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Identifying the Potential for IT start-ups to help sustain Agriculture in India during Covid-19

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A B S T R A C T

During Coronavirus numerous small ventures have shut down because of which numerous individuals have returned to their hometowns and their lone type of revenue is from cultivating crops in their village. In a difficult time like this Indian start-ups can help provide employment to this individual and at the same time gain a profit by using Information Technologies like Artificial Intelligence, IoT, Machine Learning and Deep Learning, Mobile Applications and Websites to connect with farmers to help them identify the infestations on the crops and provide adequate solutions and to help them sell the cultivated crops. This paper explores the different ways IT can help boost the Agriculture Sector in India during Covid-19.

Keywords: AgriTech, Agriculture, start-ups, Covid-19, Technology

Introduction

Farming is the primary source of livelihood for about 58% of India's populace. Net Value Added by agriculture, was assessed at Rs.19.48 lakh crore in the year 2020. Development in GVA in agriculture and partnered areas remained at 4% in FY20 figure 1.

The Indian food industry is ready for gigantic development, expanding its commitment to world food exchange each year because of its huge potential for esteem expansion, especially inside the food handling industry. The Indian food market is the world's 6th biggest which contributes to 70% of the deals.¹ The Indian food handling industry represents 32% of the nation's all out food market, probably the biggest business in India and is positioned fifth as far as creation, utilization, trade, and anticipated development.

In the world across many developed countries, Information Technology is growing its impressions at the ground level having a critical effect on the planet's most fundamental area that is Agriculture, India is still catching up when it comes to using Information Technology in Agriculture across many states and during this Covid-19 pandemic it has accelerated the process of implementation of IT in many sectors of agriculture.

Present Scenario of Agriculture in India

Indian agriculture gives employment opportunities to the greater part of our populace. It incorporates more than 12 crore smallholder and minimal farmers, a large portion of them face yearly dangers identified with low rainfall, value instability, swelling, weak foundation, obligations, etc. Covid-19 pandemic is an additional challenge for this area and its partners, affecting lion's share of populace because of its enormous effort. On one hand rural area is one of the dismissed areas and then again, worldwide pressures left us to focus more on nearby utilization and creation, leaving no other choice to look upon producers, neighborhood endeavors and provincial economy.

We have heard "Necessity is Mother of Invention" since our youth, and this pandemic demonstrated it appropriate for Indian agriculture sector as well.² We have seen different advances taken by government during this Covid-19 pandemic, a considerable lot of those were needed since many years. Covid-19 pandemic astonished us all and gave investors a chance to explore, test, learn and actualize imaginative thoughts. Covid-19 affected the farmers when lockdowns struck which carried difficulties to Indian farming system; these are predominantly identified with lack of

work, types of gear, supply chains and divided demand.²

Exploring Technologies Available for Agriculture Artificial Intelligence

Artificial Intelligence is in the adoption process in India. Start-ups and corporations are familiarizing themselves with the concept of using artificial intelligence to increase success of their business. Much of India's AI development can be seen in the private sector, but it has also drawn attention from the government in recent years.³

In India, for their subsistence, a large population relies on agriculture. The problem of farmers in India is not excessively big because they rely on traditional farming methods. In the agricultural industry, this specialty can be made use of in Artificial Intelligence. The AI models can give urgent insights about the farmland, plant development, assisting farmers in planning exercises, watering the farmland. In India, because of absence of understanding of cultivating, the efficiency of production decreases due to continuous erosion of soil. It is possible to use scattered dirt tracking done by photo recognition and deep information versions to take rehabilitative steps to carry back soil well-being.³

If plants receive enough water, the use of water in agricultural land can be maximized by using thermal imaging cameras that keep track of it continuously. It may help to decide suitable crops to grow on a fertile surface in a favorable setting, as well as the sowing technique to enhance efficiency and reduce costs as well. To provide more detailed demand-supply information and to foresee the need for agricultural produce for farmers, anticipating modelling using AI may be significant.

The image shown in Figure 1, is an application of AI in agriculture that was seen in the Google I/O 2018 where a few students created an app to analyze the infestation in crops using the camera of a smart phone where the AI analysis the data and uses a model that is trained to identify and provide options on the best ways to manage it.⁴ It may also be used to predict activity and to research parasites that could be useful for advanced insect control planning.

