers, as chelates do not react with their components. Most chelates can be mixed with dry mixes and liquid fertilizers.
8. Chelates are not readily leached from the soil as they adsorb on to the surface of soil particles.

Conclusion

Addition of chelating agents to the soil can bring metals into solution through desorption of sorbed species, dissolution of Fe and Mn oxides, and dissolution of precipitated compounds. Important consideration in the application of chelating agents for soil remediation, include complexing power, selectivity, and recoverability of the chelators with respect to heavy metal contaminants. EDTA has been the best chelating agents for removing heavy metals from soil. Use of chelated fertilizers is a new approach towards increasing the nutrient availability in soil. Chelated fertilizers are less reactive to soil conditions and can significantly enhance nutrient uptake and utilization efficiencies.

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Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

An Alien Pest Threats to Maize – Fall Armyworm

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Introduction

Maize is known as the queen of cereals. In India, this is the third most important crop grown after rice and wheat. Maize is primarily grown throughout the year, especially 85% of maize is grown in kharif season. It is one of the main and popular cereal crops due to its high value as a stable food, as well as its stover demand for animal feed and fuel and even for construction purposes. It is hampered by a numerous borers and sucking pests. Recently, there is an introduction of a lepidopteran borer Fall Armyworm (*Spodoptera frugiperda*), FAW, into our country which is a devastating pest native to tropical and subtropical regions of the Americas, which is causing severe Economic damage. In India it is first observed in Shivamogga, Karnataka. FAW larvae can feed on more than 80 plant species, including maize, rice, sorghum, millet, sugarcane, vegetable crops and cotton. FAW can cause significant yield losses if not well managed.

Identification of the pest:

Egg: 100-200 eggs are generally laid on the underside of the leaves typically near the base of the plant, close to the junction of the leaf and the stem. Initially eggs are pale green or white at the beginning. Egg masses are covered with a coating of moth scales or fine bristles and turn clear brown colour before hatching. They hatch within 2 – 3 days.

Larva: Newly hatched caterpillars are green in colour during the1st – 2 nd instars and turn brown to black from 3^{rd} – 6^{th} instar. The larval stages last 12 to 20 days (depending on ambient temperature and other environmental conditions). They larvae are generally characterized by three yellow stripes on the back, followed by a black, then a yellow stripe on the side. Look out for four dark spots forming a square on the second to last segment (photo). Each spot has a short bristle (hair). The head is dark; it shows a typical upside down Y-shaped pale marking on the front.

Pupa: The pupa is reddish brown in colour and forms a cocoon of about 20 -30mm in length and is oval in shape mostly found in the soil in 2-8cm deep. Pupa lives 12-14 days before the moth emerges.

Adult: The moth is 3 to 4 cm wide. Its front wings are dark brown while the rear wings are grey white. It will live 2 to 3 weeks before dying. Males and females can be distinguished based on markings. Male moth has two characteristic marking that is a fawn coloured spot towards the centre and a white patch at the apical margin of forewing. Female is dull with faint markings. Usually a female moth lays over 100 eggs in single or multiple clusters

ISSN: 2582-6980

covered with hairs. . It can have several generations per year and the moth can fly up to 100 km per night.

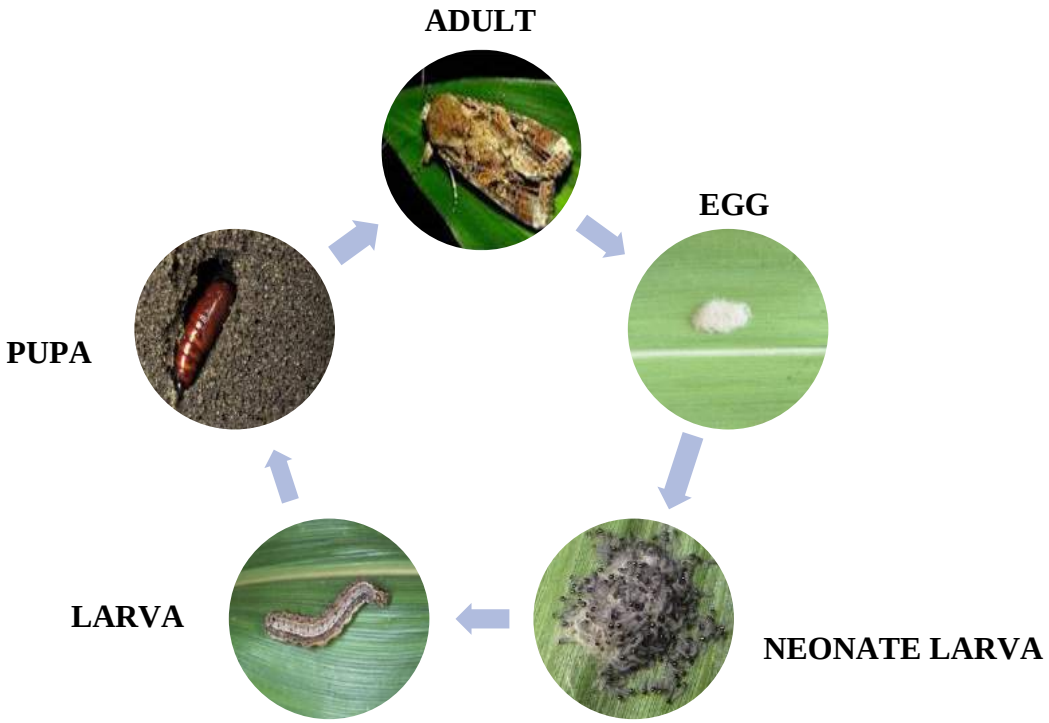

Fig. 1: Life cycle of fall armyworm, *Spodoptera frugiperda*

Symptoms of Damage:

The young larvae feed gregariously and damage the leaves by scrapping the epidermal layer of leaves leaving behind a silvery transparent membrane. Older larvae cause an extensive damage by feeding on the leaves and leaving behind only the midrib and stalks of the plant. The larva reduces the growth potential of plant by burrowing the growing point. Such as buds, whorls etc. of the host plant. The fall armyworm larvae may also burrow through the husk on the side of the ear of corn plant and feed on kernels. Cannibalistic nature has been observed in second and third instar larvae therefore, usually one or two larvae are present per whorl.

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Fig. 2: Infestation of *Spodoptera frugiperda* larvae attack on leaves of maize plants

Fig 3: Infestation of *Spodoptera frugiperda* larvae attack the ear of corn plant and feed on kernels.

Management Includes:

- Ploughing the field exposes the larvae and pupae thereby making the vulnerable to adverse environmental conditions and causing their mortality. Apply neem cake @ 250 kg/ha during last ploughing and treat seeds with Thiamethoxam 30 FS or *Beauveria bassiana* @ 10 g/ kg.
- Adopt spacing of 60 x 25 cm for irrigated and 45 x 20 cm for rainfed maize and rogue spacing of 75 cm for every 10 rows.
- Practice crop rotation. Alternate maize with crops that are not attacked by the fall armyworm e.g. cassava.
- Raise border crop of cowpea, sunflower or gingelly, and intercrop with black gram or green gram to attract and conserve natural enemies.
- Use solar light trap @ one /ha and sex pheromone traps @ 50/ha for mass trapping of adults from 10-15 DAS.

