A STUDY ON THE ROLE OF E-TECHNOLOGY TO TAKE OVER AGRICULTURE DISTRESS IN INDIA

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INTRODUCTION

Agriculture sector is the core sector and the backbone of Indian economy for food and nutritional security, sustainable development, inclusive growth & for poverty alleviation. It contributes approximately 17 % of GDP. The country’s food grain production stood at 252.23 million tonnes in 2015–16, a production of 271.98 million tonnes in 2016–17 and 277.49 million tonnes in 2017-18. Although the production is increasing but the profitability of farmers is stable. The Indian farming and agricultural sector for a long period of time is dependent on nature and primordial techniques of cultivation. The Indian agriculture sector was consumption-oriented, lacks agricultural implements, proper irrigation facilities and this lead to low output. The Indian farmers are using agriculture technique which are old and outdated which results in uncertainty in their production.

This state of agriculture can be revolutionized only by technological innovations. Technology has a wider scope in agriculture development and increasing farmers income. The focus of modern agriculture has to be shifted from more “productivity” but to “profitability”. This is of great significance as agriculture and allied sectors form the backbone of the Indian workforce.

Objective

The major objectives of the research are

- To study the meaning and scope of e-Technology for development of agriculture.
- To know the forms of alternative farming’s which can be practiced in India.
- To identify the major initiatives taken by both the government and startups to enhance agriculture sector in India.
- To suggest measures encouraging role of e-Technology and in agriculture.

RESEARCH METHODOLOGY

The Indian agriculture sector is facing various challenges. The research paper on the title “A study on the role of E-technology to take over agricultural distress in India” is based on descriptive-Analysis method. The research is done on secondary sources and various articles and research papers are studied.
This is one of the most debated current issues of the Indian economy and hence, the author has relied more on News papers, online sources, Journals, Magazines and debates in news channels for collection of recent facts and data. The research paper tries to explore the new opportunities created by e-technology in agriculture sector for gaining productivity and profitability.

**Use of e-Technology in agriculture: world scenario**

The Food and Agriculture Organization, the United Nations’ agency published a report in 2009 which suggested that by 2050 agricultural production will have to rise by 70% to meet projected demand. Since most land suitable for farming is already farmed, this growth must come from higher yields. Agriculture has to undergo yield-enhancing shifts from mechanization.

According to a report by the ‘Indian Council of Food and Agriculture’ only 40% to 45% of Indian agriculture has been mechanized. But the farm mechanization percentages in other countries is – 95% of US agriculture, 90% of Australian agriculture, 99% of Japanese agriculture, 75% of Brazilian agriculture, and 91% of Chinese agriculture. Some of the major milestones which countries are striving to achieve in agriculture sector are -

1. Despite the fact that geography of Israel is not naturally conducive to agriculture with semi-arid topography. Agriculture in Israel is a highly developed industry. Israel is a major exporter of fresh produce and a world-leader in agricultural technologies. It is innovative - in use of resources; maximum yields on limited land and maximizing water conservation. Israel’s known for their irrigation system mostly the ‘drip irrigation’ that is having a profound impact in ‘water-challenged’ areas around the world. Agriculture in India is set to benefit from adopting Israeli technology.

2. Japan’s Agri-tech business are marketing a wide variety of products and services for meeting industry demands and the nation saw generally increased productivity, lower costs, use less resources such as water and pesticides, and improve product quality and availability. Japanese Tech companies are heavily investing in agriculture technology.

3. Turning deserts sand into farmland; Chinese scientists proposed a revolutionary solution to desertification. This is an eco friendly attempt to transform dead deserts into thriving ecosystems and fertile lands. Flowers and vegetables are growing in nearly 500 acres of sand with new technology.

4. Spatial Data Infrastructure (SDI) has been the key driver to support modern farming in the US, Australia and Europe as well as emerging economies of China and Brazil. While Digital Agriculture is most advanced in the US, efficient business models have emerged from Africa, Brazil and China that use big data and mobile phones to increase value chain efficiency for upstream access to appropriate inputs and credit.