Similarly, an AgriTech start-up company named CropIn

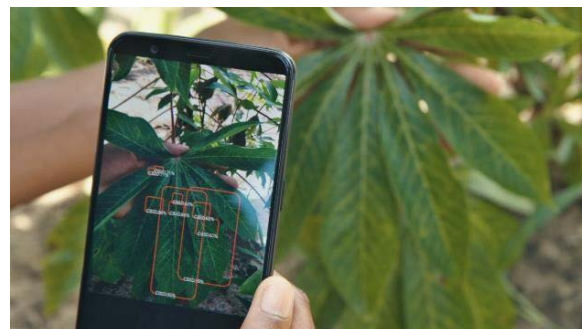


Figure 2. Detection of Infestation in Crops using AI

based in Bengaluru India has used AI to maximize per-Acre Value by monitoring crop health and providing data on when to harvest crops.

IoT

IoT in agriculture consists of sensors, processing, connectivity, and cloud solutions optimized in their working according to specific use cases.⁵ While still developing in India, the Internet of Things (IoT) has already impacted the agricultural sector of the country in recent years, deemed to be the new age technological revolution by the Department of Telecommunications (DoT), the Government of India.

Imagine the use of smart sensors, telecommunications and IT power for real-time crop health tracking, soil vital control, the production of smart irrigation facilities, and much more. That is just what IoT ecosystem developers and device integrators are doing to enable not-so-tech savvy farmers to increase their crop performance using cutting-edge technology, leading to a booming agro-based economy.

Some of the Applications of IoT are

Soil Sensors : Vital soil components such as pH, acidity, salinity, and essential nutrients such as nitrogen, phosphorous, and potassium are measured by Soil Sensors. This data is then sent to the main controller, which automates the process by drip irrigation technology to release necessary fertilizers and soil conditioners.

Integrated pest management or control (IPM/C): Pests are the worst enemy of farmers and they kill their fields, and the farmer must suffer losses or expend a lot of money available to salvage whatever is possible. The IoT will play a major role in detecting the pests at the right time to avoid this problem.

Hydroponics and Aeroponics: The discovery of hydroponics and aeroponics made the IoT device practical. These systems are made up of numerous sensors, motors, mixers, and humidity controls that constantly send in a lot of data. Both hydroponic and aeroponic systems are completely IoT-automated and connected.

Water Management : In water control, technical advances

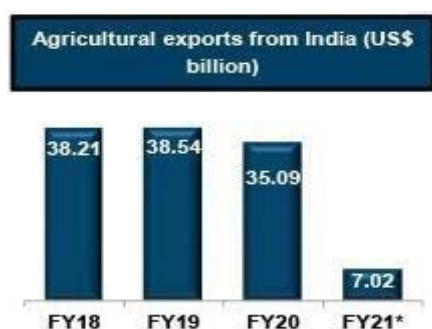


Figure 1. Graph showing agricultural exports in India

such as drip irrigation have helped, this not only allows us to save water but also control how much adequate water is to be provided for the crops.



Figure 3. Water Irrigation using IoT

Big Data

Big data is an extensive array of organized and unstructured data that can be extracted for information and processed for improved decision-making to create predictive systems. In developing countries, big data applications in agriculture are gaining traction as innovations such as livestock tracking gadgets, drones, and soil sensors produce huge data volumes to enable data-driven farming. The aim is to assist producers, farmers, and scientists in implementing effective agricultural methods.⁷

Traditional instruments are being replaced by sensor-equipped devices that can gather data from their surroundings to monitor their behavior, such as temperature regulation using thermostats or crop defense using strategy algorithms.

With the help of big data, the AgriTech start-ups can do the following things in agriculture:⁸

- Boosting productivity
- Predicting yields
- Risk management
- Food safety
- Reduce cost of expenditure

Machine Learning & Deep Learning

Machine learning helps the computer system to learn from prior insights acquired by knowledge from training data. As of now, the sub-set of artificial intelligence is machine learning, which is basically the methodology used to create AI-enabled models.

Deep Learning is the sub-set of machine learning that makes it possible for computers to solve more complex problems to get more detailed outcomes from some form of machine learning.

One of the ways Machine Learning and Deep Learning can be used in agriculture is to predict whether a plant will successfully grow or end up having a disease. A researcher

named Xin Yang has exactly done this with the help of the data set he gathered, which he used to identify plant pathogens before it is too late.



Figure 4. Robots using Machine Learning to harvest crop

According to paper¹⁰ In Indian Economy a Machine learning based recognition system will demonstrate to be extremely helpful as it saves attempts, money, and time too. For automatic detection of diseases in leaves, neural networks are used. The method indicated can substantially support a correct detection of leaf, and seems to be important approach, in case of steam, and root diseases, putting fewer efforts in computation.

Mobile Applications and Websites

Indian consumers make up about 30 percent of the global feature phone market's overall number, making it the second largest in the stated region. India had 720 million users of cell phones in 2015, of which 320 million were users of rural mobile phones.

