



NRRI 'riceXpert' APP:TAKING RICE TECHNOLOGIES IN THE DOORSTEP OF FARMERS

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The introduction of mobile technology has led to the creation of innovative services and applications that are used within the agricultural chains in both developed and developing countries. In developing countries, where a large proportion of the workforce is employed in agriculture, mobile technology is more commonly used to deliver services for producers and traders. The host of applications of mobile technology in agriculture includes market information such as trading facilities, weather information, peer-to-peer learning and financial services such as payments, loans and insurance.

Spreading agricultural related information to farmers in the poorest communities are made easier with the help of cloud computing, integrated IT systems, online education and proliferation of mobile phones. One of the benefits of such connectivity and information flow is that it helps farmers make better land management decisions. For example, it can enable soil condition to be monitored in conjunction with weather information in order to better plan the planting and harvest season. Similarly, Geographical Information Systems can be used to provide pre-emptive information on pests and animal diseases so farmers can respond accordingly to the level of risk. Optimizing the use of fertilizer, seeds and water can also be done by utilizing mobile and cloud computing technologies. This helps farmers save money while reducing consumption.

Keeping in view the multifold benefits of mobile app and with the aim of building inexpensive tools and user-friendly technologies to bridge some of the information gaps in farmer's field, the ICAR-National Rice Research Institute (NRRI), Cuttack has developed a mobile App 'riceXpert' in bilingual (English and Odia) to reach the latest rice technologies to the farmers in real time basis.

Design and development of 'riceXpert' app

The riceXpert app is designed and developed in Android platform which is compatible with the Android version 4.0.3 and above smartphone which will operate in online system. This app provides real time diagnosis of insect pests, diseases, nematodes, weeds, nutrient deficiencies and toxicities to farmers. The App has other features like rice varieties, agricultural implements, news, expert consultation through e-advisory services module, weather information and customized Pest Solution and Fertilizer Calculator etc. Farmers and farm women can use this App as a diagnostic tool in their rice fields and also make customized queries through text, photo or voice and that would be addressed by panel of experts on real time basis and get quick solution along with recommendations of their problem through SMS. This app also provides platform for the farmers who have no organized way to sell their products. Farmers can post their rice or rice related products for display to buyer. The buyer can access the detailed information about the products through the app and get the products at the best prices through direct interaction. The App is also very useful tool for the researchers, Scientists, Students and village level workers working on rice crop.

However, if anyone interested to send any query, he/she has to register in the registration page. Once, query or buy and sale button is clicked, it will automatically direct to the registration page.

