VyaVas

ABSTRACT

When it comes to pollution and climate change, the environment and agriculture suffer the quickest and with the clearest consequences. If effective changes aren't made, climate change's impact on agriculture will decimate a country's economy and eventually wipe out the food supply. Also increasing the risk of diseases, pests, insects, and weeds make it necessary to manage the crop properly to get a good yield and quality of crops. Healthy agriculture is so essential to a country's well-being, it's been the setting of some of the most exciting innovations in technology. Through artificial intelligence, blockchain software, gene manipulation, and more, scientists and farmers have been figuring out ways to increase crop productivity, use less water, and reduce negative impacts on the environment.

This project aims in designing and developing an agriculture application that provides deeper insights on the crops they grow, their health, weather, pesticides, fertilizers, market demand, various government schemes on agriculture, disease detection methods to the farmers, where the data is collected through sensors from the farms. Also, it intends to assist farmers in learning about the latest agricultural trends which is a need in the current fast-changing world to yield better production in the agricultural sector.

The agricultural data aggregated through the IoT devices with atmospheric and environmental sensors are utilized to predict and analyze the growth and status of the plant and its health. Suggestions and solutions to various problems faced by the farmers are provided in time to avoid any mishap. These suggestions are provided to the farmers in their native language as they may not be as educated to use a smartphone application efficiently. The implementation of a virtual assistant to voice out these suggestions is a method to efficiently involve the farmers to use the application consistently. This can certainly help the farmers who have been in the field for a while but do not know how to combine the existing agricultural practices with modern technology.

MOTIVATION AND BACKGROUND

The biggest hurdle faced by people nowadays who do as well as who want to do farming is no proper guidance and accessibility to technology and modern methods. We now have lots of information about farming, irrigation methods, types of fertilizers, pesticides, weedicides, and many more. But the problem is when it comes to agriculture it is completely different for different places. A technique used by a farmer in the same villages can be different. This is because of the variability in places, weather, water level, etc. So we decided to provide suggestions that are area-specific and also since it is automated the reliability level is high. Also taking into account that all farmers are not comfortable in using applications, this app provides a virtual assistant which interacts with the farmer in their preferred language. It guides the farmer right from the preparation of land till the harvesting period and also introduces new and effective methods that can be adopted for better production. So it acts as a good starting point not only for full-time farmers but also for those who are passionate about farming and have urban farms nearby. Since it takes into account the weather conditions, it helps farmers prepare for adverse conditions beforehand to protect their production and themselves.

Who this is for?

Farmers who are already in this field can take maximum advantage since they are aware and knowledgeable on farming and this analytical approach can guide them to better productivity. New farmers i.e beginners who plan on contributing their full time to farming, can use this app as a reliable guide. Also, people who have small farms or gardens can use this app.

AGRICULTURAL PROCESS

Agriculture plays a chief role in the economy as well as it is considered to be the backbone of the economic system for developing countries. For decades, agriculture has been related to the production of vital food crops. The agricultural cycle is the annual cycle of activities related to the growth and harvest of a crop (plant). These activities include loosening the soil, seeding, watering, moving plants when they grow bigger, and harvesting. Without these activities, a crop can't be grown.

The main steps for agricultural practices include

- **Crop Selection**

  Different crops need different types of soils, varying amounts of nutrients, and water. The amount of water required by the plant is also dependent on the growing season and the climate where it is grown. Crop selection involves the selection of the right crop for the given soil conditions and climate, to optimize yields and save water requirements for irrigation.

- **Field Preparation**

  Before raising a crop, the soil in which it is to be grown is prepared by plowing, leveling, and manuring. Plowing is the process of loosening the soil. This helps in the proper aeration of the soil. After plowing, the soil is distributed evenly, leveled, and then manured.

- **Sowing**

  The selection of seeds of good quality crop strains is the primary stage of sowing. After the preparation of soil, these seeds are dispersed in the field. Sowing can be done manually, by hand, or by using seed drilling machines. Some crops like paddy are first grown into seedlings in a small area and then transplanted to the main field.

- **Irrigation**

  Irrigation is the supply of water. Sources of water can be wells, ponds, lakes, canals, dams, etc. Over irrigation may lead to waterlogging and damage the crop. This frequency and interval between successive irrigation need to be controlled.

- **Adding manure and fertilizers**

  Crops need nutrients to grow and produce yield. Thus, the supply of nutrients at regular intervals is necessary. Manuring is the step where nutritional supplements are provided and these supplements may be natural or chemical compounds. Manure is the decomposition product of plant and animal wastes. Fertilizers are chemical compounds

consisting of plant nutrients and are produced commercially. Apart from providing nutrients to crops, manure replenishes soil fertility as well. Other methods for soil replenishment are vermicomposting, crop rotation, planting of leguminous plants.

