

AI apps for dissemination of horticultural information

Proper dissemination of information to the stakeholders is as important as information generation. While traditional channels of dissemination are still effective, farmers often use google and such other search engines for their information needs. In recent times, even WhatsApp/Facebook groups have become the source of information where-in, experienced farmers and experts are the members. In addition, currently, there is a new trend of AI and related technologies showing promise in dissemination of agricultural information. Mainly they are deployed in diagnosis of pests, diseases and nutrient deficiencies besides suggestion of remedial measures; synthesis of information and delivery of customized information to the user. A brief information on the apps related to these areas is provided in this article.

AI enabled diagnosis of pests, diseases and nutrient deficiencies

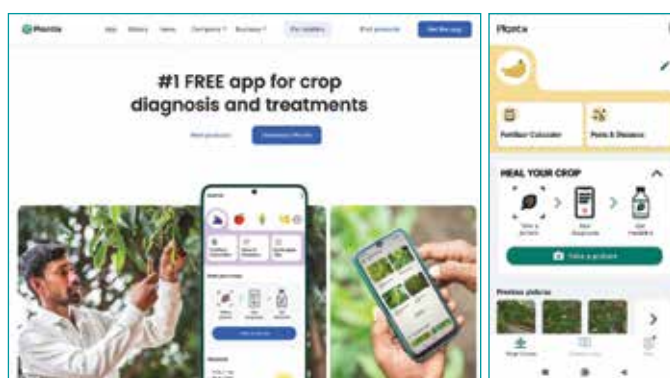
Most often, farmers need expert advice for proper management of pests and diseases affecting their crops in addition to nutrient deficiencies. However, due to the remote nature of villages and farms, this is not easily available at the time when it is most required. Further, it may be difficult for farmers/extension workers to locate distantly placed experts for every crop and seek their help for timely management. In such a situation, recent advances in mobile technologies can help to a great extent. The smartphones have already found their place in the lives of farmers and hence can be profitably used for disseminating the correct information.

In recent times, apps based on technologies such as Artificial Intelligence (AI), Visual Recognition, and Deep Learning are being developed worldwide for the identification of plants, animals, and insects including the identification of pests and diseases. Further, apps aimed at the identification of pests and diseases in specific horticultural crops have also been developed. These apps are found to be very useful and are regularly used by farmers in different parts of the world.

Here, an attempt has been made to introduce a few major apps that are aimed at the identification of pests, diseases, and nutrient deficiencies. These apps are available in the Google Play Store for download. This is not an exhaustive list and there may be a few more apps developed for the purpose in different countries.

Plantix (<https://plantix.net/>)

This is the most prominent and easy-to-use app in the identification of pests and diseases through artificial intelligence technology. It can detect about 800 symptoms



Plantix app

in 30 crops and instantly offer remedial measures. User also has the choice to contact experts in case of requirement. The app also has a fertilizer calculator which recommends fertilizer based on the crop and plot size. It is also possible to get weather forecasts for a particular farm. It can detect problems in horticultural crops such as almond, apricot, bean, bitter gourd, brinjal, cabbage, capsicum and chilli, carrot, cassava, cauliflower, cherry, coffee, cucumber, ginger, guava, melon, olive, onion, ornamental crops, pea, peach, peanut, pear, pistachio, potato, pumpkin, rose, strawberry, sugar beet, tomato, turmeric and zucchini etc.

AI-DISC

This app is developed by ICAR-Indian Institute of Statistical Research Institute, New Delhi. The AI-DISC is the acronym for Artificial Intelligence-based Disease Identification System



AI-DISC app

for Crops. It uses the deep learning model for the identification of problems of various crops. It can diagnose more than 50 diseases in 19 major crops and out of which, 10 are horticultural crops – cucurbits, tomato, coriander, brinjal, chilli, apple, peach, kinnow, Assam lemon, and mandarin.

Agrio (<https://agrio.app/>)

This app helps in diagnosing the problems of plants through artificial intelligence and computer vision algorithms. Once identified, it offers integrated management measures for the users to implement in their crop/field. It also provides satellite imagery of the farm for assessing the vegetation and chlorophyll indices, and gives recommendations for taking up agronomic practices. It also provides weather information for the user and suggests the time of pesticide applications, and sends alerts regarding the probable time of infestation by the insects. This helps in taking up timely interventions by the farmers.