**Table No. 1 Countries with highest exports and their agricultural statistics**

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<td>1</td>
<td>United States</td>
<td>$118.3</td>
<td>1.63</td>
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<td>2</td>
<td>Netherlands</td>
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<td>3</td>
<td>Germany</td>
<td>$70.8</td>
<td>1.26</td>
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<td>4</td>
<td>France</td>
<td>$68</td>
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<td>5</td>
<td>Brazil</td>
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<td>*</td>
<td>China</td>
<td>$96.60</td>
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<td>**</td>
<td>India</td>
<td>$33.87</td>
<td>41.61</td>
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Source: Employment in agriculture (%), ILOSTAT database, investopedia, media sources

The above table shows that although India and china are the major producers of most of the agricultural produce, but they are not able to export much since they are utilized for domestic consumption. The above nations have a small proportion of populations devoted towards agriculture production but they produce with efficiency and export more to the rest of the world.

**Use of e-Technology in Indian agriculture sector**

The ambitious mission of the government - ‘Digital India’ was launched on July 1, 2015 to create digital infrastructure. One of its major aims was empowering rural communities, enabling digital delivery of services and promoting digital literacy in rural areas. 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, Digitalization of agriculture has to play a greater role in Digital India programme.

New technologies such as Biotechnology, information and communication technology (ICT), renewable energy technology, space applications and Nano-technology are approaching towards farming and agriculture sector to enhance agriculture productivity per unit of land. The convergence of mobile networks, broadband internet, cloud platforms, Internet of Things (IoT), Artificial Intelligence and open data is helping to transform agriculture. Digital technology can guide crop and input selection, facilitate credit and insurance, and provide weather advisories and disease and pest related assistance and data on markets which is necessary for Indian farmers. The e-technology can be used for the following purpose-

- Information to farmers on seeds, fertilizers, pesticides.
- Information to farmers on Govt. Schemes.
- Information to farmers on Soil recommendations.
- Information on crop management.
- Information on weather and marketing of agriculture produce.
Shifting weather patterns such as increase in temperature, changes in precipitation levels, and ground water density can affect farmers, but leveraging e-technology can predict and lessen the adversaries for sowing, pest control and commodity pricing.

Recent prospects of e-Technology in agriculture sector

1. Historic climate data spanning over 30 years from 1986 to 2015 for Devanakonda mandal (Tehsil) in Andhra Pradesh was analyzed to calculate the crop-sowing period, using Artificial Intelligence (AI). And to determine the optimal sowing period, the Moisture Adequacy Index (MAI) was calculated. MAI is the standardized measure used for assessing the degrees of adequacy of rainfall and soil moisture to meet the potential water requirement of crops.

2. On a pilot basis in the southern states, technology giant Microsoft and its collaborative partner International Crops Research Institute for Semi-Arid Tropics (ICRISAT) developed an AI Sowing App powered by Microsoft Cortana Intelligence Suite, guided the farmers of Andhra Pradesh and Karnataka about the optimal date for sowing groundnut crops. The SMS was delivered in native languages; Telugu and Kannada. For this farmers only need a feature phone capable of receiving text messages. Thousands of farmers sowed crops according to the advisory of SMS. It has given a positive yield with 10 to 15 % increase in production.

3. The farmers in the villages of Telangana, Maharashtra and Madhya Pradesh are receiving automated voice calls that tell them whether their cotton crops are at risk of a pest attack, based on weather conditions and crop stage.

4. The government of Karnataka can get price forecast for essential commodities three months in advance for planning the Minimum Support Price (MSP). Thus, this kind of innovation had seen a successful price checking mechanism.

5. In Karnataka, Artificial rain (Project Varshadhare) through cloud-seeding technique has been made possible to provide relief to the drought-hit areas due to failure of monsoon in 2016-17. Thus, with the use of technology, it has become possible to minimize the risks involved in agriculture.

Alternative farming’s

There are other alternative farming’s which can play a key role in transforming the Indian agriculture and increase farms productivity along with profitability.

