A STUDY ON ROLE OF TECHNOLOGY IN AGRICULTURE

Ms. M.Sathiya

Assistant Professor, Department of Commerce (PA), Sri.S.R.N.M College, Sattur

Ms. C.D.Indooja

Assistant Professor, Department of Commerce (PA), Sri.S.R.N.M College,Sattur

ABSTRACT

Over the last few decades massive technological development and opportunities have transformed people's lives. However, these opportunities have not benefited the agriculture sector in a significant way. Farmers and various other actors along the agriculture value chain need significant amounts of information. Information and Communication Technologies (ICTs) will play a key role in knowledge exchange, targeted recommendations, market integration and access to finance to make agriculture a profitable enterprise and attractive for youth. This paper involves in descriptive analysis which focuses on the role of technology in agriculture, how it transfers the lives of farmers, how it is managing the farms and corps of the farmers, how it leads to changes in the agriculture operation, awareness of the farmers and scope of the digital agriculture.

INTRODUCTION

Digital India is a campaign launched by the Government of India to ensure the Government services are made available to citizens electronically by improved online infrastructure and by increasing Internet connectivity or by making the country digitally empowered in the field of technology. Prime Minister Narendra Modi launched Digital India on July 1, 2015 to create digital infrastructure for empowering rural communities, enabling digital delivery of services and promoting digital literacy. Given that 68 per cent of India's population is rural and agriculture is the main source of livelihood for 58 per cent of the population, one must consider the role of Digital Agriculture within Digital India. Digital Agriculture can be defined as ICT and data ecosystems to support the development and delivery of timely, targeted (localised) information and services to make farming profitable and sustainable (socially, economically and environmentally) while delivering safe, nutritious and affordable food for all. Rural connectivity will be key to provide low cost data and access to information. It would empower rural youth to realise their full potential, farmers to increase

their profitability by accessing equitable markets and rural businesses to offer value added services.

ROLE OF TECHNOLOGY IN AGRICULTURE

The key components to support the implementation of Digital Agriculture is Spatial (and Temporal) Data Infrastructure (SDI) and low-cost smart phones and tablets to support the bi-directional flow of data and information to rural consumers. Agriculture is a data-intense enterprise when one considers soil variability, moisture and nutrient levels, rainfall variability and timing of key operations like planting and harvesting, and market price volatility. Advanced agriculture industries help farmers manage these production and market risks through the application of spatial/temporal data bases that are cloud enabled and integrated through Application Programming Interfaces (APIs). This creates a rich and dynamic data ecosystem that enables advanced analytics to inform farmers of the best economic options to maximise profitability and minimise risk - the two critical variables farmers in India would also like to manage.

Smartphones are the other key intervention as they are equipped with GPS (Global Positioning System) to track where photos of field infestations or hail damage have taken place for technical support or insurance claims. Mobile phones also enable farmers to integrate into structured markets based on approved grades and standards that can be verified using calibrated photos and settlements made through mobile money. Digital technology will be the key to increasing agriculture productivity by delivering tailored recommendations to farmers based on crop, planting date, variety sown, real time localised observed weather and projected market prices.

The greatest impact of Digital Agriculture is on democratisation of market pricing and compressing transaction costs so that farmers capture a higher portion of the produce's marketable value. Agricultural value chains are complex with several actors along the chain but information asymmetry between the farmer and aggregator or intermediaries results in farmers having to sell into saturated, weak markets that are not based on standards.

With the Direct Benefit Transfers system and the unique identification number, Aadhaar, to support transfer of government subsidies to citizens, India is uniquely positioned to leverage these platforms to support the earlier interventions around soil health, Prime Minister Krishi Sinchayee Yojana, national markets and weather indexed insurance. When combined with spatial/temporal data infrastructure, subsidies can be validated (for example, application of fertiliser on a specific field under a targeted fertiliser subsidy programme) and targeted (e.g.

digital soil map and crop to be cultivated and rainfall anticipated) to increase farm profitability and manage production and market risks that in turn give farmers confidence to invest in their farms to further increase productivity.

