



KVK Mobile App: An ICT tool to empower farmers

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There exists a strong network of KVK for frontline extension system in India [https://icar.org.in/content/agricultural_extension_division]. However, the model often cannot fulfill farmers' expectation due to shortage of manpower in KVK as well as in state department of agriculture. In such scenario, ICT can play an important role in timely and fast technology dissemination in absence of adequate expertise.

A Mobile application, most commonly referred to as an app, is a type of application software designed to run on a mobile device, such as a smartphone or tablet computer. Mobile applications provide users with similar services to those accessed through personal computers. Mobile technology has transformed the information sharing in many ways. Information reach has moved one step further and even farmers are using mobiles or smartphone for getting desired information. Mobile phones are appreciated by farming communities as easy, fast and convenient way to communicate and get prompt solution to their problems. This device has given new direction and approach to farmers to communicate directly and share recent advances with each other. Government is taking steps and encouraging development of mobile application that will enable farmers across the country to get information.

A number of mobile apps have been developed for Indian farmers by different organizations. Kisan Suvidha mobile app (Mobile Seva 2019) has been developed to

help farmers by providing the information on weather forecast, agro-dealers, market prices, agro-advisories, plant protection, Integrated Pest Management (IPM) practices, etc. Unique features like extreme weather alerts and market prices of commodity in nearest area and the maximum sale price in state as well as India have been added in the app to empower farmers in the best possible manner. RiceXpert (Singh *et al.* 2018) is developed for the farmers to provide information in real time on insect pests, nutrients, weeds, nematodes and disease-related problems, rice varieties for different ecologies, farm implements for different field and post-harvest operations. This app can act as a diagnostic tool in rice fields and make customize queries for quick solution through text, picture and voice. It also provides news, announcement and advisory services, frequently asked questions on the related subject. eNAM app (Small Farmers' Agri-Business Consortium 2019) is developed to facilitate remote bidding by traders and access to arrivals and price related information to farmers and other stake holders on their smartphones. Farmers can view state wise list of e-NAM mandis, mandi wise arrivals, minimum and maximum prices prevailing in any mandi. The IVRI-Vaccination Guide App (ICAR-IASRI 2019) is targeted to impart knowledge and skills to Graduating Veterinarians, Field Veterinary Officers, Paravets and Livestock Owners about vaccination in livestock. The app provides basic information about vaccination in livestock related to all the major bacterial and viral diseases. For each of the disease in various species, the information on the causative agents, types of vaccines available, strain used for the vaccines, vaccination schedule and commercially available vaccines are provided in the App. In the NARES system, KVKs conduct location specific on-farm trials and frontline demonstrations for newly released varieties or technologies on farmers' fields under different farming system. KVK Mobile App has been developed to facilitate information dissemination from KVKs to farmers in an effective way. This app was developed by ICAR-Indian Agricultural Statistics Research Institute in 2016 under the guidance of Agricultural Extension Division, ICAR and inaugurated

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by Union Minister of Agriculture and Farmers Welfare on December 21, 2016. Through this app, entire farming community can directly keep in touch with their respective KVKs. This implies that the application has the potential to save energy, time and money of farmers and ultimately improve their farming practices.

KVK mobile app provides basic information like facilities of KVK, upcoming and past events organized by KVKs, package of practices related to crops, horticulture, animals, and fisheries, access to agro-meteorological advisory and market price of agricultural commodities to farming community. Users can send any farm related query to the experts and get solution for the same. This mobile app facilitates its users with up-to-date information that can reach directly to the beneficiaries.

KVK Mobile App has been developed to work on Android OS (Annuzzi *et al.* 2014) version 4. 4 and above (i. e. Kitkat and above). Mobile App works in sync with the web portal (ICAR-IASRI 2016) for the data management. Database has been designed and developed in SQL Server 2012 which is powerful relational database management system. KVK adds information on various parameters through KVK portal which in turn shown or is passed to the mobile app using Application Program Interface (API) or web service (Kurtz *et al.* 2014). For each of functionalities in the app, separate APIs have been developed. Information from database is also retrieved through APIs. The users consume the Web API in their mobile app (Fig 1).