Tumaini (<https://www.tumainiapp.org>)

This AI-based app is developed by CIAT, Columbia for the identification of five major diseases and one common pest in banana. It offers solutions for the user to manage the diagnosed problems. It uses image recognition technology that is trained with more than 50,000 images. The information on the geographic location of the problem is recorded in the database to track the distribution and patterns over a period of time. It is currently used in 15 countries such as Colombia, Perú, Benin, Democratic Republic of Congo, Nigeria, Togo, Cameroon, Equatorial Guinea, Malawi, Zambia, Angola, Tanzania, Uganda, Vietnam and India.

Cashew protect (<https://cashewprotect.icar.gov.in/>)

This is an AI-based app and website for the identification of pests and diseases of cashew along with nutrient deficiencies. It was developed at the ICAR-Directorate of Cashew Research, Puttur, Karnataka during 2022. It is a multilingual website and app – developed in 11 languages (English, Hindi, Kannada, Gujarati, Marathi, Malayalam, Tamil, Telugu, Bengali, Odiya and Garo). It will help in the identification of pests, diseases and nutrient deficiencies in crops and will be able to offer online solutions to users. The website/app as of now, detects 9 pests, 2 diseases, and 1 nutrient deficiency. Through the app, experts can be contacted for more information. Most interestingly, it is possible to capture data via users on the number and type of pests, diseases, and nutrient deficiencies observed in different countries/regions/districts/taluks during different periods through this



Agrio app



Tumaini app

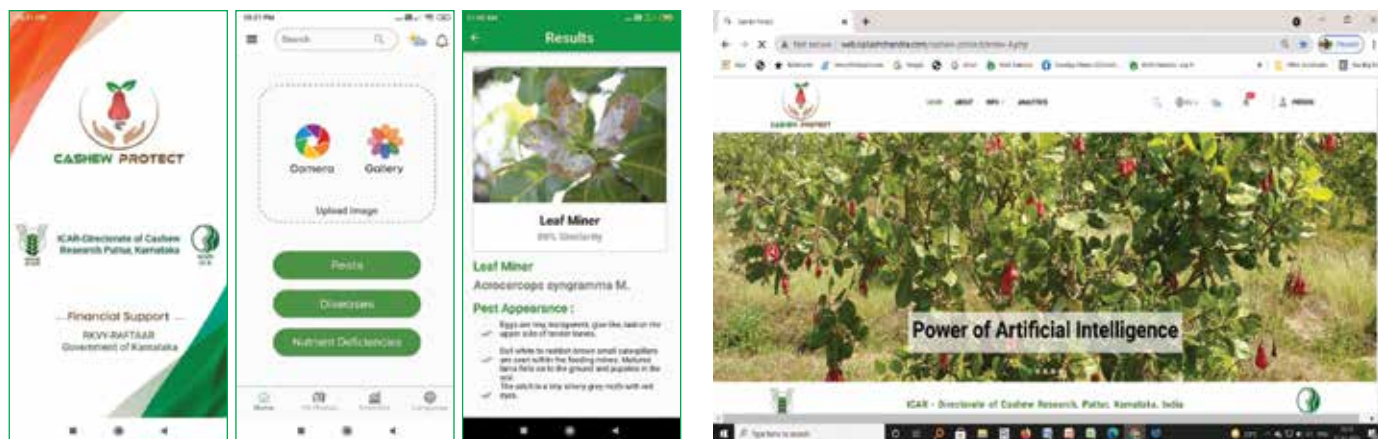
website/app. This will eventually help in early forecasting of these problems and alert farmers in a particular region in time. Further, it also helps to channel efforts and inputs required for management by the concerned agencies in an area/region of the country.

In this app, Artificial Intelligence (AI) and computer vision-based techniques are deployed. In the backend application, PHP Laravel framework, MySQL, Windows OS, and Apache/NGINX are deployed. React Native/Flutter is deployed in mobile phone applications. The AI machine learning system included Python, Windows OS, Tensor Flow as an AI framework, and GPU server for training. The website/app is constantly being trained with additional data and gets more accurate with time. The team behind developing this app/website included the scientists of ICAR-Directorate of Cashew Research, Puttur, and the scientists of AICRP-Cashew centres spread across the country. This work was funded by the RKVY-RAFTAAR program of the Government of Karnataka.