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- Release of the egg parasitoid like *Trichogramma pretiosum* and *Telenomus remus* will suppress the pest throughout the crop season.
- If case of high incidence, spray chemical insecticides such as
    - **Early whorl stage (15 – 20 DAS)** - Azadirachtin 1% EC 20 ml/10 lit (or) Thiodicarb 75 WP 20 g/10 lit • Emamectin benzoate 5 SG 4g/10 lit
    - **Late whorl stages (40-45 DAS)** - *Metarhizium anisopliae* 80 g/10 lit with 1 x 10^8cfu/g (or) Spinetoram 12 SC 5 ml/10 lit (or) Novaluron 10 EC 15 ml/10 lit
    - **Tasseling and cob formation stage (60 – 65 DAS) -** Flubendiamide 480 SC 4 ml/10 lit (or) Chlorantraniliprole 18.5 SC 4 ml/10 lit

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Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Use of Radio in Agriculture Information Dissemination

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Introduction

In developing countries like India, radio conquers a superior status because radio is the only electronic medium that can really be branded 'mass' where a large amount of the population can be reached and the listeners by and large possess the means to receive them. This is because of its flexibility, immediacy, immense potential and capacity to put out the programmes to cater the needs of national, local and rural commonalities and is the only medium which canclaim a reach to large section of population, living in remote community with no time lag overcoming the obstacles of illiteracy and economy and is therefore, a practical alternative in rural areas. No other medium has the potential to reach so many people so efficiently for information, education, culture and entertainment.

Radio- Medium for information dissemination

Radio is known to be the oldest information technologies, and most popular in the developing countries due to its accessibility and affordability. Many rural people own a radio, those who do not may access programming through family, friends, or neighbours. Traditionally, radio has been seen as a one-way communication tool, providing information, news, and entertainment to listeners. However, when integrated with other communication tools (eg: mobile phone) it can serve as a two-way platform for dialogue, to further discussions about topics that interest listeners, and to create entertaining and interactive programmes. For farmers, radio has the potential to help connect them to technical specialists, policy-makers, other farmers, suppliers, or buyers. Radio, and particularly participatory, demand-driven radio programming as a tool for extension, complements existing agricultural information systems that emphasise interaction among stakeholders (farmers, public and private knowledge brokers, market actors, researchers, policy-makers, the financial sector, etc.) where no single actor is the expert.

Radio of its flexibility, immediacy, immense potential and capacity to put out the programmes to cater the needs of national, local and rural masses is the only medium which can claim a reach to large section of population in rural areas overcoming the barriers of illiteracy.

All India Radio and Agriculture

All India Radio (AIR) began formally in 1936, as a government organization with clear objectives to inform, educate and entertain the masses.the firstsystematic attempt was made in 1956 for using radiofor disseminating latest agricultural technologies.AIR has

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stepped up its activities of Agriculture Broadcast with the launch Kisan Vani programme broadcasted from 96 stations across the country.

All India Radio observes 15th February as Radio Kisan Diwas over all its stations by mounting special programmes on the occasion for farmers and rural masses. Farm School on AIR provides intensive training modules on specific agricultural and allied subjects. Listeners of Farm School on AIR are registered for each of the specialized courses. All India Radio broadcasts programmes on agriculture and rural development in regional languages for farmers and rural masses through its regional station under its Farm and Home Unit.

Farm and Home Unit

Union Minister of Agriculture Bharat Ratna C. Subramaniam played an instrumental role in introducing Farm and Home Units at seven All India Radio (AIR) stations in the country. The objective condition to utilize the services of All India Radio was the launch of Intensive Agricultural District Programme (IADP), which aimed at providing a package of scientifically evolved and proven agricultural practices to farmers in selected districts of the country. It became imperative that the scheme be supported by strong agriculture information service. Programmes are designed based on the local day to day needs of the farming community incorporating latest information and technology for best agricultural output. The programmes are broadcast daily in the morning, noon and evening with average duration of 60 to 100 minutes per day for Rural Women, Children and Youth.

Farm school on AIR

Farm School on AIR was one of the most innovative devices based on intensive training modules on specific agricultural and allied subjects. The listeners were registered for each of the specialized courses. After undergoing the listening, the participating farmers were made to sit through an examination to ensure the extent of knowledge transfer. The successful trainees were rewarded with suitable prizes.

Strengths and weakness

Radio provides an open, two-way dialogue that is inclusive, accessible, and affordable. It has the potential to reach vulnerable and resource-poor communities, while also establishing a feedback and monitoring system through the use of other technologies. It provides an opportunity for information and resource provision at a large scale; yet can also be available in local languages.

There may be considerable variability in the capacities of radio stations to work closely with extension and other agricultural development actors. Many community stations may not have the means to sustain the programme beyond initial project duration or funding cycle. Commercial stations may not be trained in using the appropriate language for a farming audience. It certainly does not replace face-to-face interaction and is almost always more effective when it is a component of a larger extension and communications strategy.

Radio-based extension activities, particularly interactive programmes, can provide the following governance roles and services:

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Provision of feedback on government initiatives: Assistance in monitoring the uptake and impacts of government policies on land use, crop specialisation, etc. (including potential unintended consequences).

Feedback on land grabbing and land disputes: Radio can offer an inclusive and safe venue for discussing sensitive issues around land and land use changes between various stakeholders, particularly if listeners can contact the station anonymously.

Rapid information on natural disasters, food security, climate-related issues: In Liberia and Sierra Leone, local radio stations played a key role in delivering information to remote villages about Ebola prevention, while also tracking the rate and locations of infection, and advising where to seek treatment.

Conclusion

All India Radio provides extensive programmes on various subjects of interest to the rural farming community. Programme contributes in the promotion of Agriculture Food Production and development of Agricultural economy in the state.The Farm and Home broadcast is greatly helping the farmers in increasing their food production and improving their living standards. Broadcast of agriculture based programmes on FM radio may open new avenues of information inperi-urban and rural areas. Community radio also serves as a powerful information and communication tool to provide location specific information to rural farming community.

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Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Seed Borne Diseases of Groundnut

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***1. Tikka leaf spots**:*

- Early leaf spot: *Cercopora arachidicola* (Sexual Stage: *Mycosphaerella arachidis)*
- Late leaf spot: *Phaeoisariopsis personata* (Syn : *Cercospora personata*)
- (Sexual stage : *Mycosphaerella berkeleyii)*

Symptoms:

The disease occurs on all above ground parts of the plant, more severely on the leaves. The leaf symptoms produced by the two pathogens can be easily distinguished by appearance spot colour and shapes. Both the fungi produce lesions also on petiole, stem and pegs. The lesions caused by both species coalesce as infection develops and severely spotted leaves shed prematurely. The quality and yield of nuts are drastically reduced in severe infections.

Pathogen**: **C. Arachidicola

The pathogen is intercellular and do not produce haustoria and become intracellular when host cells die. The fungus produces abundant sporulation on the upper surface of the leaves. Conidiophores are olivaceous brown or yellowish brown in colour, short, 1 or 2 septate, unbranched and geniculate and arise in clusters. Conidia are sub hyaline or pale yellow, obclavate, often curved 3-12 septate, 35- 110 x 2.5 - 5.4 m in size with rounded to distinctly truncate base and sub-acute tip. The perfect stage of the fungus produces perithecia as ascostromata. They are globose with papillate ostiole. Asci are cylindrical to clavate and contain 8 ascospores. Ascospores are hyaline, slightly curved and two celled, apical cell larger than the lower cell.

P. personata (C.* personata*) (*Sexual stage: *M.* berkeleyii*)

The fungus produces internal and intercellular mycelium with the production of haustoria. The conidiphores are long, continuous, 1-2 septate, geniculate, arise inclusters and olive brown in colour. The conidia are cylindrical or obclavate, short, measure 18-60 x 6-10 m, hyaline to olive brown, usually straight or curved slightly with 1-9 septa, not constricted but mostly 3-4 septate. The fungus in its perfect stage produces perithecia as ascostromata which are globose or broadly ovate with papillate ostiole. Asci are cylindrical to ovate, contain 8 ascospores. Ascospores are 2 celled and constricted at septum and hyaline.

Favourable Conditions:

- Prolonged high relative humidity for 3 days.

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- Low temperature (20 C) with dew on leaf surface.
- Heavy doses of nitrogen and phosporus fertilizers
- Deficiency of magesium in soil.

Disease cycle:

The pathogen survives for a long period in the infected plant debris through conidia, dormant mycelium and perithecia in soil. The volunteer groundnut plants also harbour the pathogen. The primary infection is by ascospores or conidia from infected plant debris or infectd seeds. The secondary spread is by windblown conidia. Rain splash also helps in the spread of conidia.

