

A MINI PROJECT REPORT
ON
“DIGITALIZATION OF AGRICULTURAL SECTOR”

*MINI PROJECT SUBMITTED IN FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD OF THE DEGREE OF*

MASTER OF BUSINESS ADMINISTRATION
FROM
BENGALURU CITY UNIVERSITY



SUBMITTED BY
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UNDER THE GUIDANCE OF
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AI-AMEEN INSTITUTE OF MANAGEMENT STUDIES
AFFILIATED TO BENGALURU CITY UNIVERSITY
(2021-2022)

CERTIFICATE OF INSTITUTION

This is to certify that this Project entitled **Digitalization of Agricultural Sector** has been successfully completed by **Sakhil Pasha** of Reg. No. **MB206242** during the year **2021-22** and the report is submitted in partial fulfillment of the requirements for the award of the degree of **Master of Business Administration** as prescribed by the **Bengaluru City University** under the guidance of **Prof. Dr. Abdul Rizwan Shariff**.

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I hereby declare that the Project Report entitled **Digitalization of Agricultural Sector** has been prepared by me under the supervision and guidance of **Prof. Dr. Abdul Rizwan Shariff**, during the year **2021-22** in a partial fulfillment of the university regulations for the award of the degree of **Master of Business Administration** by **Bengaluru City University**.

I further declare that this project is based on the original study undertaken by me and has not been submitted at any time to any university or institution for the award of any other degree or diploma.

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CHAPTER: 1

INTRODUCTION



CHAPTER 1: INTRODUCTION

INTRODUCTION ABOUT TOPIC:

➤ INTRODUCTION TO DIGITALIZATION:

Digitalization is the process of converting information into a digital format. The result is the representation of an object, image, sound, document or signal (usually an analog signal) obtained by generating a series of numbers that describe a discrete set of points or samples. The result is called digital representation or, more specifically, a digital image, for the object, and digital form, for the signal. In modern practice, the digitized data is in the form of binary numbers, which facilitates processing by digital computers and other operations, but, digitizing simply means the conversion of analog source material into a numerical format; the decimal or any other number system can be used instead. Digitalization is of crucial importance to data processing, storage and transmission, because it "allows information of all kinds in all formats to be carried with the same efficiency and also intermingled".

Though analog data is typically more stable, digital data, has the potential to be more easily shared and accessed and, in theory, can be propagated indefinitely, without generation loss, provided it is migrated to new, stable formats as needed. This potential has led to institutional Digitalization projects designed to improve access and the rapid growth of the digital preservation field. Sometimes Digitalization and digital preservation are mistaken for the same thing, however they are different, but Digitalization is often a vital first step in digital preservation. Libraries, archives, museums and other memory institutions digitize items to preserve fragile materials and create more access points for patrons. Doing this creates challenges for information professionals and solutions can be as varied as the institutions that implement them. Some analog materials, such as audio and video tapes, are nearing the end of their life-cycle and it is important to digitize them before equipment obsolescence and media deterioration makes the data irretrievable.

There are challenges and implications surrounding Digitalization including time, cost, cultural history concerns and creating an equitable platform for historically marginalized voices. Many digitizing institutions develop their own solutions to these challenges. Mass Digitalization projects have had mixed results over the years, but some institutions have had



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success even if not in the traditional Google Books model. Technological changes can happen often and quickly, so Digitalization standards are difficult to keep updated. Professionals in the field can attend conferences and join organizations and working groups to keep their knowledge current and add to the conversation.

➤ PROCESS:

The term Digitalization is often used when diverse forms of information, such as an object, text, sound, image or voice, are converted into a single binary code. The core of the process is the compromise between the capturing device and the player device so that the rendered result represents the original source with the most possible fidelity, and the advantage of Digitalization is the speed and accuracy in which this form of information can be transmitted with no degradation compared with analog information. Digital information exists as one of two digits, either 0 or 1. These are known as bits (a contraction of binary digits) and the sequences of 0s and 1s that constitute information are called bytes. Analog signals are continuously variable, both in the number of possible values of the signal at a given time, as well as in the number of points in the signal in a given period of time. However, digital signals are discrete in both of those respects – generally a finite sequence of integers – therefore a Digitalization can, in practical terms, only ever be an approximation of the signal it represents.

➤ HISTORY:

- 1957 The Standards Electronic Automatic Computer (SEAC) was invented. That same year, Russell Kirsch used a rotating drum scanner and photomultiplier connected to SEAC to create the first digital image (176x176 pixels) from a photo of his infant son. This image was stored in SEAC memory via a staticizer and viewed via a cathode ray oscilloscope.
- 1971 Invention of Charge-Coupled Devices that made conversion from analog data to a digital format easy.
- 1986 work started on the JPEG format.
- 1990s Libraries began scanning collections to provide access via the world wide web.