AI assistants for information needs

Many farmers are familiar with the use of Google and WhatsApp/Facebook for their information needs. However, in recent times, there is a new trend of AI assistants is emerging and these are offering customized information to a user on various aspects including agriculture and horticulture. Some of them include Farmer Chat, Kisan AI, Meta AI, Gemini, Chat GPT, Copilot etc. These are made possible due to advances in language models. Their accuracy is likely to improve over the years with the feedback from users. It is very heartening to witness that two AI assistants which are created separately for the agricultural sector. Here is a brief summary of some key apps in this area, which are available in Google Play Store.

Farmer Chat: This is developed by the Digital Green company (<https://digitalgreen.org>) which has been serving the information needs of small farmers for the last fifteen years. This app provides agricultural multilingual



Cashew Protect

information according to user's location. There is a facility to ask questions through photo, text and voice. This was released in July 2024 and it seems to be quite different from many such apps in terms of interaction with the users.

Kissan AI (<https://kissan.ai>): This is developed by Gujarat-based computer scientist, Dr. Prateek Desai, now settled in USA. Here One can ask questions and get agricultural information through text and voice messages. This is developed using vast agricultural information and considerable AI training.

ChatGPT: A popular AI assistant. Besides providing required information, writing, emailing, computer code, translation, summarizing a piece of work etc. can be done. User can get many advanced facilities of the app on nominal payment basis.

Copilot: Developed by the Microsoft company. It can give the required information as well as tell how to write an essay related to a topic. It can also generate AI images based on the instructions given. It is integrated with Windows and Microsoft 360. At the bottom right corner of the computer, Copilot icon is provided and user can continue by clicking on it.

Gemini: This is the AI assistant created by the Google. When the user googles for any information, this gives synthesized answer in the beginning. Followed by this, various websites are given as earlier. This assistant has been integrated to work with all Google products – Gmail, Google Docs, Sheets, Meet. Different versions of Gemini

are available depending on the complexity of the job.

Meta AI: This is integrated in WhatsApp, Facebook and Instagram and appears as a blue circle. It can answer user's questions, advise the user and can generate photos based on the question. Meta AI will appear by typing @ symbol in the text box while chatting in the group. The answers to questions can be generated and if they are found satisfactory, then one can send it to the group. Many farmers are using this feature for sending answers to the queries asked in the group.

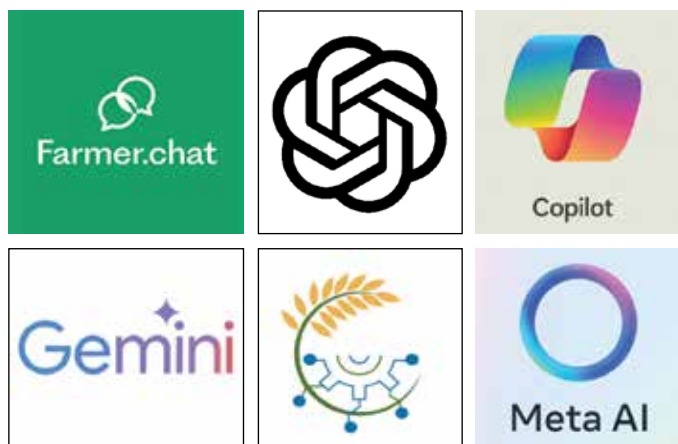
All these AI assistants synthesize the required information from the internet and various information repositories. Each AI assistant may give different answers to the same question or sometimes give wrong/inadequate answers. This could be due to the method of training these assistants. Now-a-days, they are trained using Large Language Models. The accuracy of the answer depends on the model deployed and the quality of the information used in the training. However, these AI apps continuously learn and correct themselves based on the feedback given by the user. In the next five years, we are sure to witness much more accurate AI assistants.

SUMMARY

There are 23 horticultural institutes under ICAR, which are working on various crops. They have been generating diverse and valuable information on different crops since many years and decades. This huge database and expertise available in these institutes can be profitably deployed for development of AI assistants capable of providing accurate information on a specific crop and development of AI apps for proper diagnosis of specific pests, diseases and nutrient deficiencies of different crops. This will immensely help the stakeholders associated with each crop and the institute. Hence, institutes can come forward for development of such apps and need to contribute images, data, text and expertise. The work can be taken up by either individual institutes or at the ICAR- IASRI depending on the availability of expertise and financial resources.

For further interaction, please write to:

Dr G. S. Mohana (Principal Scientist), ICAR-Directorate of Cashew Research, Puttur, Karnataka 574 202. *Corresponding author: mohangs2007@gmail.com



AI assistants