- **Harvesting and Storage**

  Once the crop is matured, it is cut and gathered. Followed by harvesting, grains are separated from the chaff either by threshing, or manually on a small scale(winnowing). Grains yielded are stored in granaries or bins at godowns for later use or marketing. To protect grains from pests and rodents - cleaning, drying, fumigation, etc., are done before storing.

- **Marketing**

  Agricultural marketing covers the services involved in moving an agricultural product from the farm to the consumer. These services involve the planning, organizing, directing, and handling of agricultural produce in such a way as to satisfy farmers, intermediaries, and consumers.

FARMERS AND AGRICULTURALISTS CHALLENGES

Adequate Infrastructure for Irrigation

Water availability in India is more than sufficient to irrigate all cultivation areas; the problem is that we still have to find cheap and suitable solutions to utilize such enormous water supplies. Due to several reasons, farmers either don't receive the appropriate amount of water or don't get the supply on time; many farmers rely on rainwater for irrigation.

Lack of Modern Equipment

Even in 2020, the majority of Indian farmers use traditional tools for agriculture such as plow, sickle, etc. This leads to the wastage of energy and manpower and less yield per capita labor force. Only little use of the machine is seen in irrigation, harvesting, and transportation. There are two reasons why farmers are not using modern equipment. First, they are not aware, and second, they can't afford such equipment.

Even if a farmer can afford the equipment, sometimes there is the unavailability of electricity 24*7 in the village areas.

Lack of Knowledge of Organic Farming

Most of the farmers rely on either traditional farming techniques for wide-area farming and end up using an excess amount of pesticides and insecticides making it unhealthy for human consumption.

Market Demand and Pricing

We often see in the news that farmers throw their crops on roads just because no one purchased them. Due to the absence of mandi houses and proper marketplaces, farmers are not able to sell their crops and get a reasonable price. The middlemen not only create problems for farmers but also for consumers because they ultimately sell the crops at a very high price after purchasing them from farmers.

Fertilizers and pesticides control

Indian soils have been used for growing crops over thousands of years without caring much for replenishing. This has led to the depletion and exhaustion of soil fertility resulting in their low productivity. The average yields of almost all the crops are among the lowest in the world. This is a serious problem that can be solved by using more manures and fertilizers.

Lack of support during a tough situation

The government brought agricultural debt waiver and debt-relief schemes in effect to benefit over 36 million farmers. The scheme also covered direct agricultural loans to stressed farmers. However, most of such welfare programs and subsidies announced by both the central and state governments are yet to reach poor farmers, while big/wealthy landlords are hugely benefited.

Scarcity of capital

Agriculture is an important industry and like all other industries, it also requires capital. The role of capital input is becoming more and more important with the advancement of farm technology. Since the agriculturists' capital is locked up in his lands and stocks, he is obliged to borrow money for stimulating the tempo of agricultural production.

Storage and selling

Storage facilities in rural areas are either totally absent or grossly inadequate. Under such conditions, the farmers are compelled to sell their produce immediately after the harvest at the prevailing market prices which are bound to be low. Such distress sale deprives the farmers of their legitimate income.

Inadequate transport

One of the main handicaps with Indian agriculture is the lack of cheap and efficient means of transportation. Even at present, there are lakhs of villages which are not well connected with main roads or with market centers.

MOBILE / ICT TOOLS IN AGRICULTURE

- Voice assistant to communicate with the farmer
- Daily Data analysis through AI system
- Agriculture Information, Awareness, and Education using ICT.
- Advanced information about adverse weather conditions, so that farmers can take precautionary measures.
- Real-time and near-real times pricing and market information.
- Information dissemination about various government schemes.
- Information regarding agri-finance, agri-clinics, and agri-business.
- Online Farmer Communities

EXISTING APPS FOR FARMERS

Uzhavan :

- Farmers need to be more 'smart' to reap the benefits of the Uzhavan app
- Weather forecasts are not dynamic and updated.
- Agricultural updates are not area-specific.
- Forecasts and reports are based on villages and not on a plot.
- No speech system is available.

Modules :

- ➢ SCHEMES: shows available schemes in all departments
- ➢ Shows fertilizers and seed stock in the district
- ➢ AGRICULTURE NEWS: Displays local news on agriculture
- ➢ PEST/DISEASE/MONITORING: image recognition of plant diseases
- ➢ ORGANIC PRODUCTS: Information on farmers practicing organic farming
- ➢ FARMER OFFICER CONTACT PROGRAM: provides details on officers of the corresponding taluk.