Digital Agriculture will also leverage social media platforms to build human capacity. One of the best examples originating from India is Digital Green. It uses participatory videos that have farmers explain best management practices to other farmers. This approach is ten times more cost effective than traditional extension services as farmers trust other farmers more given they can better relate to someone like them who are building a livelihood under similar circumstances.

Mobile money is the key intervention that has unlocked tremendous opportunities for rural consumers in Africa and will do the same for India. Paper money is expensive and risky to rural consumers but mobile money is safer, especially for women, and costs less to transfer. Mobile money also allows rural consumers to bypass poor infrastructure to support savings and access credit.

TECHNOLOGY IS TRANSFERING THE LIVES OF FARMER S

The Fourth Industrial Revolution (4IR) heralds an exponential pace of technological change, building on the digital revolution to combine technologies, spawn new ones, and transform systems, industries, countries - even society itself. For developing countries, advances in computing power, connectivity, artificial intelligence, biotechnology and GIS(geographic information system), and newer, more capable technologies hold tremendous promise. Inclusive agriculture, rural growth and structural transformation from agriculture to high-productivity manufacturing and other economic sectors can be accelerated, as technological change transforms individuals' lives and enables developing countries to progress at speeds and on scales previously inconceivable.

As more young men are migrating from rural poverty to urban areas to seek employment, they are contributing to a rapid feminisation of agriculture. Women, especially dependent on agriculture, perform most of the backbreaking labour. Their low productivity in agriculture, itself increasingly affected by climate change, demands action by policymakers. Any transformation of agriculture requires removing the constraints on women..

In 2016 India's Prime Minister Narendra Modi introduced a new national policy to double farmers' incomes by 2022. It targeted poverty reduction, food security and climate change,

which is hurting agriculture with rising temperatures, increasingly frequent floods and droughts, and a greater incidence of pests and diseases. The Ministry of Agriculture & Farmers Welfare launched a national scheme called Pradhan Mantri Krishi Sinchai Yojana (PMKSY) with the aim of irrigating every Indian farm and improving water-use efficiency.

Through its Digital India programme, GOI is working to transform the country's rural economy and create skilled jobs in rural areas. For the estimated 156 million Indian rural households, most living in poverty according to India's National Sample Survey Organization (NSSO), there is need for investment in transportation, power, and internet access to create more employment for women and youth in rural areas.

The Ministry of Communication and Information Technology enable small farmers to shift from input-intensive to knowledge-intensive agriculture. Precision agriculture can improve the timeliness of planting, secure the best market prices through market information and e-market reforms, provide fertiliser subsidies via direct bank transfers that eliminate or reduce the cost of financial intermediaries, and improve agricultural extension. Combined with improved seed supply and land and water management, which can in turn increase double and triple cropping, farmers' income can grow.

In April 2016, Prime Minister Modi launched eNAM (National Agriculture Market), an online platform for farmers that integrates agricultural markets online, allowing farmers and traders alike to view all Agriculture Produce Market Committee-related information and services, commodity arrivals and prices, and buy and sell trade offers, thus helping farmers bid for the best prices across markets. GOI also launched a crop insurance scheme, the Pradhan Mantri Fasal Bima Yojana (PMFBY) in 2016, which now covers 37 million farmers.

Additionally, GOI is investing in mapping all of India's aquifers, and using technology to manage water demand. Quantifying the relationship between rainfall and groundwater levels under alternative modes of irrigation and farming should enable prioritisation of prospective water and irrigation investments.

Digitised land registration, mobile phones and 'Rubberized' tractor services all are contributing to improved farm management. Digital India Land Records Modernisation Programme (DILRMP) is updating millions of land records, providing title guarantees and

increased security of land tenure to farmers while stimulating land rentals by nonviable smallholders and land consolidation.

To facilitate communications, Digital India is implementing plans to connect 2.5 million Gram Panchayats (local governments) with high-speed internet by 2018, with hundreds of thousands already internet-enabled. GOI has also mandated that all mobiles phones must support at least one of 22 Indian languages, other than English and Hindi, beginning July 2017. With only 27% of villages having banking services within 5 kilometres, the government is licensing new banks and using mobile phone payment technology to an increasing extent. Mobile coverage is high—over 1 billion of India's population of 1.4 billion are connected.

