

AGRO -VISION: ANDROID BASED SOLUTION FOR REGIONAL FARMING

Rajesh S. Jagtap¹, Vijay D. Patil²

¹Dept. of Computer Engineering, ²Assistant Professor, Dept. of Mechanical Engineering
Maharashtra Academy of Naval Education and Training, Pune-412201.

Abstract: Farmers faces a number of problems in the domains of agriculture like improper and insufficient scientific knowledge about cultivation, soil testing ,crop pattern ,appropriate fertilizers, proportion of pesticide and insecticides to be used ,method of cure of diseases, subsidies for agriculture and horticulture products ,water level of the land and water management, the subsidies available on alternative power source devices like solar pumps, Rural financing, Market linkage and government policies .It calls for potentially similar solutions for providing them the right, genuine authentic and exact information and solution to solve their problems. As Farming is very large sector in India, and the condition of farming changes region to region in every state, district, and tehsil and even in the one particular village. Keeping these facts in mind, This paper is focused on finding the effective solution to the problems of specific region ,In that view the problems of Nandurbar district of Maharashtra are identified and investigated the solutions through IOT. The intention of this research is to investigate the potential contribution of internet of things technologies (IoT) towards providing complete information to make the farming more effective and less expensive by making them confident by providing all scientific ,economical,practical,and government administrative solutions which are helpful encouraging and attracting younger generation towards farming.

Keywords: Farming, IOT, Crop pattern

I. INTRODUCTION

Agricultural informatics, also referred to as e. agriculture, is a combinations of advances in agricultural information, development and entrepreneurship to provide agricultural-services enhanced- technology, dissemination and information delivery through information and communications technologies and the internet [1]. E-agriculture focuses on developing agricultural and rural lives through improved information and communication processes. More specifically E-agriculture involves the idea and theme of design, development, evaluation and application of innovative ways to use ICTs in the rural domain with a focus on agriculture [1]. IoT on the other hand is the connecting of physical things to the internet which makes it possible to access remote sensor data and control the physical world from a distance [1]. The IoT has the function to overcome the gap between objects in the physical world and their representation in information systems [1].The increase in ICT affordability, accessibility and adaptability has resulted in their use even within rural homesteads relying on agriculture. The drivers of ICT in agriculture are:

- 1) Low-cost and pervasive connectivity
- 2) Demand exact and authentic information of agriculture Management
- 3) Advances in data storage and exchange
- 4) Common use of smart phones by the farmers
- 5) Policy and initiatives taken by the government for Digital India

Any ICT continuations that help and supports rural farmers will have significant direct and indirect impacts on enhancing agricultural production, marketing and post-harvest activities, which in turn can contribute to make them to do the appropriate management and increase their income which finally leads to the increase in national income [1].For all rural areas, the barriers that need to be addressed by broadband ICTs are:

- Distance barriers, i.e., access to administrative and government services and structures
- Economic barriers, i.e., access to wider business and labor markets
- Traceability of production, products and services throughout the value chain including logistics

II. CASE STUDY-NANDURBAR DISTRICT, MAHARASHTRA

It is observed that during 2009-2014 rainfall received is less than district average. It is also observed that in the month of July and August district received up to 70 % rainfall of district average [2].

Soil Status

The total cultivable area of the district is 3.47 lakh ha. Out of 3.47 lakh ha. about 63.43 per cent (2.20 lakh ha.) area comes under light type soil 17.43 per cent (0.60lakh ha.) area under medium type soil and 19.14 per cent (0.66 lakh ha.) area under heavy type soil. From soil sample analysis, it is observed that the district having large area under light soil with low to medium Nitrogen availability, very low phosphorus and very high amount of available potassium. It can be seen from the table that about 65 percent of farmers have land holding below 2 hectares (marginal and small farmers) but hold only about 37 percent of total land holding of the district. However, about 6 percent of medium and large farmers have about 21 percent of total land and remaining is with semi-medium farmers. Therefore, the average land holding of the marginal farmer and small farmer of the district is 0.67 and 1.42 hectares respectively [2].