Organic farming: It is a method of farming system which primarily aimed raising crops by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (Bio fertilizers) to release nutrients to crops for increased sustainable production in an eco friendly manner with minimum pollution. Organic farming is based on the principle of maximum production with high quality yields without affecting the soil fertility and environment. Organic farming is a small farm agriculture system with operations being on farm size of less than 1 acre in size. According to the report of ‘World of Organic Agriculture 2018’, India is home to 30 percent of the total organic producers in the world, but accounts for just 2.59 percent of the total organic cultivation. Most of the organic farmers are struggling due to poor policy measures. Sikkim is the only state where organic farming is flourishing compared to rest of the country.

Precision agriculture: Precision agriculture or Satellite farming is a farming management concept that uses information technology (IT) to ensure that the crops and soil receive exactly what they need for optimum health and productivity. Geographic Information System (GIS) is extensively used in Precision agriculture. It includes Digital Mapping and Analysis of the soil. It reduces fertilizer and pesticide use, prevents soil degradation, utilizes water optimally and raises productivity. This kind of agriculture can go a long way in tackling many of our country’s farm ills, including excessive use of water and other inputs. The global market for precision agriculture is expected to grow at an annual growth rate of 13.09% to reach a market size of over US$6.34 billion by 2022.

Smart farming: SF involves the incorporation of modern technologies such machinery, equipment, and sensors to increase quality and quantity of agricultural products. New technologies such as the artificial intelligence, Internet of Things and cloud computing are expected to advance farming. Smart farming allows a large volume of data and information to be generated with progressive insertion of automation into agriculture process. Smart farming relies on data transmission and analysis of various farm data for decision making. Microsoft is working on this matter in India.

Government steps to provide e-aid to farmers

Under the National Telecom policy, 2012 major focus is being given at improving the broadband penetration. It mentions mobiles as an instrument of socio-economic empowerment for citizens. Some of the major schemes for encouraging e-Technology are-

a. Kisan Call centre: An expert advisory system where in the farmers needs to call the toll free number 1800-180-1551 to seek expert advice on different matters related to agriculture and allied sectors.

b. Pradhan Mantri Gramin Digital Saksharta Abhiyaan: The scheme to make six crore persons in rural areas,
across India digitally literate, reaching to around 40% of rural households by covering one member from every eligible household by 31st March, 2019. Mobile-enabled kisan card system are also provided to help the agricultural community to engage in cashless transactions to bridge digital divide.

Website: https://www.pmngdisha.in

c. **mKisan:** mKisan SMS Portal has been devised to give a information on crop production, horticulture, animal husbandry, dairying and fisheries to farmers through SMS messages. Providing information or giving advisories on mobile phones from experts at various levels in regional language for easy understanding of the farmers. It sends messages relating production, marketing, weather forecast, soil testing, etc.

Website: http://mkisan.gov.in

d. **Soil Health Cards:** It aims at promoting Integrated Nutrient Management (INM) through judicious use of chemical fertilizers including secondary and micro nutrients in conjunction with organic manures and bio-fertilizers for improving soil health and its productivity. Providing recommendations to farmers for improving soil fertility, ensuring quality control requirements of fertilizers, bio-fertilizers and organic fertilizers.

Website: http://www.soilhealth.dac.gov.in

e. **eNAM:** eNational Agriculture Market (eNAM) is a pan-India electronic trading portal which networks the existing Agriculture Produce Marketing Committee (APMC) mandis to create a unified national market for agricultural commodities. The eNAM Portal provides a single window service for all APMC related information and services such as commodity prices, trade offers, etc.

Website: http://www.enam.gov.in/NAM

f. **Kisan Suvidha Portal:** Kisan Suvidha is an omnibus mobile app developed to help farmers get relevant information instantly. The app provides information on various details such as weather, market prices, seeds, fertilizers, pesticides, agriculture machinery, dealers, agro advisories, plant protection and IPM practices etc.

Website: http://www.kisaansuvidha.com

g. **Government e-Marketplace:** Government e-Marketplace (GeM) is single window solution for online procurement of common use Goods & Services required by various Government Departments/Organizations and PSUs. GeM aims to enhance transparency, efficiency and speed in public procurement. It also provides the tools for direct purchase, e-bidding and reverse e-auction.

