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Adoption of Artificial Intelligence (AI) in Agriculture Sector

Dr. J. P. Bhosale
M.Com.- Advanced Accountancy, M.Com.- Business Administration,
M.Phil. – Accountancy, M.B.A. (Human Resource Management and Finance),
Ph. D. – Cooperation & Rural Development, M. A. Economics, M. A. Marathi,
G. D. C. & A., P. G. Diploma in Banking & Finance, P. G. Diploma in Taxation,
DSM – Diploma in School Management.
Professor and Head – Research Centre in Commerce, Management and Accountancy.
Gramonnati Mandal's, Arts, Commerce & Science College,
Narayangaon, Tahshil-Junnar, Distrist-Pune, Maharashtra, India.
Savitribai Phule Pune University, Pune, Maharashtra, India.

ABSTRACT

Agriculture is crucial for every nation's economic sector. Everyone is directly and indirectly dependent on agricultural products for everyday needs. The demand for food is rising along with the global population on a daily basis. At this point, the farmers' traditional techniques are insufficient to meet the demand. Some novel automation techniques are required to fulfil the current demand globally for agriculture produce. Artificial intelligence is playing a very important role in the agriculture sector for transforming the agriculture industry. AI has the potential to change traditional agriculture by increasing efficiency of time, labor, and resources, enhancing environmental sustainability, providing accuracy in monitoring and data analysis for better agriculture results. AI is useful in agriculture from seed to seed has improving crop production, protection, harvests, processing and marketing. Numerous Hi-tech computers based devices and agri-bots have already been introduced to determine various crucial parameters for improved agriculture. In this article, I have discuss how Artificial Intelligence is revolutionizing agriculture by employing more efficient methods along with the difficulties in AI adoption.

KEYWORDS: Artificial Intelligence (AI), Agriculture Sector, Agriculture Product, Machine Learning etc.

INTRODUCTION

The World Government Summit report published in 2018 Agriculture 4.0 – The Future of Farming Technology point out that four key developments viz., demographics, scarcity of natural resources, climate change, and food wastage, pressing our future needs from agriculture. Making use of concepts like big data analytics, precision agriculture, and Internet of Things (IoT) to measure agriculture quantitatively Agriculture 4.0 envision improved crop yield with less exploitation of environment, low input use, and cost. Agriculture 4.0 emphasises organization of farm inputs (fertilizers, seeds, farm fuel, and herbicides) through distributed management practices.

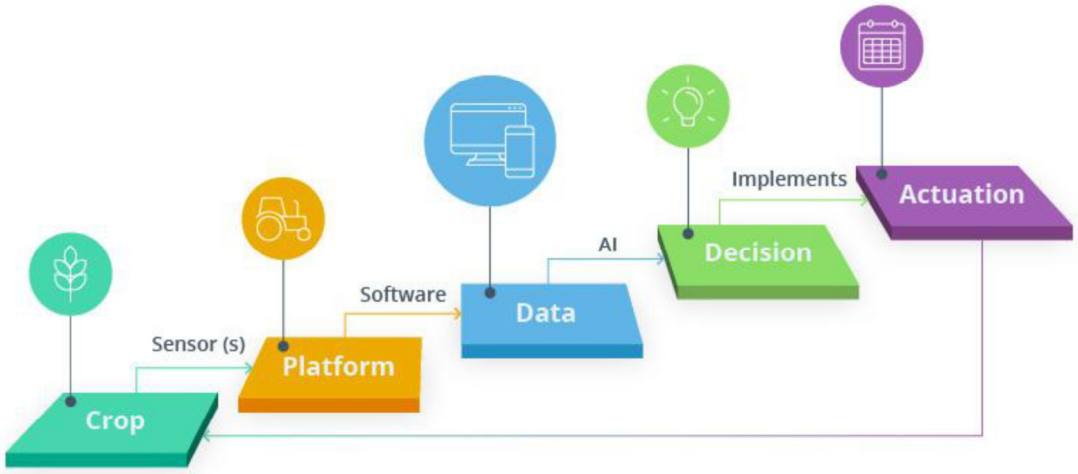
In a scenario where demand for agricultural produces keeps on increasing along with population growth and changes in lifestyle of people, production of enough material using

limited resources is hard without the help of some innovative concepts. Man-machine interaction especially, Artificial Intelligence (AI) is the concept that can potentially transform the present day agriculture to a 'produce more from less inputs' model. Figure 1 illustrates some uses of AI in agriculture.