➤ ANALOG SIGNALS TO DIGITAL:

Analog signals are continuous electrical signals; digital signals are non-continuous. Analog signals can be converted to digital signals by using an analog-to-digital converter. The process of converting analog to digital consists of two parts: sampling and quantizing. Sampling measures wave amplitudes at regular intervals, splits them along the vertical axis, and assigns them a numerical value, while quantizing looks for measurements that are between binary values and rounds them up or down. Nearly all recorded music has been digitized, and about 12 percent of the 500,000+ movies listed on the Internet Movie Database are digitized and were released on DVD. Digitalization of home movies, slides, and photographs is a popular method of preserving and sharing personal multimedia. Slides and photographs may be scanned quickly using an image scanner, but analog video requires a video tape player to be connected to a computer while the item plays in real time.

➤ ANALOG TEXTS TO DIGITAL:

Academic and public libraries, foundations, and private companies like Google are scanning older print books and applying optical character recognition (OCR) technologies so they can be keyword searched, but as of 2006, only about 1 in 20 texts had been digitized. Librarians and archivists are working to increase this statistic and in 2019 began digitizing 480,000 books published between 1923 and 1964 that had entered the public domain. Unpublished manuscripts and other rare papers and documents housed in special collections are being digitized by libraries and archives, but backlogs often slow this process and keep materials with enduring historical and research value hidden from most users (see digital libraries). Digitalization has not completely replaced other archival imaging options, such as microfilming which is still used by institutions such as the National Archives and Records Administration (NARA) to provide preservation and access to these resources.

➤ LIBRARY PRESERVATION:

In the context of libraries, archives, and museums, Digitalization is a means of creating digital surrogates of analog materials, such as books, newspapers, microfilm and videotapes, offers a variety of benefits, including increasing access, especially for patrons at a distance; contributing to collection development, through collaborative initiatives; enhancing the potential for research and education; and supporting preservation activities.



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Digitalization can provide a means of preserving the content of the materials by creating an accessible facsimile of the object in order to put less strain on already fragile originals. For sounds, Digitalization of legacy analog recordings is essential insurance against technological obsolescence. A fundamental aspect of planning Digitalization projects is to ensure that the digital files themselves are preserved and remain accessible; the term "digital preservation," in its most basic sense, refers to an array of activities undertaken to maintain access to digital materials over time.

➤ DIGITALIZATION VERSUS DIGITAL PRESERVATION:

Digitizing something is not the same as digitally preserving it. To digitize something is to create a digital surrogate (copy or format) of an existing analog item (book, photograph, or record) and is often described as converting it from analog to digital, however both copies remain. An example would be scanning a photograph and having the original piece in a photo album and a digital copy saved to a computer. This is essentially the first step in digital preservation which is to maintain the digital copy over a long period of time and making sure it remains authentic and accessible.

Digitalization is done once with the technology currently available, while digital preservation is more complicated because technology changes so quickly that a once popular storage format may become obsolete before it breaks. An example is a 5 1/4" floppy drive, computers are no longer made with them and obtaining the hardware to convert a file stored on 5 1/4" floppy disc can be expensive. To combat this risk, equipment must be upgraded as newer technology becomes affordable (about 2 to 5 years), but before older technology becomes unobtainable (about 5 to 10 years).

➤ DIGITAL REFORMATTING:

Digital reformatting is the process of converting analog materials into a digital format as a surrogate of the original. The digital surrogates perform a preservation function by reducing or eliminating the use of the original. Digital reformatting is guided by established best practices to ensure that materials are being converted at the highest quality.



➤ INTRODUCTION OF AGRICULTURE SECTOR IN INDIA:

Agriculture is the primary source of livelihood for about 58% of India's population. Gross Value Added by agriculture, forestry, and fishing was estimated at Rs. 19.48 lakh crore (US\$ 276.37 billion) in FY20. Share of agriculture and allied sectors in gross value added (GVA) of India at current prices stood at 17.8 % in FY20. Consumer spending in India will return to growth in 2021 post the pandemic-led contraction, expanding by as much as 6.6%. The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. Indian food and grocery market is the world's sixth largest, with retail contributing 70% of the sales. The Indian food processing industry accounts for 32% of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth. The total agricultural and allied products exports stood at US\$ 41.25 billion in FY21.

➤ MARKET SIZE:

The Economic Survey of India 2020-21 report stated that in FY20, the total food grain production in the country was recorded at 296.65 million tonnes—up by 11.44 million tonnes compared with 285.21 million tonnes in FY19. The government has set a target to buy 42.74 million tonnes from the central pool in FY21; this is 10% more than the quantity purchased in FY20. For FY22, the government has set a record target for farmers to raise food grain production by 2% with 307.31 million tonnes of food grains. In FY21, production was recorded at 303.34 million tonnes against a target of 301 million tonnes.

Production of horticulture crops in India reached a record 331.05 million metric tonnes (MMT) in 2020–21(as per 3rd advance estimate), an increase of 10.5 million metric tonnes over FY20. India has the largest livestock population of around 535.78 million, which translates to around 31% of the world population. Milk production in the country is expected to increase to 208 MT in FY21 from 198 MT in FY20, registering a growth of 10% y-o-y. Area under horticulture is projected to rise by 2.7% in FY21. Sugar production in India reached 26.46 MT between October 2019 and May 2020 sugar season according to Indian Sugar Mills Association (ISMA). India is among the 15 leading exporters of agricultural products in the world.