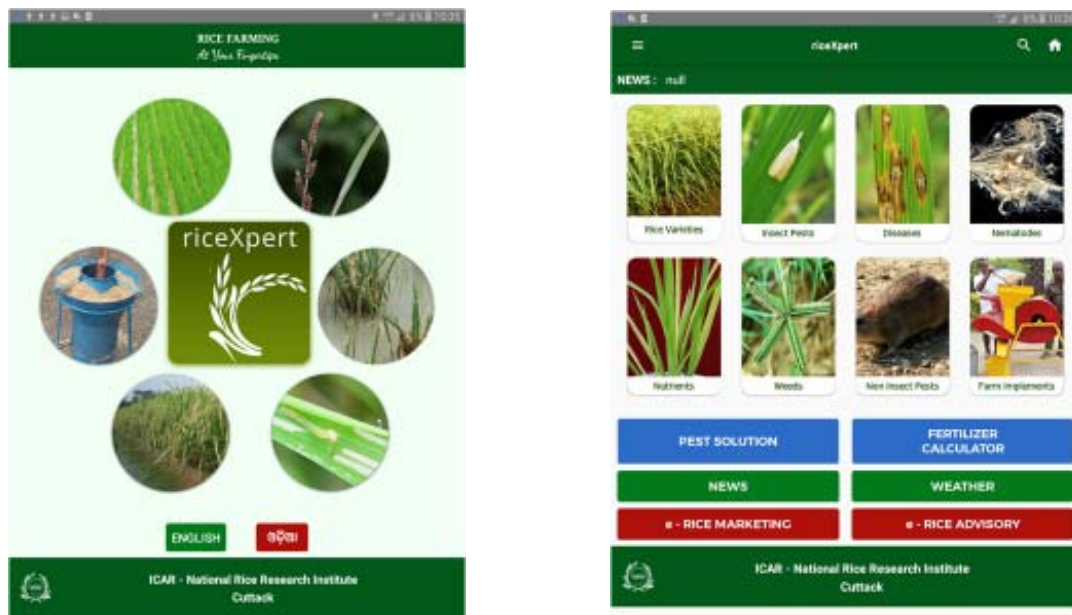


Fig 1 (a & b) Front screen and main menu page of 'riceXpert' app

Key features

This application is specially developed to solve rice related problems arising in the field and is very fruitful for farmers. Some important aspects of this application are rice varieties, insect pests, diseases, nematodes, nutrients, weeds, non-insect pests, farm implements, pest solution, fertilizer calculator, news, weather, e-rice marketing and e-rice advisory (Fig. 2).

- User friendly and easy to access
- A digital diagnostic tool
- Clear and informative
- Query based
- Client can upload field photos and record voice
- Solution on real time basis through SMS
- News on recent developments on rice
- Advisory services for rice crop
- Problem and area based automatic pest solution
- Fertilizer recommendation based on cropped area and rice ecology
- Sale and purchase of rice and rice-based products
- Elaborated FAQs on rice

Also, a user can get the solution (name and quantity of pesticides) of the problem after providing all the required data through 'pest solution' option. In case of fertilizer, a user can get the information about the type and preferred amount of fertilizer like nitrogen, phosphorus and potassium by 'fertilizer calculator' option by providing the required information. A user can get the news about pests and weather condition by this app. Another important prospective is 'e-Rice Marketing' through which online buying and selling of rice becomes easily accessible. 'e-Rice Advisory' is the most important option through which a user can directly consult with the experts.

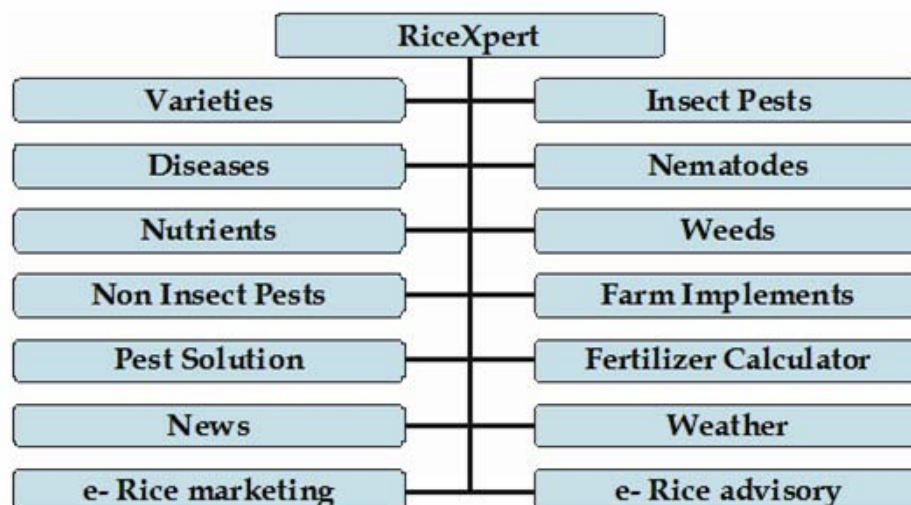


Fig. 2 Schematic diagram of different modules of riceXpert app

Step-wise user guide for riceXpert

- The mobile app "riceXpert" can be installed from Google play store. This can be downloaded from Google Play Store . The download link is also provided in the web portal www.nrri.in and www.crrri.nic.in.
- Once installed the user can visit different sections of the app to know about different facets of rice cultivation.
- The App has some other valuable features like weather information, news and advisory services like etc.
- Facilities of sending queries/ expert consultancy are also available through text, photo or voice. For that, the farmers need to register him/her to the app. These queries are addressed by panel of experts on real time basis and get quick solution of their problems through sms
- Farmers can also use the Pest Solution and Fertilizer Calculator to know the exact dose for precise application of pesticide and fertilizer, respectively.
- There is a unique feature "e-marketing module" which provides a strong platform for farmers as well as businessmen and entrepreneurs. Through e-marketing module seller/farmer can display their rice or rice related products to public and buyer can choose the products at the best prices through direct interaction with seller.