Crops and cropping pattern

The Nandurbar district is established on 1st July 1998 by the division of old Dhule District of Maharashtra. The Geographical area of district is 503426.00 ha. of which 313076.00 (62.18 %) area is cultivable, which is low as compared to geographical area and therefore there is a wide scope to increase the area under cultivation. The soil type in the district is 63.43 % light 17.43 % medium and 19.13 % are heavy soils. The annual average rainfall of the district is 872.00 mm. Agro ecologically district is divided into four ecological situation as 42.04 % Scarcity Zone 12.86 % Western Ghat zone 25.70 % Sub Mountain Zone and 18.75 % Western Maharashtra Plain Zone. On an average 15.3 percent of the cultivated area (47000.00 ha.) is under irrigation of which 8.00 % is under well irrigation and 7.00 per cent area is under canal irrigation. The irrigated area under canal irrigation is more in Navapur, Nandurbar and Shahada Taluka's as compared to Akrani Taloda and Akkalkuwa taluka's of the district.

Normal area under kharif crop is 252300.00 ha. Kharif season is the most predominant season. Kharif jawar, cotton, Bajara, kharif paddy are the main crops. Whereas tur, green gram, black gram, sunflower and groundnut are second important crops. Maize and Soyabean is fast emerging crop of the district. In rabbi season rabbi Jawar, wheat and gram are predominant crops. Groundnut, Bajara and sunflower are taken in summer season. In hilly area of the district vary and other hill millets are predominant crops. The productivity of hill millet is very negligible. Paddy is taken in both irrigated as well as rain fed condition. No other factor is as critical to paddy production as the moisture stress at the reproductive stage of the crop. Yield reduction from lack of water during reproductive stage can lead to serious losses in paddy productivity. Tur is mostly taken as inter crop in paddy, jawar, cotton and maize crop. Horticulture crops like mango, Papaya, banana chilly, cauliflower, cabbage, brinjal, onion and beans are important crops. The agricultural production and productivity of principal crops is low and fluctuating as compare with state as well regional level. District as a whole only 20.50 % area is under cash crop/high valued crops and 5.21% area under horticulture crops, which is in an undeveloped stage with few exceptions requires additional inputs for reaching optimum level of productions. Anchor is famous local value added product of mango prepared from local varieties of mango, it fetches good market price. Chilly is also very remunerative crop. Chilly pockets have already been developed in the district [2].

Irrigation and Groundwater

Nandurbar district has a net sown area (NSA) of 2.95 lakh hectares of which net irrigated area accounts for 0.46 lakh hectares. This indicates that only 15 per cent of net sown area is irrigated. The percentage of net irrigated area to net cropped area in Shahada, Navapur and Nandurbar is 46 per cent, 19 percent, 13 per cent, respectively. The percentage of irrigated area in the rest of the talukas is much lower than district Average [2].

III. PROBLEM IDENTIFICATION

The following crop related problems are identified in the Nadurbar region, Maharashtra.

TABLE 1. Crop Problems

Crop	Season	Problems Identified
Cotton	Kharif	Lack of knowledge regarding improved varieties of deshi cotton. Improper cultural practices. Improper nutrient management.
Greengram	Kharif/ Summer	Lack of knowledge regarding improved varieties. No knowledge of improved cultivation practices. Nutrient management not done properly. Weed management not done properly
Groundnut	Kharif	Lack of knowledge regarding improved varieties. Improper nutrient management (basal application not done).
Bengalgram	Rabi	Lack of knowledge regarding improved varieties. Recommended spacing, seed rate and time of sowing is not followed. Proper nutrient management not done.
Wheat	Rabi	Traditional and local seed material used. Varieties are not selected according to the time of sowing. Nutrient management is not done properly. Weed management not done properly.
Bajara, Tur, Groundnut, Jawar, etc.	Kharif / Rabi / Summer	Crop rotation not followed. Mix / intercropping practice is not followed. More stress on chemical fertilizers than FYM or compost.