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Agricultural export from India reached US\$ 38.54 billion in FY19 and US\$ 35.09 billion in FY20. According to Inc42, the Indian agricultural sector is predicted to increase to US\$ 24 billion by 2025. The private sector's share in seed production increased from 57.28% in 2017 to 64.46% in FY21. India is the world's second-largest producer of rice, wheat, sugarcane, cotton, groundnuts and fruits & vegetables. It also produced 25% of the world's pulses, as of last decade, until 2019. The organic food segment in India is expected to grow at a CAGR of 10% during 2015-25 and is estimated to reach Rs. 75,000 crore (US\$ 10.73 billion) by 2025 from Rs. 2,700 crore (US\$ 386.32 million) in 2015.

The processed food market in India is expected to grow to Rs. 3,451,352.5 crore (US\$ 470 billion) by 2025, from Rs. 1,931,288.7 crore (US\$ 263 billion) in FY20 on the back of government initiatives such as planned infrastructure worth US\$ 1 trillion and Pradhan Mantri Kisan Sampada Yojna. The food processing industry employs about 1.77 million people. The sector allows 100% FDI under the automatic route. Between April 2020 and February 2021, the total value of processed food products exports was Rs. 43,798 crore (US\$ 6.02 billion). India exported key processed food products such as pulses, processed vegetables, processed fruits and juices, groundnuts, guar gum, cereal preparations, milled products, alcoholic beverages and oil meals.

➤ INVESTMENTS AND DEVELOPMENTS IN AGRICULTURE:

According to the Department for Promotion of Industry and Internal Trade (DPIIT), the Indian food processing industry has cumulatively attracted Foreign Direct Investment (FDI) equity inflow of about US\$ 10.43 billion between April 2000 and June 2021. Some major investments and developments in agriculture are as follows:

- From 2017 to 2020, India received ~US\$ 1 billion in agritech funding. With significant interest from the investors, India ranks third in terms of agritech funding and number of agritech start-ups. By 2025, Indian agritech companies are likely to witness investments worth US\$ 30-35 billion.
- In March 2020, F&S, the oldest large-scale fertiliser manufacturer in the country, crossed one million production and sales mark.
- Nestle India will invest Rs. 700 crore (US\$ 100.16 million) in construction of its ninth factory in Gujarat.



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- In November 2019, Haldiram entered into an agreement for Amazon's global selling program to E-tail its delicacies in the United States.
- In November 2019, Coca-Cola launched ‘Rani Float’ fruit juices to step out of its trademark fizzy drinks.
- Two diagnostic kits developed by Indian Council of Agricultural Research (ICAR) - Indian Veterinary Research Institute (IVRI) and the Japanese Encephalitis IgM ELISA were launched in October 2019.
- Investment worth Rs. 8,500 crore (US\$ 1.19 billion) have been announced in India for ethanol production.

➤ **GOVERNMENT INITIATIVES:**

Some of the recent major Government initiatives in the sector are as follows:

- In October 2021, the Union Minister of Home Affairs and Cooperation launched the ‘Dairy Sahakar’ scheme in Anand, Gujarat.
- Ministry of Civil Aviation launched the Krishi UDAN 2.0 scheme in October 2021. The scheme proposes assistance and incentive for movement of agri-produce by air transport. The Krishi UDAN 2.0 will be implemented at 53 airports across the country, largely focusing on Northeast and tribal regions, and is expected to benefit farmers, freight forwarders and airlines.
- In October 2021, Agricultural and Processed Food Products Export Development Authority (APEDA) signed a Memorandum of Understanding (MoU) with ICAR-Central Citrus Research Institute (ICAR-CCRI), Nagpur, for boosting exports of citrus and its value-added products.
- In October 2021, the Union Ministry of Agriculture and Farmers Welfare announced that 820,600 seed mini-kits will be distributed free of cost in 343 identified districts across 15 major producing states under a special programme.
- In September 2021, Prime Minister Mr. Narendra Modi launched 35 crop varieties with special traits such as climate resilience and higher nutrient content.
- Prime Minister of India launched the Pradhan Mantri Kisan Samman Nidhi Yojana (PM-Kisan) and transferred Rs. 2,021 crore (US\$ 284.48 million) to bank accounts of more than 10 million beneficiaries on February 24, 2019. As per the Union Budget 2021-22, Rs. 65,000 crore (US\$ 8.9 billion) was allocated to Pradhan Mantri Kisan Samman Nidhi (PM-Kisan).