Rice Varieties

Based on the rice ecologies viz., upland, aerobic, shallow lowland, irrigated medium, medium deep water, deep water, boro and coastal saline and type of rice varieties viz., high protein, biotic stresses, list of rice varieties are provided. After selecting the name of the rice variety, photos of that particular variety and passport information of the variety such as state for which released, total duration, yield potential, grain type and special features i.e. resistance and susceptibility towards the pests or diseases will be shown immediately on the screen.

Insect pests

Under this menu, there are list of rice insect pests based on their mode of feeding viz., stem borer, foliage feeder, sap feeder, leaf feeder, panicle feeder is provided. Besides, the potential natural enemies of



rice insect pests, Economic threshold level (ETL) of the major insect pests of rice at different crop stages and recommended insecticides by the experts are clearly mentioned. Control measures of the insect pests through Integrated Pest Management (IPM) are also given.

Diseases

Rice crop is generally affected by three types of diseases fungal disease, bacterial disease, viral and Mycoplasma disease. All these diseases included under these three categories are described in easy to understand language. Photos, identification symptoms and management of the disease will be shown from primary stage to severe stage if any one disease option will be chosen. Under integrated disease management (IDM) option, control of the disease by cultural and bio-control methods which are not harmful to environment are described. Also under another option the name of the fungicides and bactericides with recommended doses are also given.

Nematodes

There are three major nematodes which are described under this option. These are root knot nematode, white tip nematode and root nematode. By selecting any of these three nematodes photos of infected plant parts, identification symptoms and management methods will be shown immediately.

Nutrients

After selecting this, two options will come that is nutrient deficiency and nutrient toxicity. If anyone chooses nutrient deficiency option all major nutrient elements are shown line by line. After selecting any of the nutrient elements, it immediately shows the photos with different stages of deficiency, description of deficiency symptoms, conditions for deficiency and its management. And if anyone chooses nutrient toxicity option the toxicating nutrient elements are shown with their photos of affected plant parts, deficiency symptoms, conditions for deficiency and its management is also shown.

Weeds

Mainly three types of weeds are described under this option viz., broad leaved and aquatic weeds, grasses and sedges. Under these three categories number of weeds prevailing in rice are given. By selecting any of these weed name clearly distinguishable photos of the respected weed with description of identifying characters and control measures are shown.

Non-insect pests

Three non-insect pests which are very harmful for rice crop in field are given under this option. These are crabs, mites and rodents. Two types of mites are described that is leaf mite and panicle mite. After selecting any of the category scientific name, photos of the pest and infected field with description on identification, symptoms and its management are shown.

Farm Implements

Farm implements are categorized into three types sowing and transplanting implements, weeding implements and post harvesting machinery. Selecting these options, one can access number of machines used in rice cultivation and post-harvest operations. If one of these machines will be selected, photos, characteristic features and specifications of the machine are shown immediately.

Pest Solution

By accessing this feature, control measures of any of the pest problem like insect pest, diseases, weeds nematodes can be easily done. When 'pest solution' option is being selected, first a number of instructions are shown. Then selecting the 'proceed' option in the next step you have to choose details of the problem from dropdown menu step by step like pest problem, crop stage affected, type of pest. After that a photo will be displayed according to the information given. You have to confirm the photo if it is



matching with the problem raised in the field by selecting 'yes' button. Then tap on 'submit' button. Then the total information about the recommended pesticide with recommended quantity are shown.