IV. PROPOSED SOLUTION

Agro-Vision app has been designed to join Prime Minister Mr. Narendra Modi's call for a Digital India by empowering the Indian farmers in the agricultural sector to help farmer the next Green Revolution with the use of knowledge, science and technology. It is a revolutionary Android based mobile application.

It provides complete information on Crop Protection and all relevant agriculture allied services on your Smartphone!! In addition to being an information portal, Agro-Vision App bringing farmers, agri inputs and services on a common digital platform.

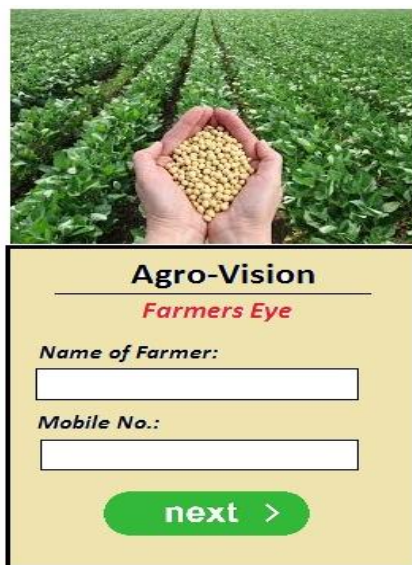


Fig 1. User Interface of App Agro-Vision

Agro-App Features:

In Agro-Vision App, We have included following features:

- 1) Crop Selection
- 2) Crop Videos
- 3) Question Answers
- 4) Solar Pump
- 5) Success Stories
- 6) Subsidies



Fig 2. Features of App Agro-Vision

1) Crop Selection:

Cotton is major cash crop grown in Nandurbar district. Cotton is cultivated in all types of soil i.e. light, medium and heavy soils of the districts. Cotton is grown in Rain fed & irrigated condition of the district. As But cotton gets more yields, maximum farmers get stimulated towards but cotton cultivation in rain fed as well as irrigated condition. Farmers applied chemical fertilizer randomly without soil testing. Application of Bio fertiliser for seed treatment or soil application, use of micronutrient is also lacking. In But cotton sucking pest's i.e. Aphids, Jassids, Thrips, White flies are the major constraints.

For the control of sucking pests farmers spray this crop adequately with chemical pesticides that increases cost of production. So to boon up the yield of cotton & to reduce plant protection cost demonstrations on IPM were conducted in Nandurbar district. This feature is used to select the specific crop from the list of different crops like Cotton, Maize, Wheat, Banana, Green gram, Groundnut etc.



Fig 3. Crop selection Feature of Agro-Vision

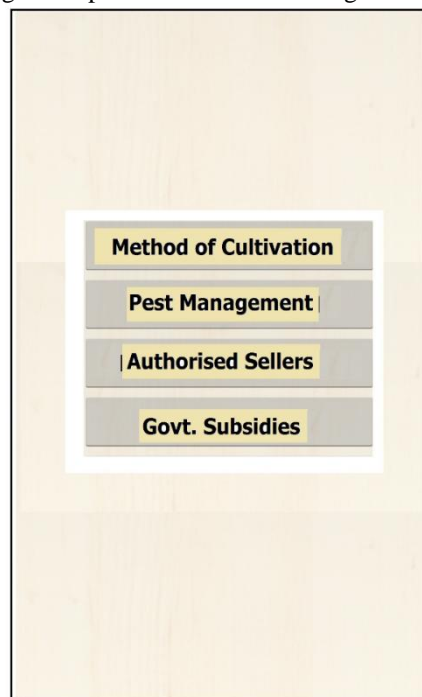


Fig 4. Crop information module of Agro-Vision
Method of cultivation

The cultivation is a complex activity that requires a series of processes to achieve the finished product. The basic stages of cultivation include:

1. Seed selection

2. Land preparation
3. Crop establishment
4. Water management
5. Nutrient management
6. Crop health management
7. Harvesting

Pest Management

Pest Management allows you to identify, map and find integrated management options for common weeds, insects and disease in corn, soybean and cereal crops. Any pesticide use information in the app is specific to Ontario only and users should always read the product label - and ensure all directions on the label are followed - before applying any pesticide.