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- The Indian government has initiated Digital Agriculture Mission for 2021-25 for agriculture projects based on new technologies such as artificial intelligence, block chain, remote sensing and GIS technology, drones, robots and others.
- In September 2021, the Union Ministry of Agriculture and Farmers' Welfare signed five MoUs with CISCO, Ninjacart, Jio Platforms Limited, ITC Limited and NCDEX e-Markets Limited. This MoU will have five pilot projects, which will help farmers make decisions on the kind of crops to grow, variety of seeds to use and best practices to adopt to maximise yield.
- With a budget of US\$ 1.46 billion, the 'Production-Linked Incentive Scheme for Food Processing Industry (PLISFPI)' has been approved to develop global food manufacturing champions commensurate with India's natural resource endowment and to support Indian food brands in international markets.
- As per Union Budget 2021-22, Rs. 4,000 crore (US\$ 551.08 million) was allocated towards implementing Pradhan Mantri Krishi Sinchayee Yojana (PMKSY-PDMC).
- The Ministry of Food Processing has been allocated Rs. 1,308.66 crore (US\$ 180.26 million) in the Union Budget 2021-22.
- Under Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PM FME), an outlay of Rs. 10,000 crore (US\$ 1.34 billion) over a period of five years from FY21 to FY25 has been sanctioned.
- To boost farmer incomes and growth of the agricultural economy, the Indian government released funds in June 2021 for farm mechanisation such as establishment of custom hiring centres, farm machinery bank and high-tech hubs in different states.
- In April 2021, the Government of India approved a PLI scheme for the food processing sector with an incentive outlay of Rs 10,900 crore (US\$ 1,484 million) over a period of six years starting from FY22.
- The Government of India came out with Transport and Marketing Assistance (TMA) scheme to provide financial assistance for transport and marketing of agriculture products in order to boost agriculture exports.
- The Agriculture Export Policy, 2018 was approved by the Government of India in December 2018.



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- The new policy aimed to increase India’s agricultural export to US\$ 60 billion by 2022 and US\$ 100 billion in the next few years with a stable trade policy regime.
- The Government of India is going to provide Rs. 2,000 crore (US\$ 306.29 million) for computerization of Primary Agricultural Credit Society (PACS) to ensure cooperatives are benefitted through digital technology.
- The Government of India launched the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) with an investment of Rs. 50,000 crore (US\$ 7.7 billion) aimed at development of irrigation sources for providing a permanent solution from drought.
- Government plans to triple the capacity of food processing sector in India from the current 10% of agriculture produce and has also committed Rs. 6,000 crore (US\$ 936.38 billion) as investments for mega food parks in the country, as a part of the Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA).
- The Government of India has allowed 100% FDI in marketing of food products and in food product E-commerce under the automatic route.

➤ ACHIEVEMENTS IN THE SECTOR:

- As of October 27, 2021, the total rabi area stood at 0.53 lakh hectares.
- As per first advance estimates released by the Ministry of Agriculture and Farmers Welfare, record foodgrain production of 150.50 million tonnes is likely in the 2021-22 kharif season.
- As per first advance estimates released by the Ministry of Agriculture and Farmers Welfare, production of rice was estimated at 102.36 million tonnes (MT), while production of food grains was estimated at 144.52 MT in the crop year 2020-21.
- In July 2021, the first commercial consignment of Kashmir's Mishri cherry was shipped to Dubai, paving the way to boost horticulture crop exports.
- In June 2021, India exported 24 metric tonnes of groundnuts to Nepal from West Bengal, boosting groundnut exports from Eastern India. Paddy procurement in Kharif Marketing Season (KMS) 2020-21 until January 10, 2020, reached over 534.44 lakh metric tonnes (LMT), an increase of 26.24% against the last year corresponding purchase of 423.35 LMT.



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- In FY21, India exported 1.91 lakh tonnes of banana worth Rs. 619 crore (US\$ 82.90 million).
- In November 2020, the planting of winter crops exceeded by 10% compared with the last year and witnessed 28% increase in area under pulses. The total area acreage under pulses increased to 8.25 million hectares from 6.45 million hectares last year.
- Out of the total 37 mega food parks that were sanctioned, 22 mega food parks are operational, as of January 2021.
- In November 2020, Minister of Consumer Affairs, Food and Public Distribution, Mr. Piyush Goyal announced that the Food Cooperation of India and state agencies are set to procure a record quantity of 742 LMT (lakh metric tonnes) paddy during the ongoing Kharif crop season as against 627 LMT paddy last year.
- The Electronic National Agriculture Market (e-NAM) was launched in April 2016 to create a unified national market for agricultural commodities by networking existing APMCs. It had 16.9 million farmers and 157,778 traders registered on its platform until February 2021. Over 1,000 mandis in India are already linked to e-NAM and 22,000 additional mandis are expected to be linked by 2021-22.
- Sale of tractors in the country stood at 880,048 units in 2020 with the export of 77,378 units.
- The principal commodities that posted significant positive growth in exports between FY20 and FY21 were the following:
 - Wheat and Other Cereals: 727% from Rs. 3,708 crore (US\$ 505 million) to Rs. 5,860 crore (US\$ 799 million)
 - Non-Basmati Rice: 132% from Rs. 13,130 crore (US\$ 1,789) to Rs. 30,277 crore (US\$ 4,126 million)
 - Soya Meal: 132% from Rs. 3,087 crore (US\$ 421 million) to Rs. 7,224 crore (US\$ 984 million)
 - Raw Cotton: 68% from Rs. 6,771 crore (US\$ 923 million) to Rs. 11,373 crore (US\$ 1,550 million)
 - Sugar: 39.6% from Rs. 12,226 crore (US\$ 1,666 million) to Rs. 17,072 crore (US\$ 2,327 million)
 - Spices: 11.5% from Rs. 23,562 crore (US\$ 3,211 million) to Rs. 26,257 crore (US\$ 3,578 million)



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- During FY20 (till February 2020), tea export stood at US\$ 709.28 million.
- Coffee export stood at US\$ 742.05 million in FY20.

