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# Soil Nutrient Manager: A Mobile App for Farmers in Eastern India

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## Abstract

Mobile phones are inextricably linked with life in rural and urban areas alike. Used appropriately, mobile apps could be of huge importance in delivering the intended message to the target population in a rapid and effective manner. In view of the cost involved and environmental concerns associated with indiscriminate use of fertilizers, an Android based mobile application named 'Soil Nutrient Manager' has been developed to optimize the fertilizer application and to achieve higher crop yield and farm income in eastern India, particularly Bihar and Jharkhand. The app makes fertilizer recommendations based on native soil fertility status and nutritional requirements of the crop to be grown in a particular region. It can be downloaded from Google play store for free. Operational aspects of the app have been described in this article. Suggestions for further improvement have also been made which would certainly enhance its utility for the farming community in eastern India.

## Introduction

Use of mobile phone is becoming increasingly popular in all spheres of life. At the beginning of information and communication revolution, urban population was the primary beneficiary of smart phones, but rural areas have also been penetrated by this technology at an unbelievable pace in recent times. As of now, mobile phones are inextricably linked with life in rural and urban areas alike. Used appropriately, mobile apps could be of huge importance in delivering the intended message to the target population in a rapid and effective manner. Mobile apps are being used in all walks of life including sports, music, business, education, agriculture, medicine *etc.* Recently, *Arogya Setu* app became hugely popular and useful in India which was aimed at creating awareness about COVID-19 pandemic and containing its possible spread. With the penetration of mobile phones in rural households, use of mobile apps is becoming popular in agriculture also. A large number of such apps are presently available for the use of farming community. Kisan Yojana, Kheti-Badi, IFFCO Kisan, Soyabean Gyan, FarmBee, Kisan Suvidha, Pusa Krishi, Kisan Rath, Krishi Gyan, Crop Insurance, Agri Market, AgMobile, Spray Guide *etc.* are a few among many other important apps available to guide the farmers in various activities related to agriculture. Such apps are even more important in the wake of ongoing COVID-19 crisis when physical movement of farmers to the agricultural experts and institutions (such as KVKs, research and training institutes *etc.*) are severely restricted. Recently, a mobile app named "Soil Nutrient Manager" has been developed by a team of scientists at ICAR Research Complex for Eastern Region, Patna, which aims at providing ready recommendations on fertilizer doses and time of application for a number of crops commonly

grown in Eastern India, particularly in Bihar and Jharkhand.

## Soil Nutrient Manager: What, Why and How?

Fertilizer is one of the most costly inputs in crop production. Its indiscriminate application not only affects crop productivity and farm income, but also causes harm to soil and environment. An Android based mobile application named 'Soil Nutrient Manager' was therefore developed to optimize fertilizer application and to achieve higher crop yield and farm income in eastern India, particularly Bihar and Jharkhand. The app makes fertilizer recommendations based on native soil fertility status and nutritional requirements of the crop to be grown in a particular region. It can be downloaded from Google play store for free. While searching in Google play store, one can identify the app by seeing its logo as shown in Figure 1. Sequence of the screen appearances that a user finds during registration is shown in Figure 2. Registration process is very simple and requires only user's name, mobile number and an eight-digit password.



Figure 1: The logo of Soil Nutrient Manager App

Once a farmer gets registered, he/she needs to provide the required inputs in the input boxes appearing on the screen. First three inputs would be the name of the state, district and village the farmer (user) belongs to. Presently, options are available for all the districts of Bihar and Jharkhand. Next, the farmer has to choose the crop (among many crop options appearing in drop down list) for which he/she needs fertilizer recommendations. Hybrid rice, rice variety to be grown, timely sown wheat, late sown wheat, rain fed wheat,