Website: https://gem.gov.in

**Initiatives of the Government**

Government has been encouraging the use of space technology and for this purpose, four core areas are considered, namely, crop assessment and monitoring, agricultural resources management, disaster monitoring and migration and satellite communication and navigation applications.

a. The Government signed a MoU between India and Italy on the 6th December, 2017 with an objective to enhance agricultural cooperation between the two countries. India would also continue its endeavour to promote cooperation with other countries.

b. Neem Coated Urea (NCU) scheme is initiated to regulate use of urea, enhance availability of nitrogen to the crop and reduces cost of fertilizer application. NCU slows down the release of fertilizer and makes it available to the crop in an effective manner. It reduces the cost of cultivation and improves soil health management. The extension of urea subsidy to farmers till 2020 is estimated at Rs. 45,000 crore.

c. Pradhan Mantri Krishi Sinchai Yojana (PMKSY) was launched on 1st July, 2015 with the aim of providing end-to-end solutions in irrigation supply chain, water sources, distribution network and farm level applications with an investment of Rs. 50,000 crore (USD 7.7 billion). A dedicated Micro Irrigation Fund in collaboration with NABARD with an initial corpus of Rs. 5000 crore (Rs. 2000 crore for 2018-19 & Rs. 3000 crore for 2019-20) for encouraging public and private investments in Micro irrigation is also proposed.

d. With an aim of commercializing Indian agriculture recent strategies include -allotment of Rs. 2000 crore for computerization of Primary Agricultural Credit Society (PACS) to ensure cooperatives are benefited through digital technology. A New AGRI-UDAAN programme launched to boost innovation and entrepreneurship in agriculture.

e. Cotton Association of India (CAI) is preparing to launch a dedicated mobile app for cotton cultivators for dissemination of quick and credible information on price, arrivals and cotton trade.

**Private sector initiatives**

Technology giant Microsoft has now taken Artificial Intelligence (AI) in agriculture to a step further. In collaboration with United Phosphorous (UPL), India’s largest producer of agrochemicals a Pest Risk Prediction API has been developed, that leverages AI and machine learning to indicate the advance risk of Pest attack on crops. India is among the countries with highest number of agriculture startups (USA, India, Canada, United Kingdom, Israel, and France). Some of the major startups are-

a. **Skymet:** Skymet is India’s largest weather monitoring and Agri-risk Solutions Company. According to their website, they are the experts in measuring, predicting, and limiting climate risk to agriculture, thus reducing losses incurred due to bad weather conditions. It offers services such as weather forecast, crop insurance and agri-risk management.

b. **Barrix Agro Sciences:** The Bangalore-based startup offers eco-friendly crop protection methods after much research on products that support organic farming to increase crop produce and quality with minimal expenditure. The startup developed pest control traps with artificially synthesized smelling agents that attracts and traps pests.
c. Deshpande Foundation India: The Deshpande Foundation India is a Hubli based initiative and is building a nurturing ecosystem for entrepreneurship, innovation, and local, grassroots efforts so that young people can transform this growing country.

d. Frontalrain technologies: The Bangalore-based agri-tech startup seeks to deliver affordable advanced technology solutions for emerging companies and take technology to remote corners of the country. The company is offering Rain+, a comprehensive suite of products for food and agribusinesses like spices, herbs, basmati rice, seeds, animal feed, sea food, dairy and edible oil.

e. Mitra: The Nashik-based startup, MITRA (Machines, Information, Technology, Resources for Agriculture) aims to improve mechanization at horticulture farms with the use of R&D and high quality farm equipment. Air blast sprayers developed for fruits and vegetables particularly grapes and pomegranates. The sprayers, used to add hormones that help the growth of crops and are less time-consuming.

Importance of e-Technology on agriculture sector

Improved decision making – With necessary information, farmers can make better and more informed decision concerning their agricultural activities. They can decide the timing of sowing and harvesting crops which can increase yield.