➤ ROAD AHEAD:

India is expected to achieve the ambitious goal of doubling farm income by 2022. The agriculture sector in India is expected to generate better momentum in the next few years due to increased investment in agricultural infrastructure such as irrigation facilities, warehousing and cold storage. Furthermore, the growing use of genetically modified crops will likely improve the yield for Indian farmers. India is expected to be self-sufficient in pulses in the coming few years due to concerted effort of scientists to get early maturing varieties of pulses and the increase in minimum support price.

In the next five years, the central government will aim US\$ 9 billion in investments in the fisheries sector under PM Matsya Sampada Yojana. The government is targeting to raise fish production to 220 lakh tonnes by 2024-25. Going forward, the adoption of food safety and quality assurance mechanisms such as Total Quality Management (TQM) including ISO 9000, ISO 22000, Hazard Analysis and Critical Control Points (HACCP), Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP) by the food processing industry will offer several benefits. The agri export from India is likely to reach the target of US\$ 60 billion by the year 2022.

➤ THE DEFINITION OF DIGITAL AGRICULTURE:

- There are differences in how different entities define digital agriculture or digital farming, precision agriculture/farming and smart agriculture/farming and AI in Agriculture.
- The International Society for Precision Agriculture which claims to be the sole international scientific society completely devoted to Precision Agriculture defines Precision Agriculture as “Precision Agriculture is a management strategy that gathers, processes and analyzes temporal, spatial and individual data and combines it with other information to support management decisions according to estimated variability for improved resource use efficiency, productivity, quality, profitability and sustainability of agricultural production.”
- The EU funded BIOPRO Baden-Württemberg GmbH project dossier (20184) defines Precision farming and smart farming thus: “Precision farming is an agricultural



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concept involving new production and management methods that make intensive use of data about a specific location and crop. Sensor technologies and application methods are used to optimize production processes and growth conditions. In contrast to conventional agricultural methods, using digital data can increase resource and cost efficiency as well as reduce environmental impact. Further, Smart farming (also known as Farming 4.0 and digital farming) is the application of information and data technologies for optimizing complex farming systems. The integration of smart agricultural technologies and modern data technologies enables seed planting to be adapted to a specific field to ensure an efficient production process. The application of information and data technologies support farmers in making informed decisions based on concrete data. “

- The media organisation specializing in IoT, IoT For All describes “Smart farming as an emerging concept that refers to managing farms using modern Information and Communication Technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labor required by production. They specifically identify sensors, software, connectivity, location (gps, satellites etc.), robotics and data analytics as the technologies that can be used for smart agriculture. Further they specify Precision Farming or agriculture, as “an umbrella concept for IoT-based approaches that make farming more controlled and accurate. In simple words, plants and cattle get precisely the treatment they need, determined by machines with superhuman accuracy.



STATEMENT OF THE PROBLEM:

The statement of the problem is to study the digitalization of agricultural sector. The focus area in Indian Agriculture, in the recent times has been on enhancing farmer incomes. This took the shape of official government policy after the clarion call of the Prime Minister of India to double farmers' incomes and the subsequent budget announcement¹ to this effect. As far as agricultural production is concerned, India ranks first in the production of milk, jute and pulses, and is placed second in producing wheat, rice, groundnut, vegetables, fruits, cotton and sugarcane. It is also among the leading producers of fish, livestock, poultry, spices and plantation crops. Thus, to an extent, production is not the biggest problem of Indian Agriculture, whereas due to tiny landholdings, farmers' incomes are definitely not sufficient. Therefore, an attempt has been made to study the digitalization of agricultural sector.

NEED AND RELEVANCE OF THE STUDY:

Farmers' incomes in India are very low and efforts have to be made to enhance their incomes. For this, increasing the efficiencies of agricultural production processes and the entire value chain is important. Digital Agriculture is emerging as one of the ways to increase efficiencies and enhance incomes in agriculture globally. We define Digital Agriculture in the Indian context and list the challenges as well as the possibilities for Digital Agriculture in India. It is found that lower cost of technology, easy to use portable hardware, pay per use renting models, policy support and harnessing the power of farmer collectives are essential for the success of Digital Agriculture in India. One of ways of enhancing farmer incomes is through the use of Digital Technologies in Agriculture to increase the overall efficiency of the agricultural production processes as well as the entire value chain. “The future of food is unequivocally digital, and the future of digital is inevitably AI (Artificial Intelligence).