Agriculture is the basis for the sustainability of any economy (M.A.kekan 2013). It plays an important role in long-term economic growth and structural change (B.F Johnson et al. 1975), however, it may differ internationally (R. Dekle 2012). In the past, agricultural activities were limited to food and plant production (M.fan2012). But over the past two decades, it has advanced to the processing, production, marketing and distribution of crops and livestock products. Currently, agricultural activities serve as a primary source of livelihood. A source of national trade, reduce unemployment, supply of manufacturing resources to other industries, and improve the global economy (T.O.Awuse et al., 2009). Agriculture and Technology go hand in hand in today's world. Current exercise and land cultivation work in a more dramatic way than in the last few decades, due to advances in development, including sensors, metals, machinery and development.

CONCEPTUAL BACKGROUND

Artificial intelligence is a tool that mimics human intelligence and ability processes by machines, advanced computer systems, robots and digital equipments. AI has many uses, including natural language processing (NLP) to understand spoken human language, computer vision to view analog-to-digital conversions like video, and speech recognition and expert systems to mimic judgement.



The role of AI in the Agriculture Information Management Cycle

OBJECTIVES OF THE RESEARCH STUDY

The objectives of said research study are as follows –

1. To study and understand the concept of AI and Machine Learning.
2. To study the need and significance of AI in Agriculture Sector.
3. To study an examine the challenges of AI Application in Agriculture Sector.

RESEARCH METHODOLOGY

This research is purely descriptive in nature. The data have been collected to conduct deep research on the impact and role of digitization on entrepreneurial growth in contemporary India. The secondary data have been collected from various reference books, government reports, government website and data banks to conduct deep research and analysis of facts and figures.

NEED OF AI IN AGRICULTURE

To overcome from obstacles in traditional agriculture we have need to use some innovative techniques. The difficulties in cultivation are as follows when using conventional methods:

1. **Labour challenges:** It will be challenging to use enough labour for farm practices due to expensive labour costs. This issue immediately affects the income and output of the agricultural sector.
2. **Weather factors**: Using conventional methods, we are unable to predict sudden weather changes that have a negative impact on our agriculture and cause difficulties with sowing, harvesting, and spraying.
3. **Decision making**: When it comes to improved agriculture, traditionally we haven't been able to make wise decisions regarding the timing of sowing, crop variety selection based on field characteristics, irrigation timing, soil nutrient deficiency, spraying area, or dosage calculation.
4. **Accuracy in data collection and analysis**: It is impossible to gather accurate data on insect pests, diseases, and weeds without the use of cutting-edge technologies. We can decrease the amount and applications of pesticides by using accurate data for better crop production.

APPLICABILITY OF AI IN AGRICULTURE

1. **Diagnostic Application Service:** Identification of symptoms of water stress, pest and diseases infestation etc. in farm fields.
2. **Prescriptive Application Service:** Soil health analysis and prescription of fertilizer recommendation or any other agricultural inputs
3. **Advisory Application Service:** Weather advisory and Irrigation scheduling
4. **Predictive Application Service:** Yield prediction, disease and pest attack forecasting (early warning system)

BENEFITS AND CHALLENGES OF AI IN AGRICULTURE

BENEFITS

1. Farmers can make better choices and conduct more effective farming with the help of eco-friendly AI techniques. Additionally, it enables farmers to determine the precise regions that require pesticide application, fertilization, and irrigation, helping them to avoid overusing resources and chemicals on their crops.