Management:

- Remove and destory the infected plant debris.
- Eradicate the volunteer groundnut plants.
- Keep weeds under control.
- Treat the seeds with Carbendazim or Thiram at 2g/kg.
- Spray Carbendazim 500g or mancozeb 2 kg or Chlorothalonil 2 kg/ha and if necessary,repeat after 15 days.
- Grow moderately resistant varieties like ALR

2. Collar rot or seedling blight or crown rot (Aspergillus niger and A. pulverulentum)

Symptoms:

The disease usually appears in three phases.

i. Pre-emergence rot:

Seeds are attacked by soil-borne conidia and caused rotting of seeds. The seeds are covered with black masses of spores and internal tissues of seed become soft and watery.

***ii. Post-emergence rot*:**

The pathogen attacks the emerging young seedling and cause circular brown spots on the cotyledons. The symptom spreads later to the hypocotyl and stem. Brown discolored spots appear on collar region. The affected portion become soft and rotten, resulting in the collapse of the seedling. The collar region is covered by profuse growth of fungus and conidia and affected stem also show shredding symptom.

iii. Crown rot:

The infection when occurs in adult plants show crown rot symptoms. Large lesions develop on the stem below the soil and spread upwards along the branches causing drooping of leaves and wilting of plant.

Pathogen:

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The mycelium of the fungus is hyaline to sub-hyaline. Conidiophores arise directly from the substrate and are septate, thick walled, hyaline or olive brown in colour. The vesicles are mostly globose and have two rows of hyaline phialides viz., primary and secondary phialides.

Symptoms:

The conidial head are dark brown to black. The conidia are globose, dark brown in colour and produce in long chains.

Favourable Conditions:

- Deep sowing of seeds.
- High soil temperature (30-35° C).
- Low soil moisture.

***Disease cycle*:**

The pathogen survives in plant debris in the soil, not necessarily from a groundnut crop. Soil-borne conidia cause disease carry over from season to season. The other primary source is the infected seeds. The pathogen is also seed borne in nature.

Management:

- Crop rotation.
- Destruction of plant debris.
- Remove and destroy previous season's infested crop debris in the field
- Seed treatment with *Trichoderma viride* / *T.harzianum* @ 4 g/kg of seeds and soil application of *Trichoderma viride* / *T.harzianum* at 2.5kg/ha, preferably with organic amendments such as castor cake or neem cake or mustard cake @ 500 kg/ ha.

3. Root rot (*Macrophomina phaseolina)*

***Symptoms*:**

In the early stages of infection, reddish brown lesion appears on the stem just above the soil level. The leaves and branches show drooping, leading to death of the whole plant. The decaying stems are covered with whitish mycelial growth. The death of the plant results in shredding of bark. The rotten tissues contain large number of black or dark brown, thick walled sclerotia. When infection spreads to underground roots, the sclerotia are formed externally as well as internally in the rotten tissue. Pod infection leads to blackening of the shells and sclerotia can be seen inside the shells.

Pathogen:

The fungus produces hyaline to dull brown mycelium. The sclerotia are thick walled and dark brown in colour.

Favourable Conditions:

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- Prolonged rainy season at seedling stage and low lying areas.

Disease cycle:

The fungus remains dormant as sclerotia for a long period in the soil and in infected plant debris. The primary infection is through soil-borne and seed-borne sclerotia. The secondary spread of sclerotia is aided by irrigation water, human agency, implements and cattle etc.

***Management*:**

- Treat the seeds with thiram or carbendazim 2g/kg or *Trichoderma viride* at 4g/kg.
- Spot drench with Carbendazim at 0.5 g/lit.

4. Anthracnose (*Colletotrichum dematium* and *C. capsici)*

Symptoms:

- Small water-soaked yellowish spots appear on the lower leaves which later turn into
- circular brown lesions with yellow margin 1 to 3 mm in diameter. In some cases lesions enlarge rapidly become irregular and cover the entire leaflet, and extend to the stipules and stems.
- Brownish grey lesions occur on both the surfaces of leaflets. Infection spreads to stipules, petioles and branches.

Disease cycle:

- The pathogen is seed, soil and air-borne.

Management:

- Deep summer ploughing.
- Use healthy certified seeds.
- Removal of plant debris.
- Seed treatment with copper oxychloride at 3g/kg seed or carbendazim at 2g/kg seed.

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ISSN: 2582-6980

Role of Lysimeters in Estimation of Transpiration Efficiency in Millets

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Introduction:

Millets are group of small grained cereal food crops which are highly tolerant to drought and other extreme weather conditions and are grown with less water and chemical inputs such as fertilizers and pesticides. Despite these extraordinary traits millets are nutritious, environment friendly and climate change compliant crops. Millets fall under the group of C4 cereals with high efficiency of water use. Most of millet crops are native of India and are popularly known as Nutri-cereals and are gluten free and non allergenic. These are rich source of many vital nutrients and hence, promise an additional advantage for combating nutrient deficiencies in the third world countries.

Even after realizing the full irrigation potential, about half of the net sown area will continue to remain rainfed according to the report of the National Rain fed Area Authority (NRAA), enhancing scope for millet cultivation. As against the requirement of 5,000 litres of water to grow one kilogram of rice, millets need hardly 250-300 litres enhancing scope of these low water nutri-cereal cultivation. The rainfall requirement of certain millets like pearl millet and proso millet (*Panicummiliaceum*) is as low as 20 cm, which is several folds lower than the rice, which requires an average rainfall of 120–140 cm. Most of the millets mature in 60–90 days after sowing which makes them a water saving crop.

Transpiration Efficiency:

Passioura (1977) proposed that yield is a function of transpiration. Transpiration efficiency (TE) is defined as the biomass production per unit of water transpired. Water use efficiency is defined as the primarily production of biomass (frequently limited to above-ground biomass) or grain yield per unit of water use. Assuming that runoff and deep drainage are negligible, crop water use includes transpiration and evaporation from the soil. If soil evaporation can be prevented, water loss is only by transpiration and the biomass or grain yield per unit of transpiration is termed the transpiration efficiency (Fischer, 1981).

Lysimeters:

Lysimetric method has been developed (Ratnakumar and vadez, 2011) to measure evapotranspiration. This approach allows the monitoring of plant water use and biomass accumulation (both vegetative and grain) from very early plant stages until maturity and it allows extremely robust Transpiration efficiency assessments with very low experimental error. Using this system, transpiration is measured over almost the entire crop cycle, avoiding possible artefacts found in short-term experiments when there is high transpiration variation.

Description of lysimeters

Lysimeters are devices of tanks or containers with a specific boundary (Fig.1) to contain soil water and permit measurement of soil- water balance and helps to determine transport and leaching losses of solute and also for determining actual evapotranspiration and groundwater recharge. Lysimeters are weighable or non- weighable. Weighable lysimeters provide information about the change of water storage. In precision weighing lysimeters where the water loss is directly measured by change of mass, evaporation can be obtained with an accuracy of a few hundreds of millimeters and small time periods such as an hour is considered. Non- weighable lysimeters collect only the water percolating from the soil column and the evapotranspiration for a given time period is determined by deducting the drainage water, collected at the bottom of lysimeter, from the total water input.

Additionally, this system allows plant water use to be monitored at different times during the crop cycle. It is the best system that allows measurements of all terms of the Passioura equation of yield = WU × TE × HI conducted on the same plants and then allows the weight of each term on yield to be assessed where, WU = Water Use, TE = Transpiration Efficiency and HI = Harvest Index . Harvest index is the ratio of grain mass to above-ground biomass.