The model in Fig 1 represents the data in application. In the present work, models are represented as C# classes, also known as Plain Old CLR Object (POCOs) (Tenny and Hirani 2010). Through the model, data is passed via Web API. Controller is an object that handles HTTP requests from client or user and creates the HTTP response (Paz 2013). The data access layer (DAL) provides simplified access to data stored as entity-relational database (Hall 2010), i. e. database of KVK Portal in the present context.

Description of KVK Mobile App: Users can download the KVK Mobile App either from Google Play Store (<https://play.google.com/store/apps/details?id=com.icar.iasri.kvkapp>) or KVK Portal (<https://kvk.icar.gov.in/app.aspx>) and install it on Android mobile phones. After

registration and successful login, the user needs to select his/her primary KVK, i. e. the KVK which is located in the district to which the farmer belongs (Fig 2). Users can change the primary KVK at any point of time. Once the primary KVK is selected, the functionalities, viz. Find KVK, Facilities, Package of Practices, Information about Upcoming and Past Events; Weather Advisory and Market Information can be availed by the farmers (Fig 3). On tapping 'KVK' icon, users can find any KVK details by selecting state and district in the app. After selecting state and district, the list of KVK(s) (in case there is more than one KVK in a district) appears with details, viz. address, phone number, contact person of KVK (s).

KVK provides different facilities, viz. soil testing lab, bee keeping unit, dairy production unit, etc. for the farmers. However, farmers are often unaware about these facilities. On tapping 'Facilities' icon in the app, user can find the information of such facilities in detail, provided by the primary KVK along with images and videos wherever available.

KVKs publish knowledge base for the farmers in terms of package of practices in agriculture and allied sectors. Package of practices are the roadmap to technical knowhow and cultural practices to be followed by the farmers for their crops and animals. KVKs upload this knowledge base in local language through KVK portal. As of June 2019, 4479 such documents have been uploaded through the portal. In the app, user can either read (with pdf viewer version) or download (without pdf viewer version) package of practices related to Horticulture, Fisheries, Crop and Livestock.

KVKs organize events, viz. field day, kisan mela, demonstration, skill development training, etc. mainly for farmers throughout the year. More number of farmers can participate in such events if the information is available to them earlier. With this objective, KVKs upload event information in advance on a regular basis. On tapping 'Upcoming Events' icon in the app, users can get details of these events (to be organized by the primary KVK), viz. name, venue, start date, end date and description. Once the events are over, KVKs upload description and media

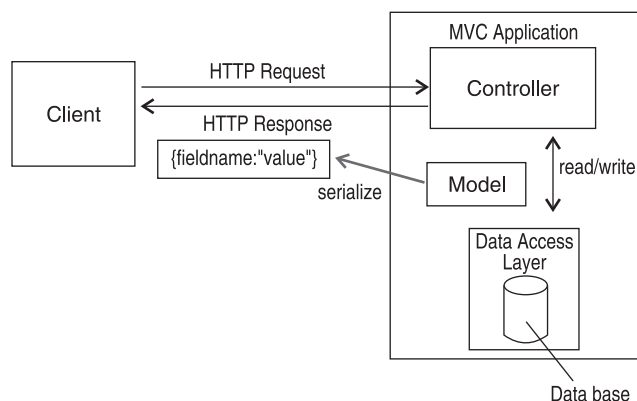


Fig 1 Web API architecture design.

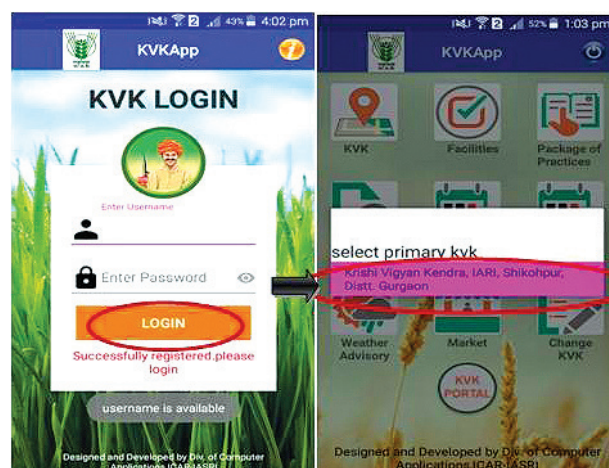


Fig 2 Selection of primary KVK.