2. AI assists farmers in overcoming key agricultural challenges such as market demand analysis, price forecasting, and determining optimal periods for sowing and harvesting crops based on weather forecasting.
3. Farming machinery with AI capabilities enables producers to produce more crops with less effort and expense. With AI and automation, farms can complete tasks without hiring more workers. Some examples include driverless tractors, intelligent irrigation and fertilising systems, smart spraying, vertical farming software, and AI-based harvesting robots.
4. The use of advanced AI-based technologies has other benefits on the agri-food supply chain, such as cutting employee training costs, reducing the time required to solve problems, reducing the amount of human errors, lowering human intervention, and providing automated good, accurate, and robust decision-making at the right time at a low cost.

CHALLENGES OF AI ADOPTION IN AGRICULTURE

Although there is a lot of potential here, there are still some obstacles.

1. The majority of farmers around the world are unfamiliar with the use of AI-enabled tools and solutions.
2. Adopting AI and innovative technologies in agriculture for underdeveloped nations can be difficult.
3. The threat of unemployment is the biggest social challenge; in reality, robots and intelligent machines could take over most of the repetitive jobs and tasks; as a result, human involvement is decreasing, which will pose a serious challenge to employment standards.
4. Another example of a technological challenge is the fact that robots can only perform the tasks for which they have been designed or programmed, and if those tasks are altered, they often fail or produce useless results.
5. The high expense of these applications, which may increase prices and input costs, is a further problem. These methods are also useless for small-scale farms or rural areas.

FUTURE OF AI IN INDIA

Applications of AI based tools in agriculture have initiated in India by several start-ups working in this area to help farmers with improved productivity and profitability from agriculture. India's burgeoning start-up ecosystem has been actively playing its part in developing the agriculture sector. Since, opportunity in agritech exists across the value chain from improving farmers' access to markets, inputs, data, advisory, credit and insurance; India can tackle the issues associated with adoption of AI based technologies by providing a suitable ecosystem to these start-ups to access the data and market. Moreover, National Strategy for Artificial Intelligence released by NITI Aayog in June 2018 identifies agriculture as one of the focus areas. To maximize farm output from limited resources agriculture in India should to make use of sophisticated deep techs in future. Deep-Tech innovations support farmers to grow crops even in arid areas with high resource use efficiency, using technologies like AI and ML, robots, temperature and moisture sensors, aerial images, and GPS. An important aspect of AI is the system's response time and accuracy. Even behavioral

changes in field crops due to changes in microclimate conditions can be analyzed in the quickest response time with accurate information. However, concerns about durability of AI technologies may discourage farmers from its adoption as technologies are changing very fast in this digital era, and changing devices and sensors quickly with advancement in the adopted technologies is not going to be economical for the small-scale farmers of India. It is certain that digital innovation can transform Indian agriculture if there are proper efforts to convince the vend users about the potential of AI based technologies in agriculture sector; not only from the user and consumer side but also to the governance and policy side.

CONCLUSION

In AI and IoT Agriculture is considered important for human survival. Supporting current traditional agricultural practices with the latest IoT / AI technology can improve performance, quality and productivity capacity. In addition, it has identified intelligent, sustainable agricultural sectors, namely human resources; plants; weather; soil; insects; pregnancy; agricultural products; irrigation / water; livestock; equipment; and fields. AI technology helps farmers to analyze soil / soil / plant life etc. and save time and allow farmers to plant the right crops in each season with the best yields. Direct planting can reduce water use, use land efficiently, and can be planted in urban areas on buildings. It can reduce the problems of unemployment. Allows predictions for next year's crop seasons / weather / weather / rain etc. AI-based forecasts allow pesticide / crop / crop suggestion in the right place at the right time before major disease outbreaks occur. With so much untapped space in agriculture to intervene with automated response systems, there is a great opportunity for the agricultural industry to use emerging catboat technology to assist farmers with answers to all their questions and to provide appropriate advice and recommendations in their specific ideas. Farm-related problems. This encourages the growth of the AI market in agriculture.

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