Bharat Agri:

- Regular basis analysis is not done
- Automation and Visual dashboards are not available
- Not available in regional languages
- Cannot access the exact location of the farmland
- Special announcements for premium members
- Need to have the proper knowledge to use a smartphone application
- No speech system is available.

Modules :

- ➢ ADD FARM: provides the option to access recommendations and suggestions for the particular crop added to the 'farm'.
- ➢ FEED: providing the recent news and schemes from the government and also offers available on the app.
- ➢ WEATHER: Average weather report for the accessed location.

➢ KRUSHI BOOK: cultivation methods of various crops and plants.

➢ CHAT: the helpline support.

Fasal **:**

- The login process is hectic and tiring

- Very slow in loading the application

- Not a user-friendly application

- Special features for users who buy the application

- No speech system is available.

Modules:

➢ PLOTS: Add details of a crop grown on the particular plot and the activities done there like spraying, sowing, etc.

➢ MENU: Having sub-modules for farm inventory, disease management, pest management, harvested crops, crop alarms, etc.

➢ HELP: A user guide to the Fasal app.

AgriApp:

- Uses all user-entered details

- Provides links to blogs, videos, and other resources for farming guidance

- A platform to buy chemicals and types of equipment for farming requirements, but general users complain about the pending status update and failed transactions.

Modules:

➢ Platform to buy farming related equipment and products

➢ WEATHER: weather forecast for block

➢ NEWS: Local news on agriculture

➢ Link to blogs and videos related to agriculture

PROPOSED MODEL

Modules / Features

1. Automated Crop Recommendation system:

    An automated system that accesses a Farmer's location, collects data, and suggests suitable crops.

2. Virtual Assistant by the Expert -Consultation, Maintenance, and Guidance :

    A Virtual assistant, which communicates with farmers' preferred language and provides guidance and consultation.

3. Awareness Videos, Current Technology, Announcement of Govt. Schemes :

    A section, where various latest methods efficient for farming, latest machinery technology, details about various Government schemes and a lot more information will be provided for farmer's benefit.

4. Market Price Prediction:

    To acknowledge farmers about the possible demands and prices of crops.

5. Machinery and Equipment Portal

    To make available, the low-cost machinery from nearest locations

CASE STUDY

The questionnaire can be prepared based on these questions

- Usage Of Mobile Phone:

  Do they have smartphones or normal phones?

  How Regularly do they use mobile phones?

- Cultivation Method

  What are the past cultivations?

  Are past crops profitable to them? (With Profit Amount)

- Types of soil

  What types of soil are available there?

  Do they have enough water for irrigation for given soil?

- Weather

  What kind of crop do they grow (Weather Respective)

  Do they face difficulties regarding weather predictions

- Seed quality

  From where do they buy seeds? Do they buy seeds suitable for that soil? Or they are buying it because they were said to buy it.

  Is this the same case with fertilizer and pesticides for plant growth and plants with diseases respectively?

- Government schemes

  Do they get to know about all govt schemes?

  On avg, how many schemes do they apply annually?

- Buyer information

  Where do they sell their products?

  Do they get a good profit from it?

- Market rate

  Are they aware of market prices when they sell their products?

Do they have any idea of what all crops will be in demand for a given time?

- Current Demand

  Do they have any idea of what crops can be grown concerning current demand?

- Modern techniques

  Are they aware of modern techniques and machines used for farming?

- Awareness about other types of farming

  Are they aware of organic farming, vertical farming, hydroponics, and so on?

  Do they do any one of the above farming?

CONCLUSION

Agriculture plays a chiefly role in the economy and it is considered to be the backbone of the economic system for developing countries. In India, around 70% of the population relies on the agricultural sector for their livelihood, especially in rural areas. However, due to drastic climatic changes and other factors, the farmers are unable to produce their maximum yield. The rise of digital agriculture and its related technologies has opened a wealth of new data opportunities. Remote sensors placed in farms can gather information 24 hours per day over an entire field. These can monitor plant health, soil condition, temperature, humidity, etc. The idea is to allow farmers to gain a better understanding of the situation on the ground through advanced technology (such as remote sensing) that can tell them more about their situation than they cannot see with the naked eye. And not just more accurately but also more quickly than seeing it walking or driving through the fields. Then this data is made useful through a series of processes and the insights are made available to the users through the dashboard and virtual assistant. Using these farmers can achieve a better harvest through making better decisions in the field.