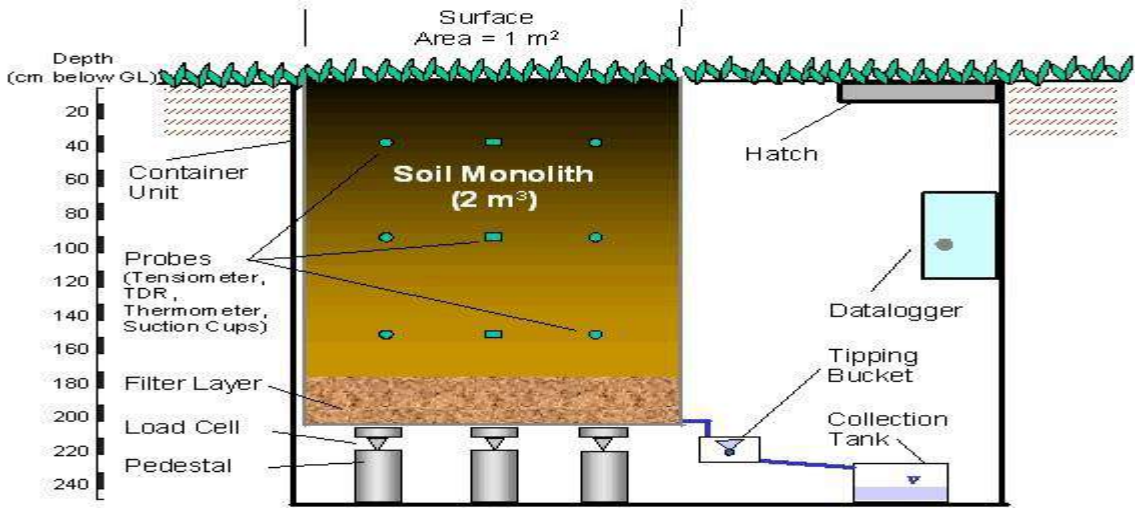

Fig. 1: Weighing Groundwater Lysimeter station

Brief Work Done In India and Abroad

David *et al*., (2010) concluded weighing lysimeters like WSREC (West Side Research and Extension Centre) lysimeters are useful tools for developing Kc curves in broccoli, lettuce and bell pepper in central California. They reported at midseason, when groundcover was greater than 70% - 90%, K_{cb} was 1.0 in broccoli, lettuce and bell pepper and developments of this new crop coefficients will facilitate irrigation scheduling and help to achieve full yield potential without over irrigation.

Meena and Rao (2015) conducted an experiment to quantify the seasonal evapotranspiration rate crop coefficient and crop water use efficiency of sesame under rain

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fed, 50% ET irrigated and 100% ET irrigated grown using weighing lysimeter in the arid region of India. They reported water use efficiency (WUE) was 2.15, 2.35 and 2.75 kg $ha^{-1}mm^{-1}$ under rain fed, 50% ET irrigated and 100% ET irrigated respectively and concluded WUE of sesame increased when irrigation water applied increased.

Gupta *et al*., (2017) conducted an experiment using weighing-type field lysimeters to determine single and dual crop coefficients Kc (this method allows to separate soil evaporation $K_e$and plant transpiration K_{cb}) and to estimate water productivity of mustard (*Brassica juncea*) cultivar, Pusa Vijay (NPJ-93) during *rabi* 2013–14 and 2014–15. Relationship between K_{cb}(transpiration component of K_C) and leaf area index as well as between K_{cb} and growing degree days was also established, for judicious irrigation scheduling in order to enhance water productivity in semi-arid environment.

Benefits of lysimeter:

- Crop coefficients can be derived
- Direct method that helps in measurement of actual evapo transpiration 3. Helps to determine irrigation scheduling and enhances water use efficiency Limitations of lysimeter:
- Difficult and expensive to construct
- Operation and maintenance requires special care
- Use is limited to specific research purpose

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Agri Mirror: Future India
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ISSN: 2582-6980

Paleoclimatology

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Introduction

The scientific study of climatic conditions, along with their causes and effects, in the geologic past. These conditions are reconstructed on the basis of evidence found in the geologic record, especially in the form of glacial deposits, fossils, sediments, and rock and ice cores. Past climate can be reconstructed using a combination of different types of proxy records. These records can then be integrated with observations of earth's modern climate and placed into a computer model to infer past as well as predict future climate.

Important of paleoclimatology

The science of paleoclimatology is important for past, contemporary, and future issues. Understanding past climate helps us to explain how current ecosystems came to be. For example, climate typically controls what types of vegetation grow in a particular area. Furthermore, paleoclimatology provides data that we can use to model and predict both current and future climate change scenarios. Computer models can be used to study the potential effect of increased atmospheric carbon dioxide on climate.

With a system as complex as Earth's climate, it is a daunting task for scientists to be able to make projections about future climate changes and how it may affect the distribution of plants and animals. However, paleoclimate data are used as a foundation for climate scientists by providing crucial information such as rates of past climate change and how vegetation and animal populations responded to the change. Computer models can be used predict different future climate patterns, and paleoclimate data provides a useful framework from which to base these models.

Ice Cores

Ice cores drilled in glaciers and ice sheets are used to investigate atmospheric chemistry, climate and glacier dynamics in the past. Precipitation that falls as snow in the polar regions, and at high altitudes in the tropical and temperate regions, if it survives summer warmth, is eventually transformed to glacier ice. Aerosols and soluble gases that are scavenged from the atmosphere by precipitation (wet deposition), or accumulate on the snow surface as dry deposition, are preserved within the ice. Atmospheric gases are also preserved in the form of air bubbles trapped within the ice. Ice cores are retrieved by means of a mechanical or thermal drill that cuts an annulus around a central, vertical core that is typically 10–20 cm in diameter and a few tens of meters to several thousand meters in length. If the

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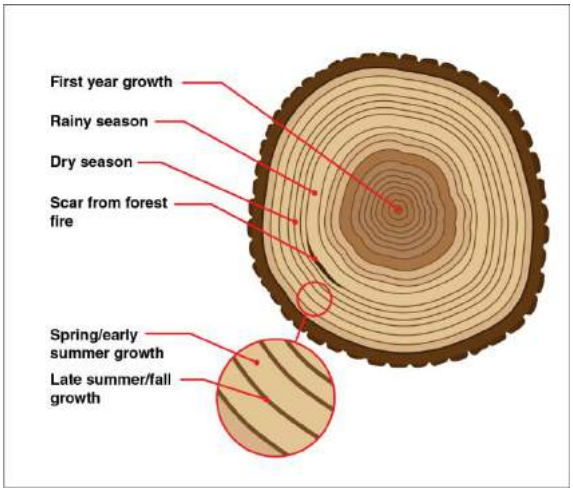
relationship between length along the core and time in the past is known, time-series of atmospheric composition can be derived. The best-known example is the record of carbon dioxide from Antarctic ice cores, which documents significant changes in concentration of this important greenhouse gas over the last several hundred thousand years of Earth history. Time-series have also been developed from ice cores for many other trace gases and aerosol species, and, indirectly, of atmospheric temperature, atmospheric dynamics, solar variability, and marine and terrestrial biogeochemical cycles. Because most of this information is unavailable from any other source, ice cores play a central role in our understanding of paleoclimate.

Tree rings

Trees can live for hundreds and sometimes even thousands of years. Over this long lifetime, a tree can experience a variety of environmental conditions: wet years, dry years, cold years, hot years, early frosts, forest fires and more.

If we observed tree stump, you've probably noticed that the top of a stump has a series of concentric rings. These rings can tell us how old the tree is, and what the weather was like during each year of the tree's life. The light-colored rings represent wood that grew in the spring and early summer, while the dark rings represent wood that grew in the late summer and fall. One light ring plus one dark ring equals one year of the tree's life.



Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Insect Intervention with Divine and Myth

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Introduction

Insects are important components of our ecosystem, as they act as decomposers, pollinators and offer many economic benefits. More or less human life style depends on belief and myth and thus people believe that happenings of something in their life are by god through insects. The intervention of god with insects are classified into two categories. First is that, god punishes humans with insects for their worst behaviour and second deals with the human's prayed god to reduce the problems of insect. Example, early Egyptians believed that god had punished people with insects by spreading plagues among them which was mentioned in the Bible. People are symbolically throughout the world's religions in a variety of roles. However, India possesses the world oldest religions and is an ancient mythogenic center whose mythologies have spread to other cultures over time. Cherry and Sandhu (2013) mentioned insects in the religions of India and believed in karma and reincarnation that, if ones bad deeds surpass the good deeds, one will be reborn as a foreigner, a bird, or even a reptile or insect. In Chinese mythology, different hells exist to punish offender for different crime. The sixth hell is ruled by Pien-ch'eng, who punishes those guilty of sacrilege. There are several variations of punishment here, one of which is being devoured by locusts. Noteworthy, there is much mythology relating insects to death. In fact, the very existence of death in humans has been blamed on insects. In Native American mythology of the California Yuroks, the locust "wished death into the world." The locust is also responsible for death in the mythology of the Wiyot of California (Cherry, 2011). This paper reports on insects found in the divine and mythology.

Divine and Myth

In the traditions of ancient Egypt, the soul moving after death is described by the "Book of the Dead". This ancient and mythological source is used for consultation after death for spells toward off numerous dangers, including giant beetles (Cherry, 2015). During ancient period locust have been major threat to people, who prayed for the control of locust in different gods in different cultures. In Greek, Zeus, Heracles, or Apollo and Zeus were gods in their mythology and their nicknamed "fly catcher". Pliny reported that during a festival in honour of Apollo, an ox was sacrificed to flies and a god of flies was invoked for relief from annoying flies. Even as, Baalzebub (Baal- Lord: Zebub- flies) god of the Philistine city of Ekron and called the Lord of Flies, because people are believed and thought to defend from

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plague. Noteworthy, the well-known example of the Mormon cricket miracle, noted by Waldbauer (2012) in this place more than 150 years ago when Mormons in the valley of the Great Salt Lake planted wheat. However, their crop was damage and destruction by wingless "katydids," now known as Mormon crickets. California gulls acted as predators from nearby marshes came to the rescue and ate the insects. In 1913, the Mormons commemorated this miracle by placing a monument topped with two gilded seagulls in Temple Square in Salt Lake City.

Golden statue of gulls at Salt Lake City commemorating their control of Mormon crickets (Cherry, 2015)

Table 1: Divine punishment using dipteran insects

Insect	Mythology	Occurrence
Fly	Bible	Jehovah sent fly plague to Egyptians
Fly	Native American	Lazy tribe punished by transformation into flies
Fly	Australian Aboriginal	Lazy tribe punished by transformation into flies
Fly	Native American	"Big Biter" harasses fishermen
Gadfly	Greek	Hera sent gadfly to harass
Gadfly	Norse	Loki transforms himself into gadfly to harass people
Gadfly	Greek	Gadfly stings Bellerophon on the winged horse Pegasus.
Mosquito	Native American	Mosquitoes are punishment for disrespectful woman (Cherry, 2015)

The Hindu view of God is of two types i) polytheistic and ii) monotheistic. Karma, reincarnation and the caste structure are core beliefs in both types. As vertebrates assume

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powerful roles, one of thing is gods, while insects are numerous in major roles. For few examples, Kali is the ferocious female world ruler who leaves death and destruction in her wake and is sometimes described with the epithet "The Bee" (Knappert, 1995). Bhramari Devi is called the goddess of the black bees. Bhramara means "relating to the bee". In Buddhism, originating in India, spread throughout Asia through missionary activity. Today, Buddhism thrives as one of the world's main religions, with 300 to 500 million followers worldwide (McDowell and Brown, 2009). According to the teachings of Buddha, killing insects and other creatures has karmic consequences and should be avoided whenever possible. Jainism of the six "great vows", that are central to Jainist belief, perhaps the most important is the concept of ahimsa (not harming), which extends even to insects because killing insects may have karmic consequences. This has resulted in several Jainist behaviors to avoid killing insects when possible. Water may not be drunk at night for fear of swallowing some unseen insect and masks may be worn to avoid inhale insects (Cherry and Sandhu, 2013).

The praying mantis is the god of the Hottentots in South Africa and has been blamed for the origin of death. The myth involves a series of mistakes resulting in mankind's loss of immortality. Several insects are correlated to death, especially when found in a house. For example, in Brazil belief, a cricket is said to announce death and is thus killed if it chirps in a house. Three species of moths in the genus Acherontia are called "death's head hawk moths" because of dorsal markings which resemble a human skull with thigh bones crossed beneath. The moths also make a squeaking sound associated with the anguished moaning of a child. This moth is thought to be an omen of coming evil or a forerunner of death. The cicada is a symbol for immortality, which probably derives from its desiccated appearance and long life span. For example, the ancient Chinese regarded cicadas as rebirth symbols. This is exemplified by cicada- shaped funeral jades (tongue amulets) used by the Chinese. These carvings were placed on the tongue of the dead person, apparently to induce resurrection by sympathetic magic. In Oraibi, believed that cicada had immortal powers and when mortal wounds were received in battle, a medicine made from these insects was used in the hope that it had powers of regeneration. Among insects, moths especially associated with the soul. In Polynesian mythology, a black moth is found as an emblem for the soul of man. To the Goajiro of Columbia, if a large white moth is found in the bedroom, it must not be mistreated, because it is the spirit of an ancestor comes to visit. If the moth becomes troublesome, it can be removed only with the greatest of care or the spirit may take revenge. Finally, we come to true insect spirits that one may encounter after death. Among the Hopi of the south-western United States, kachinas are friendly spirits who are counterparts for the real world. These kachinas are personified into carved figures called Tihu by the Hopi and incorrectly called "kachina dolls" by people unaware of the religious significance of the figures to the Hopi. Butterflies, assassin flies, crickets and hornets are found in kachina figures (Cherry, 2011). Clearly, insects abound in both the physical reality and the mythology of death in cultures around the world.

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ISSN: 2582-6980

Growth Retardants in Chickpea Cultivation

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Introduction

Pulses occupy a unique position in the Indian diet constituting one of the cheapest sources of vegetable protein for the vegetarian population of the country. It is known as poor man's meat and rich man's vegetable. Pulses also give nutritive forage and grain concentrates to feed the large cattle population in the country. There are also known to improve the soil fertility and consequently the productivity of succeeding crops (Jones, 1974). Chickpea (*Cicer arietinum* L.) contains about 21.1 percent protein, 61.5 percent carbohydrates, 4-5 percent fat, 0.49 percent lysine, 0.4 percent tryptophan and 0.11 percent methionine (Katiyar, 1982). It is also rich in calcium, phosphorus and iron. Besides this, chickpea's haulm is an excellent feed for cattle and grain concentrates are very much used for dairy cattle.

At present, the area under pulses in India is around 29.29 million hectares with total production of 25.23 million tons with the productivity of 841 kg ha^{-1}. Among the pulses, 11.23 million tons of chickpea grains is produced from an area of 10.56 million hectares with productivity of 1063 kg ha^{-1}.

Chickpea being a rainfed crop grown under residual soil moisture conditions undergoes many biotic and abiotic stresses which lead to poorer yields. The other factors that are responsible for the continued low yields in chickpea are unsatisfactory cultural practices, inconsistency of monsoon, low fertility in soils, insufficient quality seeds *etc*. Therefore, there is a need to standardize the agronomic practices for realizing the yield potential in chickpea. Since, chickpea is determinate in growth and twining in nature, but flowering occurs in flushes, the plant height has to be reduced so that the lateral productive branches can be produced. Hence, nipping is found to be an effective method to improve the productivity of Chickpea.

Nipping and growth retardants have been found to arrest excessive vegetative growth and make plants photosynthetically more effective. Nipping is an important operation, which includes the removal of the stem apex (2- 3 cm) or clipping of the terminal bud that leads to the initiation of the lateral buds to produce more lateral branches. This practice makes the good source and sinks relationship in the plant that eventually leads to the better demonstration of yield attributes. Sheldrake (1979) suggested that inter and intra competition between flowers and immature pods is the cause associated with flower and pod shedding. He further reported that pod filling was primarily determined by the combination and balance of endogenous plant hormones. This limitation on yield due to hormonal imbalance can be removed by exogeneous application of growth retardant.