Fertilizer calculator

By using this menu, farmers can get the required quantity of the fertilizer instantly for different stages of rice. When 'fertilizer calculator' option is being selected, first a number of instructions are shown. Then selecting the 'proceed' option in the next step the details of the crop step by step like rice ecology, N-P-K dose, crop stage area of the cultivated field are provided. Then tapping on 'submit' button, the quantity of recommended fertilizer is shown.

Results

More than 15000 users covering different countries viz., India, Ghana, Vietnam, Philippines, Cambodia, Taiwan, Indonesia, Russia etc. have downloaded the app and being used by them. Around 1000 queries have been received from the Indian users through e-rice advisories module of the app covering 16 major states of India and the queries are being addressed by the panel of experts from and the solutions are being sent to them through SMS. The details of discipline-wise, month-wise and state-wise queries received and solved are depicted in the Fig 3-4.

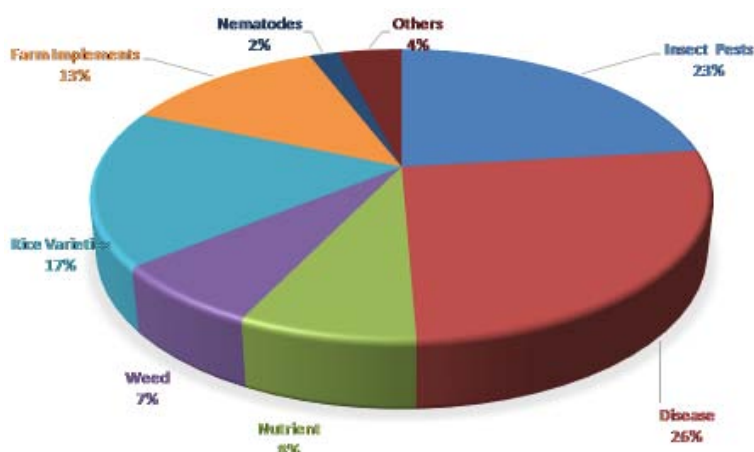


Fig 3. Category-wise queries received in "riceXpert" app

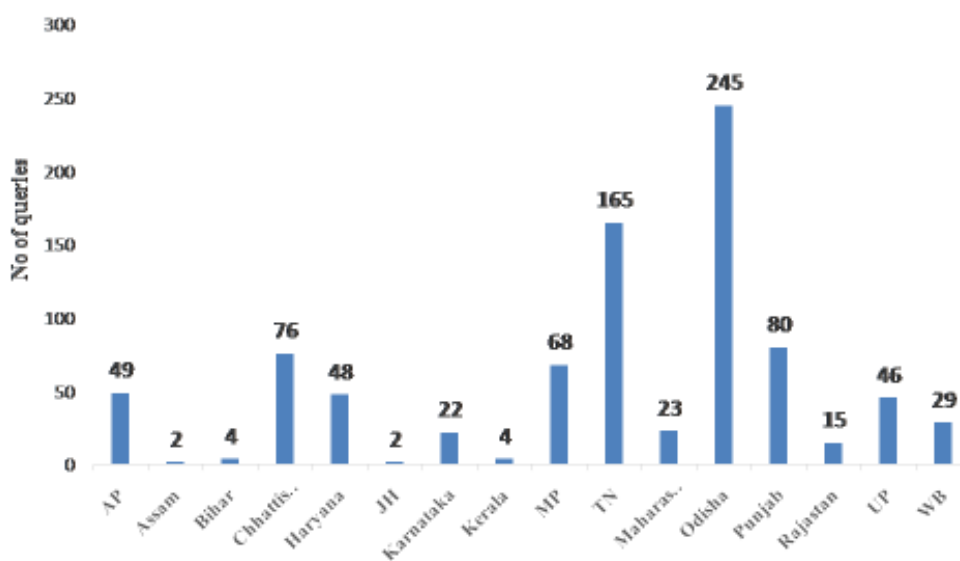


Fig 4. State-wise queries received through 'riceXpert' app