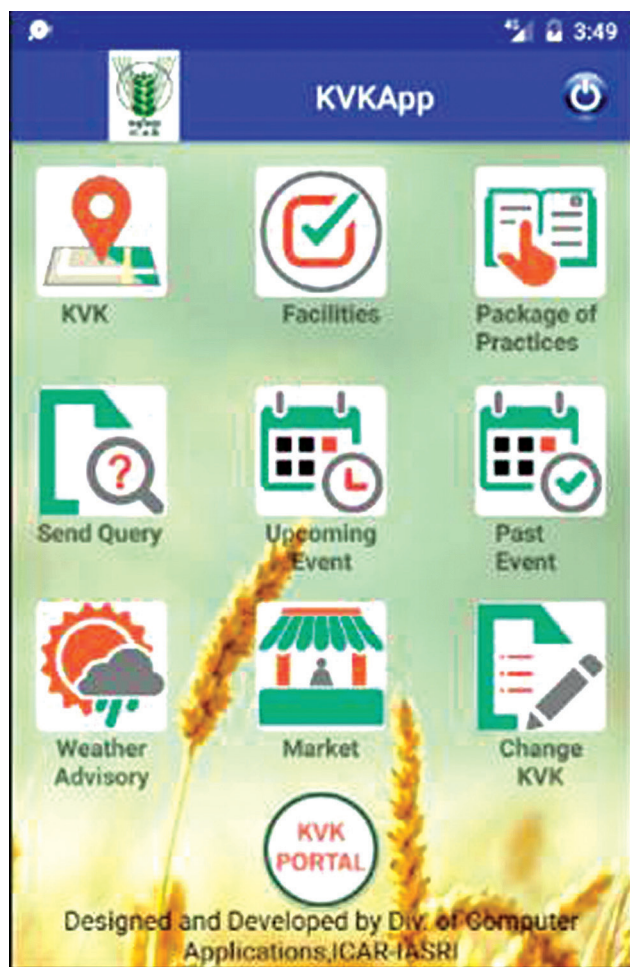


Fig 3 Various functionalities of KVK App.

files associated with the events. On tapping 'Past Events' icon in the app, a list of past events (already organized by the primary KVK) appears. Here user can get details, viz. name, venue, start and end date, description, image, video, etc. of past events (Fig 4).

Agricultural Meteorology Division (IMD), Pune provides district-wise agro-meteorological advisory bulletin of next five days for the farmers. This facility is accessed in the KVK app through web service. Users can download the advisory through the app for their districts either in English or in local language. The downloaded advisory is saved in download folder of the mobile so that the same can also be referred at any point of time in

offline mode.

It is relatively difficult for the farmers to visit the KVK and get expert's advice all the time in case of any farm related problem. To overcome this scenario, this app also has 'Send Query' option that allows farmers to get solution directly from expert of his primary KVK online. To send a query, user has to select type of commodity, commodity name, problem name and write his problem in the description box provided (Fig 5). Apart from description, user can elaborate his query by sending image (in . jpeg format), audio (in . mp3) and video (in . mp4) related to the problem or by taking picture/making audio or video file (Fig 5). After submitting query, user can see his/her query in the 'List of Queries'. When expert (s) answers to the query, solution is attached with the query asked (Fig 5).

Other than the functionalities mentioned above, there are additional features in the KVK mobile app. For instance, 'Market' icon redirects user to the National Agriculture Market (NAM) Portal where user can get market price of agricultural commodities. Change KVK icon provides user the choice to change primary KVK to the new one by selecting State, District and KVK. 'KVK Portal' icon redirects user to KVK portal.

KVK Mobile App is an important e-governance initiative taken by ICAR in accordance to the Digital India program of Government of India. Since the launch of the KVK Mobile app, more than 14000 farmers have registered through this app to the KVKs for getting the desired information. As on June 2019, more than 500 queries of the farmers have been answered by respective KVKs by using this app. The queries related to different aspects, viz. pest and disease problem, soil testing, agronomic practices, crop variety, seed requirement, poultry and dairy have been asked by the farmers. One such query related to nutritional deficiency and its resolution (provided by KVK ICAR-BIRDS, Belagavi district of Karnataka) has been depicted in Fig 5. Farmers have also uploaded images, audio and video files to clarify their problem.