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A growth retardant is a chemical which reduces the cell division and elongation in the shoot tissues and thus regulate the plant height physiologically. Mepiquat chloride (N, N-dimethyl piperidinium chloride) is a growth retardant, which is mainly used in cotton. This chemical restricts the synthesis of gibberellic acid so stem elongation is inhibited and promotes lateral buds. TIBA (2, 3, 5 - tri iodo benzoic acid) is a member of benzoic acids and it is an auxin polar transport inhibitor. It has a role as anti-auxins which in turn inhibits the apical dominance and give rise to lateral buds, hence, the number of branches will be increased.

Brief Work Done on Growth Retardants on Chickpea Production:

Aslam *et al.,* (2008) stated that in chickpea, nipping increased the number of pod bearing branches, total dry matter (7644.22 kg ha^{-1}) and maximum crop growth rate (11.77 g m^{-2} day^{-1}) at maturity. More number of branches was formed in nipped plots (13.8) while the control plot has less number of branches (10.34). Further, Reddy *et al.,* (2009) studied the effect of growth retardants and nipping on chlorophyll content and yield in cowpea variety C-152. The application of nipping and growth retardants at 35 days after sowing increased the chlorophyll content. Mepiquat Chloride at the rate of 500 ppm and 1000 ppm increased chlorophyll content which in turn increased the yield. Saiful and Nargis (2016) made an investigation to study the effect of different concentrations (10, 20, 30 and 40 ppm) of 2, 3, 5-tri iodo benzoic acid (TIBA) on a cultivar of chickpea (*Cicer arietinum* L.) grown during *rabi* season of 2015- 2016 and reported that 30 ppm TIBA if sprayed on chickpea plants could be positively effective for growth and development of plants with higher values of physiological characteristics. Similarly, high gross returns, net returns and benefit to cost ratio in detopped and mepiquat chloride (MC) applied at 250 ppm at 2 growth stages of soybean crop was reported by Manpreet *et al.,*(2018) and Bhavana *et al.,* (2019) reported that spraying of mepiquat chloride 250 ppm in horse gram recorded significantly higher yield (872 kg ha^{-1}), more number of branches (8.1), higher number of pods $plant^{-1}$ (54.85) and higher harvest index (0.233) followed by spraying of chlormequat chloride 250 ppm spray with a yield of 809 kg ha^{-1}.

Advantages Growth Retardants

- Retardation of senescence together with increase in concentrations of chlorophyll, protein and minerals
- Increase in transport of assimilates to seeds
- Promotion of flowering
- Increase in resistance to cold, heat, drought and disease.

Disadvantages:

- Surface application of growth retardants leads to delaying in plant response.

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Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Exploring Climate Consultant Version 6.0 in the Thiruchirapalli district of Tamil Nadu

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Introduction

The purpose of Climate Consultant is to plot climate data, organize and represent this information in easy-to-understand new ways that reveals the subtle attributes of the climate and its impact on built form (Milne*et a*l., 2007). The goal is to help users create more energy efficient, more sustainable buildings, each of which is uniquely designed for its particular spot on our planet (Bahoush and Salehabadi, 2018). In this study Climate Consultant was used in Thiruchirapalli District of Tamil Nadu in order to assess the Building energy implications of Climates. It is one of the Pioneer studies in India to use Climate Consultant software. This study is mainly used for the construction of buildings based on the results of climate analysis.

Materials and Methods

Software

In this study Climate Consultant software Version 6.0 was used for Climate data analysis

EPW Climate Data

EPW (Energy Plus Weather) data is provided by the US Department of Energy. Each EPW climate data file contains hourly data for all 8760 hours per year (Moazami *et al*., 2019). These files were assembled by climatologists from actual months of recorded data for that site. Although the months might be selected from different years, the objective was to make the average temperatures for the EPW data year match the long term average data for the site. Where possible the record temperatures in the EPW file matched the average highest and average lowest temperatures in the long-term statistics(Moazami *et al*., 2019). To prevent jumps in the data between months, special statistical smoothing functions were used to modify data for three days at the end of each month and the beginning of the next. This approach tries to preserve the unique patterns of actual data, sequences of extremes data, and recurring weather patterns (Hughes et al., 2019). Recorded long term radiation data is rarely available for most sites so instead is calculated.

Results

Temperature Range:

In the Temperature Range Chart (Fig.1) the Record High and Low Temperatures (round dots) are the highest and lowest Dry Bulb Temperatures in each month or over the full year in the

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EPW file. Note that they are probably not the all-time record high for that site but rather represent the average of the annual record highs. The single bar on the right hand side shows the Annual Design High or Low Temperatures (top and bottom of green bars). They are used to calculate the size of the heating and cooling equipment, and are defined on the Criteria screen as a percentage of hours not met per year. In Thiruchirapalli district the Annual maximum and minimum temperature values ranges from 65^{o}F to 105^{o}F . The maximum and minimum temperature peaks during the month of April and less deviation was observed during the month December. Based on the results obtained the building planning can be made in Thiruchirapalli district

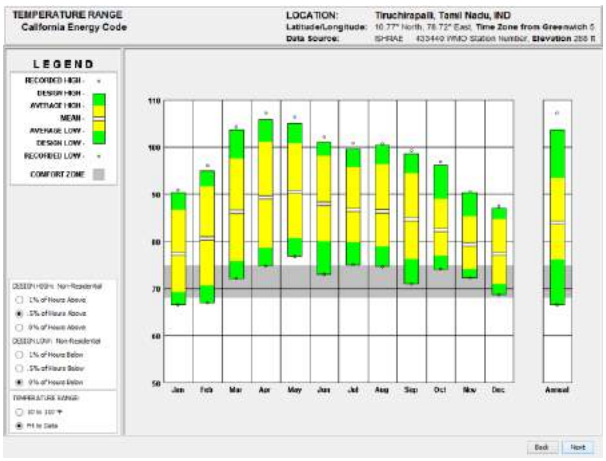

Fig.1: Temperature Range of Thiruchirapalli district of Tamil Nadu

Sun Shading Chart

On this Sun Shading Chart (Fig.2), the yellow dots indicate comfort conditions when the dry bulb temperature is within the comfort zone as defined on the Criteria Screen. Red dots indicate overheat conditions when the dry bulb temperature is above the top of the comfort range. Blue dots indicate underheat conditions when dry bulb temperatures are below the bottom of the comfort zone. In Thiruchirapalli district it is observed that maximum red dots scatters in most of the time which indicates over heat conditions prevails over the entire area. The occurrence of yellow dots found to be very meagre in the area of the Thiruchirapalli district.

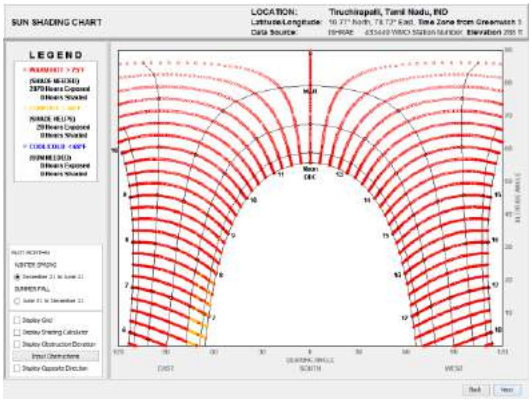

Fig. 2: Sun Shading Chart of Thiruchirapalli district of Tamil Nadu

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Sun Chart

The yellow dots indicate comfort conditions when the dry bulb temperature is within the comfort zone. Red dots indicate overheat conditions when the dry bulb temperature is above the Comfort High Temperature. Blue dots indicate underheat conditions when dry bulb temperatures are below the Comfort Low Temperature. From the Fig 3. It is clear that the comfort condition prevails in Thiruchirpalli district during 6 to 9 hours and evening hours.Remaining hours are fully scatters with Red dots.