These management options are currently only pesticide related. Pesticide options are ranked into by their average control of all pests selected. A user can also look up information on a pest and specific pesticide.

Authorised Sellers

This feature provides the list of authorised sellers. The list of authorised seller is helpful to farmers to buy original seeds and pesticides. In Authorised shop, the price of seed bag and pesticides are appropriate.

To avoid deceiving of farmers from fake sellers, the authorised seller shop is playing vital role.

Government Subsidies

An agricultural subsidy is a governmental subsidy paid to farmers and agribusinesses to supplement their income, manage the supply of agricultural commodities, and influence the cost and supply of such commodities.

Examples of such commodities include: wheat, feed grains (grain used as fodder, such as maize or corn, sorghum, barley, and oats), cotton, milk, rice, peanuts, sugar, tobacco, oilseeds such as soybeans.

There are different types of subsidies available for Indian farmers like:

- 1) Fertiliser Subsidy
- 2) Seed Subsidies
- 3) Credit Subsidy
- 4) Price Subsidy
- 5) Infrastructural Subsidy
- 6) Export Subsidy

2) Crop Videos

Videos on best practices, farming technology, agricultural information are uploaded into the app from reliable sources. The videos are carefully examined for their correct information and quality. Some of the videos are on, feedings for livestock, manure production, treatment for particular disease and many more.

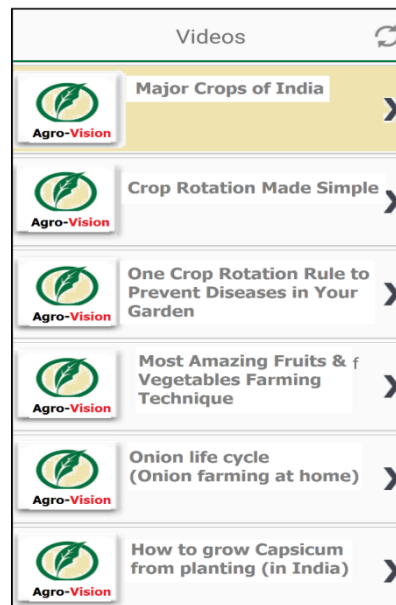


Fig 5. Video Feature of Agro-Vision

3) Question Answers

Question Answers is a newly introduced feature in Agro-Vision App, with an objective of solving queries of our Kisan brothers as fast as possible. Farmers can take images of the diseased or pest infected crop and share the images with our Agri Experts for the fastest resolution of queries. The advisories and alerts provided are based on long research done by the leading agri experts of the industry. These advisories will help the rural and urban farmers in taking the necessary corrective and preventive measures in advance.

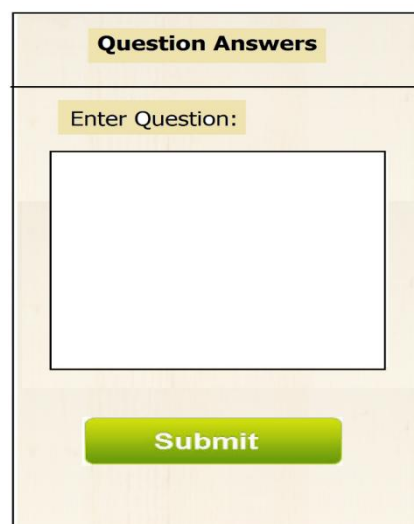


Fig 6. Question-Answer Feature of Agro-Vision

4) Success Stories

When we talk about the Indian agriculture industry, there is a belief that growth can only equal crisis. The Green Revolution brought about a technological breakthrough, leading to short duration high yielding varieties, chemical fertilizers and pesticides but critics blame it for lacking vision. Recently, the Malwa region in Punjab was dubbed as the 'cancer belt' of India. The unusually high incidence of cancer cases has been linked to the excessive use of

pesticides by cotton farmers. In its fifth National Report on Desertification, Land Degradation and Drought published in 2015, the government has conceded that land degradation is a major environmental concern for the country. It reveals that one-third of India's soil is degraded while 25 percent land is facing desertification which has affected its productivity and food security of millions across the country. The success stories of different states are available in this feature.