CHAPTER: 2

METHODOLOGY



CHAPTER 2: METHODOLOGY

REVIEW OF LITERATURE:

- **Mulla and Khosla (2015)**, note that the terms site-specific and precision farming were introduced into scientific literature by John Schueller from the University of Florida. He helped organize an important symposium on this topic at the 1991 Annual Meeting of the American Society of Agricultural Engineers (ASAE) in Chicago. According to Schueller, “the continuing advances in automation hardware and software technology have made possible what is variously known as spatially-variable, precision, prescription, or site-specific crop production.”
- **Strobel (2014)**, while noting that the development of precision agriculture technology started in the 1960s, lists the 5 major tools of technology out of the several tools used in precision agriculture, namely: 1. yield mapping, 2. guidance and global positioning systems (Global National Satellite System, GPS), 3. variable rate technology (VRT), 4. controlled traffic farming (CTF), and 5. Geographic information systems (GIS).
- **Ullah A. et al**, survey the technologies and challenges in precision agriculture. They begin by identifying a greater need for efficiency in current farming methods to be able to meet the goal of feeding an ever-growing population, which the FAO expects to reach 9.2 billion by 2050. They proceed to list different technologies, challenges and state-of-the-art methods based on artificial intelligence and image processing for efficient precision agriculture.
- **Zhao C. et al, 2016**, describe methods for acquiring spatial information about farmlands using remote sensing techniques towards the requirements of decision making in precision agriculture. They note that to achieve the goals of precision agriculture, high-density, highspeed, and low-cost supply of spatial information on crops, soil, and environmental conditions is necessary. They list remote sensing techniques to estimate chlorophyll in crops, Nitrogen in crops, water content of crops and crop LAI (leaf area index). They note that “Acquisition of crop yield data in the plot and plotting the spatial distribution diagram are the starting points of precision agriculture and also the basis for achieving scientific regulation of input and making decisions about crop production.”



- **Yang C., et al, (2016)** study precision agriculture in large scale mechanized farming. According to the, the central concept of precision agriculture is identification and management of within field variability with the aim to improve farm input efficiency, increase farm profits, reduce environmental impacts and improve sustainability. They list 4 steps for automatic implementation of the concept of precision agriculture (1) measuring spatial variability; (2) analyzing data and making site-specific recommendations; (3) implementing the variable-rate application (VRA) of farm inputs; and (4) evaluating the economic and environmental benefits. Thus, in their opinion, “A broader view of precision agriculture would include more than VRA. It is more about helping farmers better manage their operations and correct inadvertent errors using sensing and control to automate and more precisely carry out field operations.”
- **A DLG (German Agricultural Society) position paper (2018)** reviews priorities to achieve the full promise of digital agriculture. They view PA to mean optimizing growth conditions by means of sensory analysis and precise application technology and Smart Farming as the further development of PA that contributes chiefly to supporting decision making due to the complex nature of information processing which can only be achieved through automation. Thus, Digital Farming, according to them, combines the “consistent application of the methods of “Precision Farming and Smart Farming”, internal and external networking of the farm and use of web-based data platforms together with Big Data analyses”.
- **Salam A. (2020)**, in his study identifies the Main Barriers to Digital Agriculture Technologies Adoption. According to the study, among the major issues in adoption, first is return on investment. The cost of digital agriculture equipment and services is still higher than their benefits. Thus, naturally interest is low due to economic reasons. Secondly, digital agriculture technology business is mostly targeted to the big farms and thus smaller farm owners are excluded. Thirdly, enormous data is generated due to the application of digital technologies on the farm but there is a lack of decision tools. Thus, interception of this data and decision making become very time consuming for the farmers.

OBJECTIVES OF THE STUDY:

- To study the digitalization in agriculture sector in India.
- To study the challenges faced by farmers in Digital agriculture.
- To know the government initiatives in digitalization in agriculture sector.

SCOPE OF THE STUDY:

The research of the present study covers the scope which is limited to the digitalization in agriculture sector in India, challenges faced by farmers in Digital agriculture and government initiatives in digitalization in agriculture sector. The study enables the students to develop independent critical thinking skills and it can be utilized by the juniors as reference material for their relevant research study.

METHODOLOGY OF THE STUDY:

The study is descriptive in nature. It has been carried out with the help of secondary data taken from various journals, text books, newspapers, magazines, internet sources and online research reports.

SOURCES OF DATA:

➤ **SECONDARY DATA:**

Secondary data is a data which is readily available. The data for the present study covers the secondary sources such as magazines, websites, journals, newspapers, various books related to the topics and other references were made.

LIMITATIONS OF THE STUDY:

- Time constraint is one of the major limitation.
- In depth research was not made.
- There might be bias in the secondary information.



