



Quintessential Frameworks to Enable Farmers to Easily Identify Pests and Diseases on their Own

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Received: September 23, 2021

Published: October 21, 2021

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India is a sub-continent with rich biodiversity and diverse Agro-climatic zones. Agriculture has emerged as the largest private-sector occupation in India. The agriculture sector contributes about 19.9% of GDP in 2020-21 which abruptly increased from 17.8% in 2019-20 to the Indian economy. Further, the percentage share of Gross Value Added (GVA) of agriculture and allied sector to total economy has shifted from 18.4 in 2019-20 to 20.2 in 2020-21 thereby fondly known as the backbone of the Indian economy. Indian agriculture faces many challenges such as unpredictable weather patterns, falling water tables, reduction in arable land, decreasing farm sizes, low per hectare yield, a very long supply chain (dominated by middlemen), increasing pest and disease attacks etc. Of these, the most important threat faced by farmers during crop production is due to biotic stresses like pests and diseases, weeds and nematodes. The major crop loss is due to weeds (37%), insects (29%), diseases (22%), others (12%) (Source: Kurukshetra, 2011). According to FAO, at least 40% crops lost to pests every year. Knowing the importance of agriculture, we are in an alarming situation to alleviate the difficulties faced by farmers especially concerning pests and diseases.

Existing practical problems in the diagnosis of pests and diseases by farmers

- **Lack of Awareness:** In India, most of the farmers fall in the marginal or small category with a size below 2 hectares. Many farmers are lacking awareness in distinguishing the stresses caused due to either pest or disease or nutrient deficiency.

- **Lack of Extension Activities:** The field level extension activities were decreasing nowadays compared to the green revolution period in several areas from the farmers perspective.

- **Lack of Technology Adoption:** In the 21st century, many digital revolutions are being taken place. One among these is the development of artificial intelligence in the field of agriculture. Unfortunately, the Indian farmers are lacking in the adoption of technologies.

Quintessential frameworks required

Education to farmers

Educating the farmers is very much important. The subject matter specialists or extension personnel should teach the farmers about how to distinguish and diagnose the pest and disease attack or nutrient deficiency. The teaching must be carried out in such a way that the farmers should be involved in a full-fledged manner and the class should be in the live mode. Of all these, the training should be understandably given to the farmers.

Strengthening extension

Training and Visit system (T&V) developed by world bank expert Daniel Benor based on frequent training of extension workers and regular field visits for onward guiding the farmers in agricultural production and raising their income by providing appropriate risk managing plans should be strengthened with the support of Audio and Visual (A&V) aids.



Figure

Propagating artificial intelligence

Artificial Intelligence (AI) technologies are greatly assisting nowadays to overcome the traditional changes in every field. AI has a very prominent role in agriculture especially in the field of plant protection. One of such AI technologies that emerged in the field of plant protection is the Plantix app. Plantix app helps farmers diagnose pest damage, plant disease and nutrient deficiencies by taking a photo of their affected crop. Users can discuss possible causes and solutions with each other, or with experts paid to monitor infestations and provide scientifically verified solutions. What Plantix brings to the table is a way to help farmers minimize crop losses, for free. Most farmers in India have smartphones. As researchers/subject experts, one can work with the science, tech companies, and government to bring what one knows to more people. Detection success is now at 85 percent accuracy. Some diseases with shorter life cycles needing only four hundred pictures to help identify the problem. Others may require five thousand pictures to train algorithms to detect disease. There are currently five hundred diseases in the database, with a focus on those affecting rice, wheat, groundnut, cotton and tomato. The app has been downloaded by almost twelve million users globally, with the majority of these in India, where it is available in eight local languages. Diseases and pests are evolving all the time. At this moment there are more than 400 pests and diseases that still need to be entered. This app is an empowerment tool and the value are in the intangible benefits, in giving a voice to the farmers. Likewise, several other applications such as Uzhavan, AGRIDaksh were also been in the contemporary world.

Providing technical assistance

Like freebies such as laptops, television and cycle, tablets/ smartphones may be provided to the farmers and extension personnel through the public-private partnership. This will enable the farmers to bear the risk through the detection of pests and diseases on their own. Extension personnel assisted with tablet/ smartphone must undergo survey and keep updating the pest and diseases database. The more the database collection, the greater will be the accuracy.

Educating the educators

Capacity building training should be given regarding the use of digital technology to the extension personnel. This is imperative perhaps extension workers are those who play a vital role in the transfer of technology from the lab to land.

Knowledge on post-harvest pests and diseases

Imparting knowledge on post-harvest pests and diseases to the farmers through SAU's Agri-tech portal viz. TNAU Agritech Portal and other extension aids is indeed to decline crop loss and to enhance the livelihood of farmers.

Acknowledgement

I extend my sincere gratitude to Mr. V. Ravichandran who is a Global Director of Global Farmers Network, United States and a progressive farmer from Thiruvavur District, Tamil Nadu for sharing his insights about practical constraints and needs of farmers from his rich farming experience.

Note

This article has been written based on the theoretical knowledge, field experience and interview of farmers.

Volume 5 Issue 11 November 2021

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