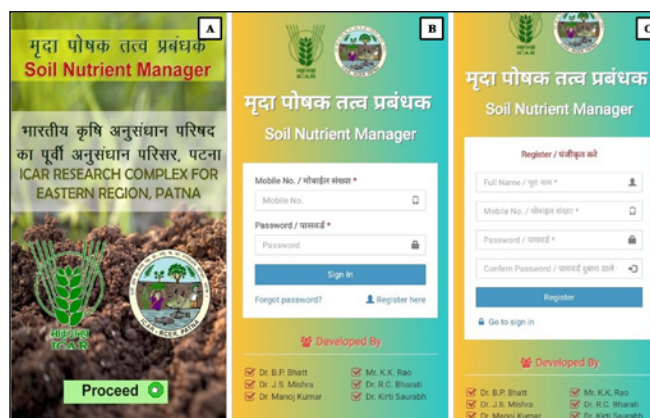


Figure 2: Sequence of the screen appearances during users' registration for the app

*kharif* maize, mustard, potato, *rabi* maize etc. options are available in the drop down list. Further, a farmer needs to provide some inputs related to soil test values. If the farmer has soil health card for his field, the reports contained therein would be quite handy in filling the required inputs related to soil. Essential soil parameters are marked with an asterisk in the list, which includes soil pH, organic carbon (%), available nitrogen, phosphorus and potassium ( $\text{Kg ha}^{-1}$ ), DTPA Zn and Fe ( $\text{mg kg}^{-1}$ ). Figure 3A shows the inputs (imaginary values for demonstration only) provided by a farmer residing in the village Maidan of Sitamarhi District in Bihar. Based on the inputs, fertilizer recommendation has been generated for hybrid rice (Figure 3B) which shows recommended quantity of urea needs to be applied in 3 splits, while DAP and MOP should be given as basal applications.

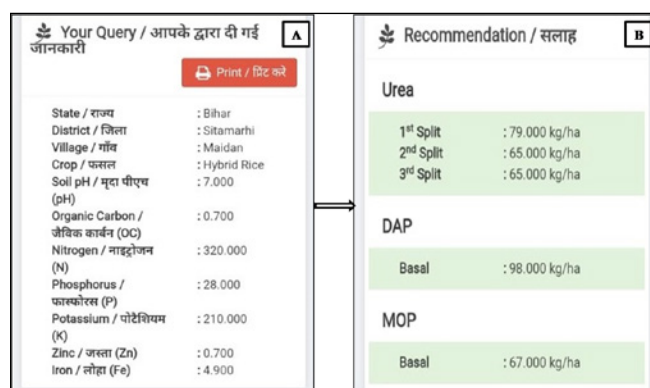


Figure 3: (A) Inputs required for getting fertilizer recommendation (B) Fertilizer recommendation based on inputs given (values of inputs are for representational purpose only)

Although the Soil Nutrient Manager app has been very useful and well accepted by the users, a few improvements would further enhance its utility. In addition to Bihar and Jharkhand, other states of eastern India should also be included in the app. Number and variety of crops may also be worked

upon. Common aquatic crops grown in eastern India such as Makhana (Kumar *et al.*, 2020) and water chestnut, and some important cash crops, medicinal crops, vegetables, fruits *etc.* should also be included. As the fertilizer requirements are expected to increase to meet the growing food demand in the country, and more so under the projected climate change (Kumar *et al.*, 2011), it's of utmost importance to use this costly input in judicious manner. Given the criticality of micronutrients for improving crop production (Kumar *et al.*, 2016), it would hugely enhance the utility and acceptance of this important app if the recommendations on micronutrients are also included.

### Conclusion

In view of the cost involved and environmental concerns associated with indiscriminate use of fertilizers, "Soil Nutrient Manager" App has been developed by ICAR RCER, Patna. Based on soil fertility status, fertilizer recommendations are presently made in form of commonly used fertilizers available to the farmers, for some major cereals, pulses and oil seed crops grown in eastern region. Coverage of some more states and inclusion of some other important crops grown in the region along with addition of recommendations on micronutrients would further enhance its utility for farmers in eastern India.

### Acknowledgement

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