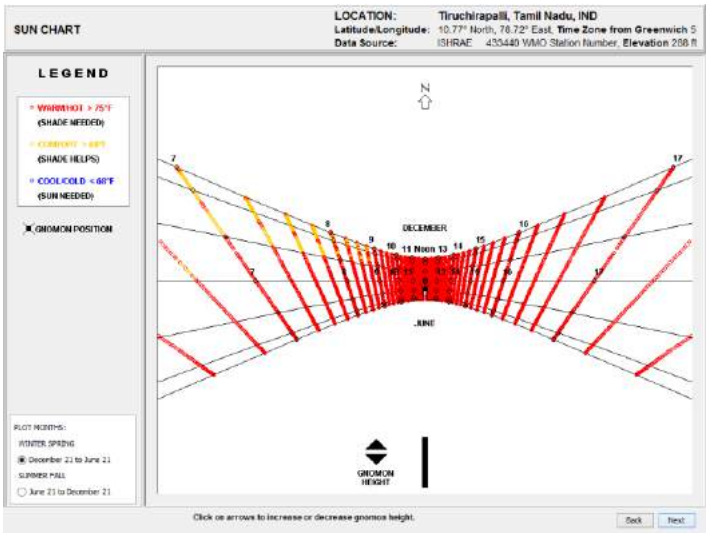

Fig. 3: Sun Chart of Thiruchirapalli district of Tamil Nadu

Time Table Plots

The units for each variable in Time table chart as shown in Fig 4.Indicated that in the upper left, divided into five different ranges in colors from blue to red. The percentages of hours during the year that fall in each range are also shown in Fig 4. It is clear that Comfort condition prevails in Tiruchirapalli district during the month of January, February and December. In these months the temperature ranges from 68 ^{o}F to 75^{o}F respectively.

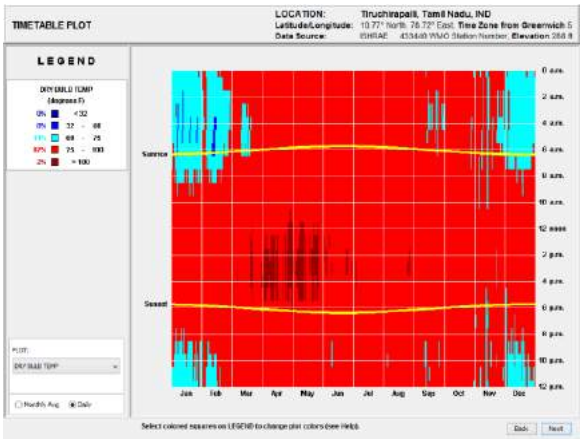

Fig. 4: Time Table Plots of Thiruchirapalli district of Tamil Nadu

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Psychrometric Chart

In the Psychrometric Chart each of 13 different building design strategies can be represented as different colored zones on the chart. To display this data select the 'Display Design Strategies' option in the lower left.The Table of Effective Design Strategies (Fig.5) will be displayed in the upper left. It shows the number of hours and the percentage of time that falls within each strategy range. It is clear that the Chance of occurrence of Comfortable condition prevailed in the Thiruchrapalli district is 15.3% through the natural ventilation. Almost about 78.8% comes under Not comfortable conditions. Remaining conditions are also Prevailed in the Thiruchirapalli district as shown in the Fig.5.

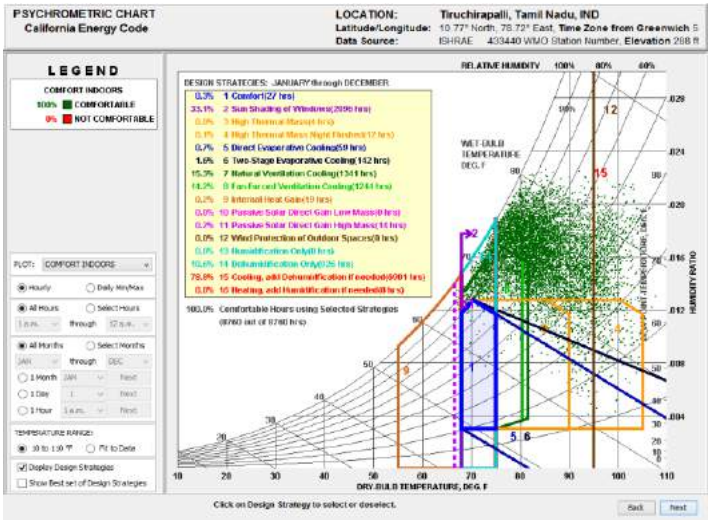

Fig. 5: Psychrometric Chart of Thiruchirapalli district of Tamil Nadu

Wind Wheel

A unique way of representing wind data has been added to Climate Consultant 3.0. It shows on one screen a number of different interacting variables (Fig.6). The outermost ring (brown) shows the percentage of hours when the wind comes for each direction. On the next (blue) ring the height and color of the radial bars shows the average temperature of the wind coming from each direction (light blue is in the comfort zone). The next ring shows average humidity (light green is considered comfortable). The three triangles in the innermost circle show the minimum, average, and maximum velocity of the winds from each direction; in this case the fastest wind comes from the south southwest and reaches 45 miles per hour. The reults revealed that maximum amount of wind flow occurs during the month of June, July and August.

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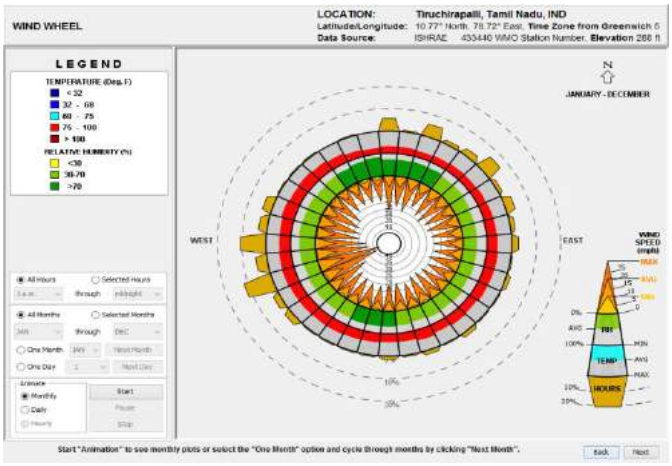

Fig. 6: Wind wheel of Thiruchirapalli district of Tamil Nadu

Conclusion

The Results revealed that the Annual maximum and minimum temperature values of Thiruchirapalli district was ranged from 65^{o}F to 105^{o}F . According to the psychrometric chart the comfortable condition prevailed in the Thiruchrapalli district is 15.3% through the natural ventilation. Almost about 78.8% comes under Not comfortable conditions. Based on the climatic results obtained from the Climate Consultant software the energy efficient and sustainable building planning can be planned in the Thiruchirapalli district of Tamil Nadu.

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Agri Mirror: Future India
Vol 1 Issue 8: December 2020
ISSN: 2582-6980

Innovative ICT Based Learning Strategies: Solutions to Present Pandemic Situation

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Introduction:

ICT is alchemy of mixing technology and education. It is a digital tool that uses technology to enhance and optimize the delivery of information. In a world where everything has become increasingly digital, technology helps in being more productive than our former ways. Digital tools are the basic keys that rely on wireless technologies and internets which keep us connected and enable exchange of information.

"If we teach as we taught yesterday, we rob our children of tomorrow"

E-Learning:

- E-learning is a strategy to access educational curriculum outside of a traditional classroom. Virtual classroom programs enhance participant learning and retention.
- Virtual Classrooms: A synchronous form of e-learning has been embraced by many organizations in their attempt to promote workforce learning while trying to cuttravel time and costs associated with face-to face instructor led sessions.

Devices/Technology in ICT:

- Digital repositories [digital libraries]
- Using gadgets [tablets, mobiles and laptops]
- Flipped classroom concept.
- Online/ cloud based academic management.

1. Digital Libraries:[e-books, journals, quizzes, videos]

It is a revolutionary concept of replacing our textbooks with our tablets. Digital library aids in research and instructional content readily available in digital formats compatible with current technology and tools.