50 million users of smartphones with internet connectivity were also included in this calculation. This share of rural India has jumped to 48 percent by 2020, according to 'The Growing Wired Customer in Rural India', a report by the Boston Consultancy Company. Given that 58% of rural households depend on agriculture as one of their most significant sources of livelihood, the role of Digital Agriculture in Digital India needs to be considered.¹¹

The AgriTech start-ups with the help of government in India has developed numerous mobile apps to work towards farmers' empowerment and village growth. These applications help improve overall market efficiency and reduce the detrimental effects of farming on the climate. Farmers can now access information about the weather, dealers, market rates, plant safety, agricultural advisories, etc. with the click of a button. Thus, these developments would undoubtedly help bring about major improvements in farmers' lives and in the world of agriculture. These applications come in various regional languages.

The above image is a website developed by India- Japan Joint Research Laboratory Project entitled "Data Science based farming support system for sustainable crop production



Figure 5.A Website that diagnosis Crops

under climatic change (DSFS)", funded by Department of Science and Technology, India (DST) and Japan Science and Technology Agency (JST).¹² Websites & Mobile Applications with similar features like the one mentioned above can be developed by new start-ups and make them available in regional languages to help with the various problems faced by farmers in agriculture in Indian states.

Challenges in The Indian Agriculture

Although the technologies are effective, known to operate, and innovative, their implementation in the Indian agriculture sector is one of the major challenges. Technology is the tool that will help the farmers increase their productivity and build better and cost-effective financial freedom avenues, thus providing jobs in the process by companies willing to create a start-up around it with the help of the government. The dilemma is not that there are no technical alternatives to agricultural problems, but it is of greater importance that they are not adequately implemented. There is a need to train farmers with the use of data on risk avoidance and prospective upsides likely. This also helps one understand the amount of training hours that farmers need to be provided in integrating these innovations in daily farming. The troubles do not stop there. Issues such as utilities, the need for uninterrupted electricity and internet access, and funding for technological implementation are still a problem. This includes guidance on computer use, practical troubleshooting, data use, mobile and app usage, and more.

Overcoming The Challenges

The government of India has taken great initiatives in helping new and upcoming AgriTech start-ups and has come up with various schemes to help fund this start-up and provides insurance to this AgriTech start-ups.

Several schemes were launched by the government last year, such as the [Krishi] Udaan Logistics Improvement Scheme and the Agriculture Infrastructure Fund. This year,

we foresee a close emphasis on farming.¹³ In October 2020, the government announced that it is putting up a common data infrastructure for farmers in the country. PMFBY (Pradhan Mantri Fasal Bima Yojana), PM-Kisan and the Soil Health Card will be integrated through a common database, along with land record details.¹

The government of India also provides mentoring to tech start-ups with the help of AGRI-UDAAN program which helps them connect with potential investors. This will also help the youth of rural areas to train themselves and add value to the farmers produce.

Many AgriTech start-ups have Found Success some of Them are:

1. CropIn provides an insightful, clever, self- evolving system that provides the whole agriculture sector with future-ready farming solutions with the help of AI.
2. Fasal has helped its farmers reduce cultivation costs and boost quality and yield, providing farm-specific, crop-specific, crop-stage- specific, actionable advice through their AI powered IoT systems for horticulture.
3. Intello Labs claims to have advanced technologies for image recognition that can identify and tag objects, faces, and flora fauna in any image using Deep Learning Algorithms.

Advantages

Creates Job

Technology is the tool that will help the farmers increase their productivity and build better and cost- effective financial freedom avenues, thus providing jobs in the process by companies willing to create a start-up around it with the help of the government during Covid-19 pandemic.

Quality Products for Consumers

Information Technologies makes it possible to avoid challenges and remove all issues that may arise during farming processes. Thus, the quality of the product is growing, and consumers get a good product of high quality.

Economic Growth

Agriculture is expected to buffer the shock of the Covid-19 pandemic on the Indian economy in 2020- 21, with growth of 3.4% in both Q1 and Q2. A series of ambitious government reforms have led to feeding a thriving agriculture market, which remains a silver lining in India's FY 2020-21 growth story.¹⁴

Conclusion

This paper shows the tremendous potential of AgriTech start-ups in India, it is imperative that technology can be used to the fullest to make the best of it for both farmers and consumers. We have seen many AgriTech start-ups emerging in the country with recent developments in

technology coupled with favorable government policies, which is a perfect starting point for the penetration of advanced technologies in agriculture. It also demonstrates how the farming scene in India can be sustained with the aid of information technology by increasing efficiency, reducing manual labor, saving time, and making farming productive and providing jobs to the people during Covid-19 pandemic.

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