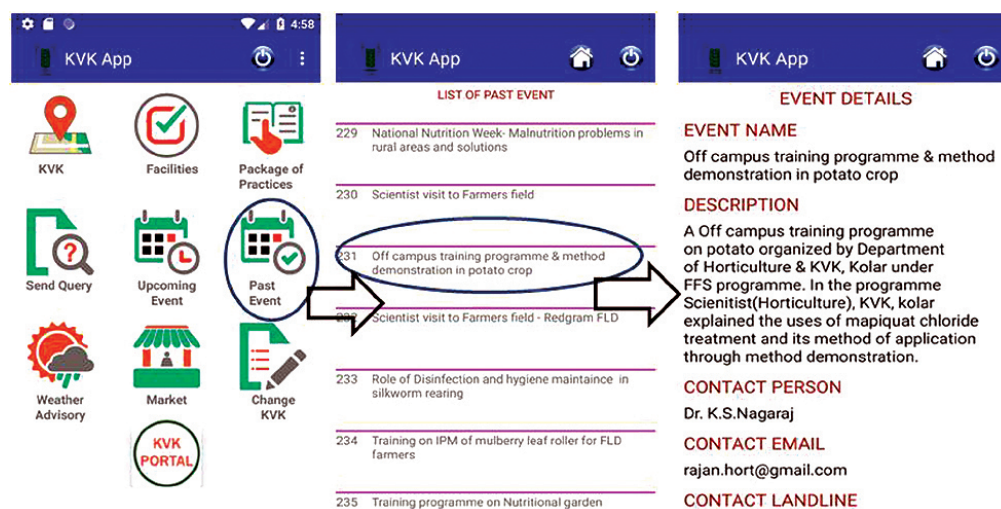


Fig 4 Past events in KVK app.

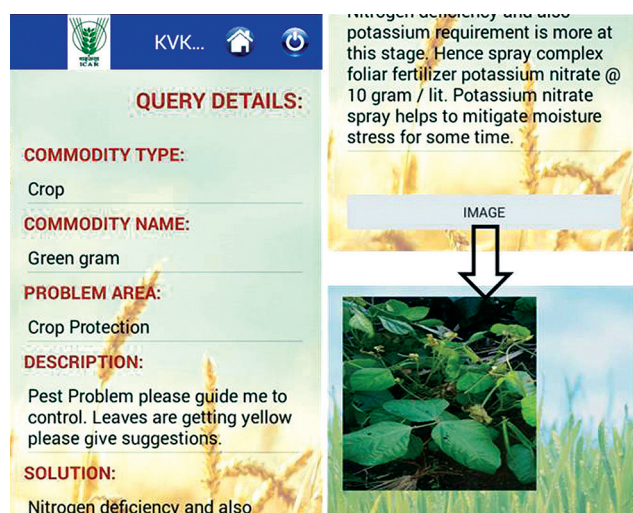


Fig 5 Farmer's query and resolution in KVK mobile app.

This app considerably saves time, energy and money through transaction costs reduction and helps to acquire the information in a cost effective manner. In future, this app will act as a tool for bridging the gap between farmers and extension activities.

SUMMARY

An android-based mobile application, viz. KVK Mobile App has been developed to facilitate farmers by providing vast amount of knowledge generated at Krishi Vigyan Kendra (s). Farmer has to register into this app and select the Krishi Vigyan Kendra (KVK) which is located in the district to which the farmer belongs. The registered farmers can access package of practices for crops and animals developed by the KVK. Farmers can send any farm related query to the experts available in the KVK and get resolution of their problem through this app. The mobile app contains details of information on facilities available at KVK for farmers. Information on past and future events of KVK is available through this application. There are provisions in the app to access agro meteorological advisory and market price of agricultural commodities. This mobile app can be very useful particularly for the farmers who often find difficulty

in reaching to the KVK physically due to geographical constraint. This app can be downloaded from Google Play Store as well as from KVK Portal (<https://kvk.icar.gov.in/>). This mobile app can be used as an add-on to the extension system established between KVK and farming communities for enhanced communication.

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