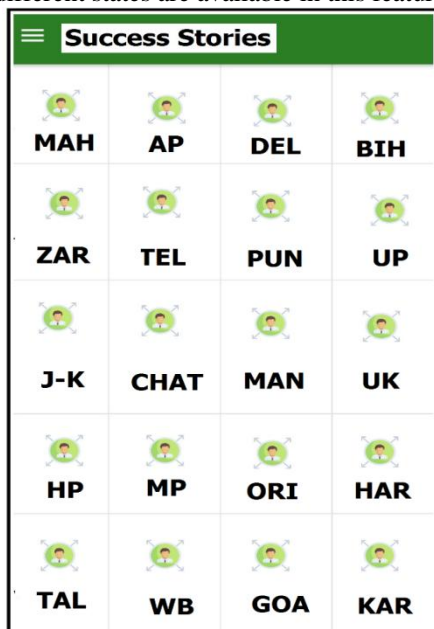


Fig 7. Success Stories Feature of Agro-Vision

4) Solar Pump

Solar water pumps scheme for farmers in Maharashtra is launched by state government of Maharashtra. Under the state government scheme, beneficiaries are supposed to get solar pumps at a highly subsidized rate and farmers have to pay just 5 per cent of the pump's total cost. The Maharashtra government ambitious scheme of installing five lakh solar agricultural pumps across the state for farmers. The government has given a contract for at least 10,000 solar pumps to install in the pilot phase. The government has vision for ensuring that farmers get water for agriculture even when power is not present in the areas.

Benefits of Solar Water Pumps Scheme for Farmers in Maharashtra:

- Subsidy to install solar water pumps
- Saving energy and bills
- No impact of power cuts and load shading

Eligibility for Solar Water Pumps Scheme for Farmers in Maharashtra:

- All farmers who have less than 5 acres land are eligible for Solar water pumps scheme for farmers in Maharashtra

Documents Required for Solar Water Pumps Scheme for Farmers in Maharashtra:

- Application form
- Applicant Aadhaar card
- Applicant 7/12

How to Apply:

- The applicant need to contact Maharashtra State Electricity Distribution Co. Ltd for application of solar water pumps scheme.

V. CONCLUSION

This paper investigates the role of IOT in farming sector for specific region. It will provide the information to farmers about cultivation, pest management and subsidies etc. It leads to develop and user friendly Android based app to help the farmer to overcome the problems faced by them on day to day basis. The experts, government agencies, agriculture departments and Krishi Vigyan Kendras in particular district can play important role in developing this kind of app. It will contribute significantly to the 'Digital India' mission by providing value based information to the most important sector of farming which contributes a lot for national income.

VI. FUTURE SCOPE

The App can be made more practical considering actual conditions of specific zone or region using available information about soil testing, crop pattern, water availability etc. The information about allied complimentary scheme like cow and buffalo rearing, goat farming, poultry and use of drip irrigation scientifically can be further added.

ACKNOWLEDGMENT

We would like to thank Principal, Academic Head, Administrative and Technical staff of the Maharashtra Academy of Naval Education and Training, Loni-Kalbhor, Pune for their valued suggestions and support in their respective roles. We thank all those who are directly or indirectly involved in shaping up of this research work.

REFERENCES

- [1] Nomusa Dlodolo and Josephat Kalezhi, "The internet of things in agriculture for sustainable development," published at www.researchgate.net/publication/277713549, conference paper May-2015.
- [2] C-DAP Nandurbar: General description of Nandurbar district
- [3] Copyright© 2010 kvknandurbar.net Krishi Vigyan Kendra, Nandurbar, Maharashtra, developed by patheya consultancy services
- [4] www.GOVINFO.ME
- [5] Android App: AgriApp from Play Store.
- [6] Android App: Crop-Clinic from Play Store.