ASSISTANCE OF TECHNOLOGY IN MANAGING THE FARMS AND CORPS OF THE FARMERS

Digital farming helps to keep a tap on day to day farming operations possible through real time flow of data from the plot to the company office. The agribusiness can make use of end to end features to take care of entire value chain, right from sowing to harvesting. Right from sowing, the package of practices is set at a crop level on the plot and is communicated to the farmer through digital systems. There are systems of advisory for right quantity of chemicals and fertilisers application as well. The field staff attached to the farmer

ensure best practices for the farmers on the field.

Digital monitoring of the farm enables instant notification of the pests and diseases affecting the farmers' field to the right stakeholders. The plot in these conditions can digitally be managed by giving the right course correction advice and taking regular updates on the health of the farm through pictures.

Another advantage that follows is pacing farmers' activities on plots with the weather changes. This is of strategic importance to the field as weather play impacts the output. Providing not only short term and long term weather but also agricultural metrics can give farmer a quick health and time to maturity of the plot.

DIGITISATION LEADS TO CHANGES IN THE AGRICULTURE OPERATIONS

The digitisation is going to change the agricultural practices in various means such as remote sensing of plots through satellite systems with precision as close to 5X5 meter resolution can

help identify the pest or disease affected areas of the plot. This can be done through Big Data Analytics, with indicators like Normalized Difference Vegetation Index (NDVI), Red Edge Index etc. It will be immensely helpful in weed and pest management.

A field staff can also do quality checks on farms and see which lot of his produce meets the customer order, in case of an exporting company - it can do Lab Test Integration and see if the inventory he has checked in to the system meets Maximum Residue Limits (MRL) requirement or not. The digitisation of agricultural practices can provide traceability across the entire supply chain.

On a different perspective, technology in its frame also helps the farmer to connect with the right stakeholders in case of need whether connecting with an input provider or an equipment supplier. In case of managing crops the farmer also needs to connect with the buyers to initiate sale. An online marketplace can not only connect the buyers with the farmers but also give the farmer independence and options to choose a buyer.

AWARENESS AMONG FARMERS

we understand that education is not a barrier if the product is simple to use. If you take an example of WhatsApp and Facebook, they have spread to the remote villages of India. We have customers who deploy staff from local villages who are barely literate and could use CropIn app easily. We kept in mind of our user base and designed a simple and easy to use application. Moreover, the application supports local languages.

SCOPE OF DIGITAL AGRICULTURE

The agencies are present in 14 states in India such as Himachal Pradesh, Punjab, Rajasthan, Haryana, Gujarat, Maharashtra, Madhya Pradesh, West Bengal, Sikkim, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala and Bihar. They received overwhelming response from the clients and farmers in Ludhiana, Jalandhar and Moga districts in Punjab and Sabarkantha, Patan, Mehsana and Gandhinagar districts in Gujarat. In other parts of the country, we are getting similar response which has pushed us to expand services in rest of the states. Apart from India, They are providing services in 9 other countries such as Kenya, Nepal, Portugal, Indonesia, Vietnam, Brazil, Columbia and Mexico.

CONCLUSION

While Digital Agriculture is most advanced in the US, the concepts are scale neutral and are being successfully applied to smallholder farmers around the globe. We need to move with a

sense of urgency to apply these new tools to accelerate the pace of agriculture development to not only realize the vision of the Prime Minister of a Digital India but to facilitate the achievement of Sustainable Development Goals before 2030. And also the study suggests that the information and suggestions relates to the corps and fields in their local language not in the form of text but the mode of conversation. And also it would be much more sophisticated to the illiterate formers to clarify their doubts through queries without any hesitation. Hence, Digital agriculture will also help achieve the objectives of the National Food Security Act in the most efficient, effective and equitable manner to ensure ALL have access to safe, nutritious and affordable food.

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