2. Using Gadgets:

Laptops and tablets are the most important tech tools for virtual learning as they substitute for your class presence. These gadgets aid in mobility and with specific features tailored for more efficient energy usage and storage. The main specifications include

- Operating system
- Display
- Memory

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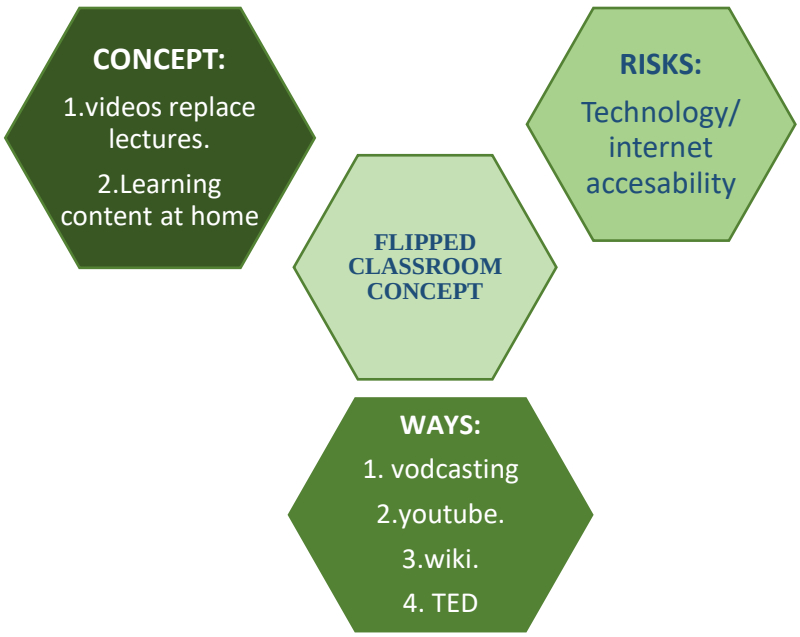
- Processor
- RAM

3. Flipped Classroom Concept:

A type of blended learning where students are introduced to content at home.



4. Online Academic Systems:

Online institutions ensure that the whole curriculum is designed to make the most out of an individual's learning experience.

- Individual assignments.
- Discussion activities.
- Journal activities.
- Virtual exams with monitoring soft wares.

Role of ICT in Agriculture and Allied Activities:

- Agriculture, Aquaculture and their allied activities are the major occupations in India yet the major portion of farmers are in debt due to poor infrastructure and lack of access to relevant information contribute greatly to this.
- Low incomes, a bleak future and stress are compelling farmers to leave their traditional occupation.
- In the 1960's biotechnology has led the transformation that came to be known as Green Revolution in the agricultural field and Blue Revolution in the aquaculture field. Ever since then, no major changes have happened for any technical advancements in these sectors.

Information Used By Farmers:

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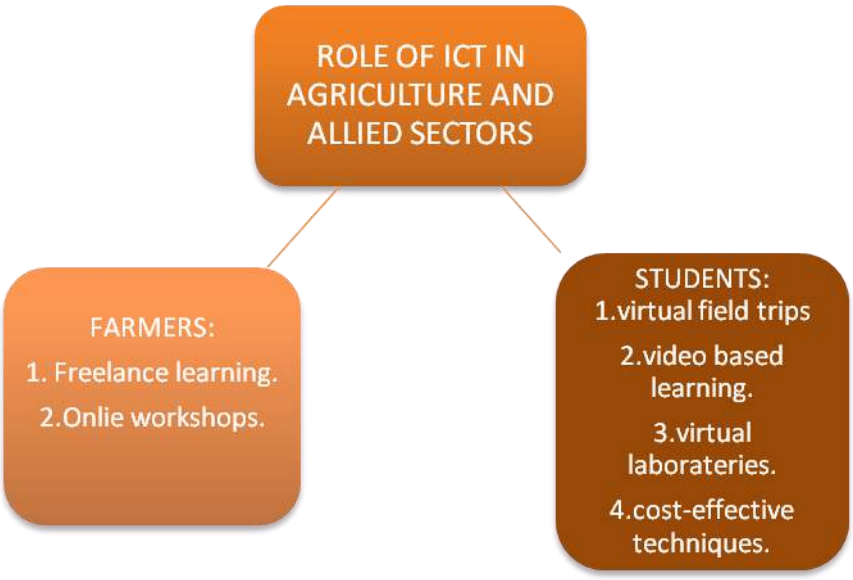
- Fertilizers and pesticides.
- Weather forecast.(through satellites)
- Crop diseases.
- Seasonal infestations.
- Soil and water nutrient status.
- Advanced irrigation technology.



Overcoming the Problems:

Compilation of data in a farmer friendly-medium and a tool to connect with farmers with all the data would be a reliable solution.

- Conducting virtual classes on 'TRANSFER OF TECHNOLOGY' concepts enables farmers to learn about new concepts.
- Mobile applications have been developed for farmers in all the languages and domains has been a recent advancement of 'SOLUTIONS AT FINGERTIPS'
- New digital tools surpass language barriers and can be adopted by remote and rural farmers to adapt to advancements in technology and be more productive.
- "Cost and time" can be efficiently utilized via virtual learning mode for more intellectuality and enhancing imagination ability.

"Everything has advanced from automobiles to technology from the past but the classroom has been the SAME"

Sustainability: Another major factor to be taken into account is 'OVER FISHING' and '*Deforestation*' practices detected through satellite technologies predict that by 2048 all the wild fish population and the forest lands will be collapsed.

Challenges during Pandemic:

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- Education has changed dramatically, with the distinctive rise of e-learning, where by teaching is undertaken remotely and on digital platform.
- Research suggests that online learning has been shown to increase retention of information and even takes less time.
- Students without reliable internet access or technology struggle to participate in digital learning.
- To get full benefit of online learning, there needs to be a concerned effort to provide this structure and go beyond replicating a physical class through a range of collaboration tools and engagement methods that promote 'inclusion, personalization and intelligence' without getting them distracted.

The Future of Farming with ICT:

In the next decade, we need to double the amount of food we now produce. Agricultural and allied activities sector has undergone major changes over the last century. From using primitive tools to highly advanced mechanizations have for producing the basic commodities had positive impacts on our lives.

Recent Major Equipments in Acting in ICT:

- In the field of *Robotics*- Using *Drones* for analyzing water and land parameter qualities. Removing weeds and harvesting has been a recent trend in 2020. These advancements replaced pesticides with drones.
- Modern methods can reduce the harmful impacts of pesticides with these advanced technologies.
- Using Laser beam technology for horticultural purposes in removing weeds and other pathogens by monitoring in digital devices without even entering the crop field.
- Using *Smart Phone* devices for monitoring the physical and chemical parameters of the field with the help multi-spectral cameras employed. These cameras transfer visual and thermal information to the connected devices thus analyzing the vital information.
- Using Blue and red wavelengths of lights to produce *Artificial Photosynthesis* as a climate replication technique.
- Satellite Cubes are sent to space to monitor agricultural lands and aquaculture.
- A fit bit for farm animals such as poultry and cattle is another technique for regulating their checks digitally.
- *Satellite Weather* information can be collected and employment for *Permaculture* which stores rain water and can be used for future use.
- *Aquaculture*
- Building an artificial ocean ecosystem and monitoring their control and growth with digital techniques has been another landmark of technological development.

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Conclusion:

Technology is what brings our '*Textbooks to Life'*. Virtual learning enables both the students and farmers to go beyond imagination. *Agriculture* is the primary source of livelihood for about 58% of India's population and providing the aspiring farmers and students with technical knowledge and advanced learning concepts can be a turning point for our future generation.

"Feeding the world will be one of the greatest challenges of 21st century, it will be impossible without using scientific advancements and biotechnology for our growing population."

There exists a digital divide of misconception that ICT solutions are only meant for the urban areas needs to change because more than half of our population relies on rural allied activities. Governmental organizations should play a pivotal role in changing the situation.

"So an industry that feeds you is an industry worth fighting for."

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