CHAPTER: 3

SWOC ANALYSIS



CHAPTER 3: SWOC ANALYSIS

STRENGTHS:

Social media are cheap and easy to use internet enabled tools for sharing information. This makes it use in agriculture important when farmers in India are separated by distance and time. These tools have become the most popular online destination for people in rural India. For many of them, one of the reasons of buying a smartphone is to use a Facebook or WhatsApp. Thus, these popular platforms can be used to share information on agriculture, animal husbandry, health education and rural development as well. Social Media can be one of the ways to bring more and more rural Indians to use internet. This can be particularly more important for rural women who face a numbers of barriers in access to internet. One strong reason is lack of awareness, motivation and a strong reason to access internet. Studies report that social media appeals to women more than men. Thus, it can bring more and more women to use internet. As the online experience of women increase they tend to use and get benefitted from financial, banking and other internet enabled services. Therefore, social media use can act as strong mobiliser to increase internet access to rural people especially women.

WEAKNESSES:

Social media use in agriculture also brings certain challenges. Dedicated use requires constant human effort in terms of time. Availability of relevant content always remains low and modifying content suited to the platform requires considerable time and effort. Sharing of irrelevant posts in form of jokes, greetings, advertisements etc. creates unnecessary loss of time, internet data and phone memory issues. Besides, it also causes information overload and dilution of relevant posts shared in the group. Another limitation is presence of large number of passive users in the group. The percentages of users who give a feedback on the relevance of the posts are few in number. As a result it may be difficult to gauge the relevance and usefulness of the posts.



OPPORTUNITIES:

Social media use especially focused approach through groups can be used to create localized content about agricultural practices of an area e.g. a district. Different farmer members can post agricultural activities (sowing, plantation, crop yield, harvesting) on Facebook group. This can keep every stakeholder updated on the farm operations of a region. Use of social media competitions such as felfies (selfies in the farm), Facebook quiz, animal photographs can bring interest in farming through social media. The group can serve as open directory of promising farmers, rural youth who are passionate about farming as well as social media use. Such farmers can be encouraged to share information among their fellow peers.

CHALLENGES:

Social media groups can be used to spread false and incorrect information about agricultural practices. It can be used to mask or exaggerate the field extension activities. The social media users may be preferred in instances where face to face extension may be more relevant. These groups can be used to settle scores on political rivalry. It can even increase the existing information and digital literacy gap as most likely the richer farmers would be included in social media extension activities.

CHAPTER: 4

OUTCOMES OF THE STUDY



CHAPTER 4: OUTCOMES OF THE STUDY

OUTCOMES:

Knowledgeable and well-trained people and effective institutions are critical for achieving growth in any of the sectors. More so in the field of agricultural marketing as it is the threshold point where in the economy of the entire farming community is dependent. India's agriculture predominantly characterized by the fragmented supply loses more than 1/3rd of its produce in the form of postharvest losses. The twin solutions to overcome the problems are physical measures and policy measures. The physical measures are in the form of creating adequate infrastructures to prevent the enormous postharvest losses. Lot of emphasis was given to create agricultural marketing infrastructure during 11th five year plan and market infrastructures are found to be inadequate in several parts of the country. The other parts of the solutions to prevent postharvest losses are the policy measures which include policy interventions to maintain the total supply chain. Some of the interventions were initiated after the reforms process started in the agricultural marketing during 2003. These include Direct Marketing, Group Marketing, Contract Farming, Grading & Standardization, Packaging, Storage and Cool Chain, Pledge Financing, Warehousing, Market Infrastructure etc.

However, these initiatives also necessitated the capacity building of the personnel involved in implementing the same. Training is an important process of capacity building of individuals as to improve the performance. Hence, training needs assessment is vital to the training process. It helps to identify present problems and future challenges to be met through training and development. It is required to find out the needs of individual trainee on which professional competencies should be built to carry out the assigned job in the organizations. A training need exists when there is a gap between what is required of a person to perform competently and what he actual knows. A “training needs assessment”, or “training needs analysis”, is the method of determining if a training need exists and if it does, what training is required to fill the gap. The expectation of knowledge, skills and abilities of officials at different levels is different so their training needs are also different. Training needs assessment has therefore to be for different target groups for exactly knowing what training is required for each group.



“DIGITALIZATION OF AGRICULTURAL SECTOR”