Better planning – The decisions of what to plant and when to plant predict yields and determine the current need of the crops, thus information is essential in sustaining agriculture success.

3Es: Transforming agriculture with the help of e-technology leads towards empowering the farmers with timely and relevant information. Market expansion with the help of ICT will encourage rural market and farmers can get better value for their product.

Increase productivity: The modern agriculture practices will increase productivity as seen in Andhra Pradesh groundnuts production. With proper decision making and planning it will yield a good produce. Indian Food and retail market is projected to touch USD 482 billion by 2021.

Specialization and Mechanization: With the use of modern technology the farmers will undergo transformation in the form of specialization in agriculture with better farm equipment. Mechanization of farming and agriculture activities will enable farmers to produce more with less labour.

“Artificial Intelligence is valued at USD 432 million in 2016 and this would be around USD 2.6 billion by 2025, Digital disruptions can impact 70 million farmers in 2020 adding USD 9 billion to farmers income” – Amitabh Kant, CEO NITI Ayog

Agriculture for everyone: Due to agriculture distress the scope and opportunities to population dependent on agriculture has reduced. With e-technology agriculture can emerge as the new area of research and entrepreneurship. Agriculture Tech startups have raised over USD 800 million in the last 5 years.

Boost to economy: The NITI Ayog predicts that Agriculture sector can grow at 4 percent and higher in order to achieve GDP growth rate of 8-10 % by the use of Digital Farming and connected farm services.

Increasing sustainability: Agricultural modernization prepares conditions for industrialization by boosting labour productivity, increasing agricultural surplus to accumulate capital, and increasing foreign exchange via exports.

Problems in effective use of Technology

a. Literacy and basic digital literacy hinders the development of e-Agriculture, and this creates a digital divide.

b. Political will and massive amounts of public investment for cost involved in ensuring services for development.

c. Technical feasibility of connectivity in rural areas since the reach of technology is not uniform throughout the country.

d. Farmers are unable to furnish the collateral that most financial institutions require to undertake the loan for buying machinery and equipments.

e. The vast majority of Indian startups are urban centric.

f. The rural infrastructure for the use of ICT is also not uniform and lot of regional disparity.

g. Provision of credit facilities to farmers is done by cooperative banks and DCCBs, proper identification of beneficiaries is the major challenge.

Suggestions

1. A national strategy needs to be drawn for spearheading IT penetration to rural India. A national coordinating agency with an advisory role can act as a catalyst in the process.

2. Information and communication technology can help farmers became more productive and get better access to market Information, financing, and other facilities and services.

3. Building farmers resilience to environmental shocks such as extreme drought and floods can be possible through e-technology and AI, which needs to be strengthened across states.

4. Special counseling and interaction with agri-experts, officers and stake holders with regular intervals at gram panchayat level will enhance confidence of the farmers in decision making.
5. Information to farmers about crop rotation, community farming, weather patterns, fertilizers use and going organic at regular intervals will benefit them.
6. Combining agriculture technology with Information technology will lead to intensification and diversification of farming activity.
7. Food processing Industries play a vital role in encouraging farmers to take up entrepreneurial ventures and agro-based industries which need to be strengthened.
8. Awareness among farmers towards initiative of both the government and private sector should be properly streamlined.
9. Farmers can form co-operatives to buy or hire the farm implements and machinery and they can share these as needed for tilling, harvesting, and post-harvest operations.

CONCLUSION

The use of technology has reduced the risk factors in agriculture and has reduced farmer’s dependency and vulnerability to the nature. The advancement in technology has introduced improved productivity through time management and proper planning. India needs to adopt the role of e-technology in order to utilize maximum advantage from agriculture. The present study focused on studying the role of e-technology but the poor farmers are away from proper information and lacks decision making. It is the responsibility of the government and other stakeholders to make them aware and provide the helping hands to remove the agriculture distress. The penetration of market forces should increase in order to reduce the distress of agriculture sector. With use of e-technology in agriculture there would be substantial upliftment and development of farming and rural economy.

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