- **AgroPad:** AI-powered technology helping farmers check soil and water health. AgroPad, developed by IBM, is a paper device about the size of a business card. The microfluidics chip inside the card performs on the spot a chemical analysis of the sample, providing results in less than 10 seconds. A drop of water or soil sample is placed on the AgroPad and the set of circles on the back of the card provide colorimetric test results; the color of each circle represents the amount of a particular chemical in the sample. Using a smartphone, the farmer can then take a single snapshot of the AgroPad by using a dedicated mobile application and immediately receive a chemical test result for a water or soil sample.
- **Plantix and crop disease identification over WhatsApp:** Developed by PEAT, a German startup, Plantix is a mobile application, which is a massive database of pictures of plant disease that can be used for comparison. This helps in identification and subsequent diagnosis and treatment. PEAT aims to support farmers across the world to enhance their agricultural output through timely and informed disease treatment. The facility is now also available over WhatsApp where just an image of the infected leaf is required to be sent to the Plantix WhatsApp number and the diagnosis is messaged back to the sender via WhatsApp in real time and many farmers in India are using this service.
- **Pay per use based farm tech and mechanization:** Trringo and EM3 Agriservices are the 2 pioneers of farm equipment rental service. They can be called the ubers of the Agriculture sector and have successfully replicated the uberisation of renting farm machinery and tractors in India. Using their services, through a mobile application or a phone call, farmers can rent their required farm machinery on a pay per use basis thus saving them time and ensuring reasonable costs while reducing uncertainty around availability.
- **Use of drones to fight locusts in India:** Locusts have been attacking and destroying large swathes of India's crops on a regular basis since the winter months of 2019 and the attack is continuing. The Agriculture Ministries both at the federal level and the state levels have been using drones for anti-locust spraying. They are proving to be effective solution in an otherwise challenging scenario where India stares at large amounts of crop loss in the states of Rajasthan, Gujarat, Madhya Pradesh and Uttar Pradesh.



SUGGESTIONS:

- Except few issues of supply chain in agricultural commodities, majority of the respondents either had a poor knowledge or were having average knowledge of most of the issues. Hence, there is a need to upgrade the knowledge of officers about the latest issues in agricultural Marketing by developing an appropriate capsule of short duration and follow up programmes to make it more effective.
- The solutions for postharvest losses are inadequate in terms of knowledge as well as initiatives being taken up by different State governments for creation of infrastructure due to over emphasis on production extension. The postharvest losses can be minimized by having complimenting Strategy of both the hardware part and software part. Policy part can be through capacity building programmes for both marketing personnel and officers working in the line department.
- In some of the States personnel from Cooperative department are deputed to work in the Directorate of Agricultural Marketing. This ad-hoc arrangement leads to disinterest among the officers so deputed to know the latest issues in marketing. Hence, a separate cadre of services on the line of Government of Karnataka can be created and thus make sure the personnel continue to work in the same department.
- Majority of the States though have specialized ‘Training Institutes’ for imparting capacity building programmes in the field of agricultural marketing but lack in coordination. West Bengal, Karnataka and Haryana are some of the States which are active in capacity building programmes in agricultural marketing.
- The results of the study uncovered several knowledge gaps among the officers of Directorate of Agricultural Marketing and among personnel working in the State agricultural Marketing boards. These knowledge gaps relating to postharvest losses needs to be addressed on war footing manner. Ministry of Agriculture, Government of India has earmarked the funds for capacity building under various schemes. The State governments should utilize such opportunity to train their personnel on various issues of agricultural marketing.

CHAPTER: 5

LEARNING EXPERIENCES AND CONCLUSION



CHAPTER 5: LEARNING EXPERIENCES AND CONCLUSION

LEARNING EXPERIENCES:

- Opportunity to learn new concepts.
- Opportunity to get explore new insights.
- Added value to the learning.
- Learned professional communication.
- Learned to collect relevant information.
- Learned to be persistent to complete the task.
- Learned to create a balance between collaborative and individual work.
- Learned to work independently.
- learned about the methods and issues.
- Studied about digitalization in India.
- Studies about agriculture sector in India.
- Studied about digitalization of agricultural sector in India.



CONCLUSION:

By evaluating all this, we conclude that Agriculture market providing more scopes to the farmers, using emerging technologies and using internet online facility now farmers can directly participate into auction and they can bid the same. There are many strengths and opportunity available in agriculture market. Government is doing lots of efforts to support agriculture market. There are lots of strength available for agriculture market for example strong links with the government providing subsidies. Nationwide presence. High control over all the operations within the production process. Even government vision is to encourage the consistency, standardize in agriculture marketplace by restructuring the measures between consumers and suppliers. Actual value sighting constructed on demand and supply. Every transaction is cash less, transparent and confirmed payment, consistency and standardization in the whole process itself says that there is a much scope in agriculture market for the farmers or agriculturalist. Using emerging and technologies and by using online internet facility scope of Agriculture Market is increasing day by day. Agriculturalists or farmer can easily consume or produce the product of agriculture to or from the perfect seller or buyer. Government providing the facility to the farmer like APMC and eNAM by providing a platform to the farmer. By using this type of platform farmer will get the benefit like cashless and transparency in the transaction. By using Agriculture Produce Market Committee, farmers or agriculturalist getting the local level benefits. Main aim of the government to provide the better platform to the agriculturalist by combining all this local level mandis into one national level agriculture market. eNAM is National Level Agriculture Market whose main aim is to provide the national level platform to the farmer which offers a transparency in transactions, getting the actual cost and actual demand of the product.



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19-Nov-2021	Discussion of title of the study, objectives of the study, statement of the problem, and need of the study.	
30-Nov-2021	Discussion of research methodology, tools for data collection and limitations of the study.	
09-Dec-2021	Discussion of digitalization, agriculture sector in India, digitalization of agricultural sector in India, and SWOC analysis.	
18-Dec-2021	Discussion of outcomes of the study, learning experiences and conclusion.	