AI-POWERED STARTUPS REVOLUTIONIZING AGRICULTURAL INNOVATION IN INDIA: A COMPREHENSIVE OVERVIEW

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Abstract : The paper provides an in-depth review of the rapidly growing sector of AI-powered industries pushing innovation in agriculture in India. The agricultural industry is dealing with historic issues such as shortages of resources, climate change, and growing population needs. One potential answer to these challenges is the integration of artificial intelligence (AI) technologies. This research looks at how AI is changing agricultural practices in India through an in-depth review of the literature already in existence. It addresses the use of AI in supply chain optimization, yield prediction, soil analysis, insect identification, and agricultural monitoring, among other areas. The study also examines the socioeconomic effects of AI adoption in agriculture, taking into account how it might improve farmer profitability, sustainability, and productivity. Additionally, it addresses the difficulties and possibilities brought about by the growth of AI-powered

IndexTerms – **AI,Agriculture industry,AI4AI,farming.**

I.INTRODUCTION:

For a long period of time, the agriculture sector in India has been the foundation of the country's economy, supporting millions of people and being an essential source of food security. But it is dealing with a variety of issues, including shortages of resources, changing market needs, and changing climates. Artificial intelligence (AI) technology integration has been an adverse effect in recent years, providing innovative solutions to these problems and transforming conventional farming methods.

The goal of the research is to provide an in-depth examination of the ways in which AI-powered startups are promoting agricultural innovation in India. These firms are changing the agricultural value chain in a number of ways, from market access to crop management, by utilizing AI's capabilities. These firms are helping farmers make data-driven decisions, optimize resource use, and increase productivity by applying machine learning algorithms, data analytics, and Internet of Things (IoT) devices.

II. DETAILS:

History of Indian Agriculture:

India is the world's second-largest agricultural producer. According to the Indian Economic Survey 2020–21, 20.2% of India's GDP came from the agricultural sector, which employed more than 50% of the labor force.[1][2]

India's agricultural traditions have roots in history and culture, and they frequently replicate the various agroclimatic conditions and socioeconomic backgrounds that exist in the various regions. These traditions have been passed down through the generations and have changed over the course of centuries.

1)Crop rotation has traditionally been practiced by farmers to maintain soil fertility and prevent soil erosion. This involves alternating crops.

2)Mixed cropping: In many parts of India, farmers used to grow several crops in one field. This was done to increase land productivity, reduce dependence on one crop, and reduce the risk of crop failure due to bad weather or pests.

3)In the past, Indian agriculture used organic fertilizers such as cow manure, compost and green manure to enrich the soil, but now they use high chemical fertilizers.

4)some areas are totally depend on rain water and some uses tank, river,ponds,canals etc.

5)Farmers preserved indigenous crop varieties suited to their specific agro-climatic zones.

6)Traditional knowledge systems, such as indigenous farming techniques, folklore, and rituals, have played a crucial role in providing guidance for agricultural practices. This knowledge, transmitted orally from one generation to another, holds invaluable wisdom regarding crop cultivation, pest control, and the preservation of natural resources.

Drawbacks in Traditional Farming:

1)Traditional farming techniques may not be sufficiently prepared to handle the challenges posed by climate change, such as unpredictable weather patterns, droughts, floods, and outbreaks of pests.

2)Traditional agricultural practices frequently depend on human labor and basic tools, leading to lower efficiency.

3)Consistent planting of identical crops without implementing effective soil management techniques, like crop rotation and integration of organic materials, may result in soil deterioration, erosion, and depletion of nutrients.

4)Many traditional farming systems in India depend on rainfall for irrigation.

5)some area supporting monoculture means same crop is taken in that area leads pest and poor soil quality.

6)The excessive use of pesticides and fertilizers can result in a reduction in soil quality, which in turn has negative effects on the environment and the quality of food.

7)The economic condition of farmers may suffer due to a lack of knowledge regarding market trends and prices.

8)Traditional farming harms the environment and sustainability.

How AI can solve issues faced by farmer:

1)Spraying pesticides on crops is a common method used to safeguard the produce from diseases and pests. Drones, which are automated, can carry out this task with greater efficiency and precision. Drones equipped with sprayers and cameras featuring computer vision capabilities can pinpoint areas requiring pesticide treatment and administer the appropriate amount of spray.

2)Farmers can analyses weather conditions using weather forecasting, which helps them plan the type of crop that can be grown and when seeds should be sown

3)An application driven by artificial intelligence has the ability to recognize soil nutrient deficiencies, identify plant pests and diseases, and offer farmers recommendations on fertilizer usage to improve the quality of their crops

4)By using technology and data analytics tools helps farmer to take decision on water management, crop rotation, timely harvesting, kind of crop to be cultivated, optimum planting, insect assaults, nutrition management, market trends, demand etc. [3]

AI-Driven Agricultural Startups: Revolutionizing Farming Practices in India:

There are over 250 Agri-Tech startups in India across the value chain, leveraging the use of technology and innovation in business models to impact the large agri sector in India. [4]

According to AgFunder's AgTech Investing Report for 2016, over $3.23 Bn was invested in agricultural sector worldwide of which, 53 Indian agritech startups raised $313 Mn in venture funding. In this paper we can review 10 start-ups. [5]

i)Agrostar:

The company was established by Shardul Seth in Pune, Maharashtra in 2013.

This platform is dedicated to providing agricultural inputs, content, and advice online. They supply a variety of products including seeds, fertilizer, tractors, water pumps, pesticides, and others. Furthermore, the platform offers farmers expert advice, agricultural information, agronomy insights, weather forecasts, and more. The company guarantees the provision of these services, with apps available for Android users. [6]

ii)Cropin:

Krishna Kumar founded a company in Bangalore in 2010.

Cropin is a leading global agri-tech company that provides a suite of SaaS solutions to maximize productivity in the agricultural sector. Their products, powered by AI and machine learning, offer predictive intelligence and data-driven insights for various stakeholders in the agri-ecosystem. Cropin's technology enables the digitization of farms, traceability of food produce, and supports decision-making with real-time insights.[7]

iii)Crofarm:

Varun Khurana founded a company in Gurgaon in 2016.

Crofarm is a new agrotechnology company that aims to reduce food waste through improved production. It is a Farm-to-Business (F2B) marketing strategy involving a community of over 10,000 farmers.[8]

iv)BharatAgri :

The company in Pune, Maharashtra was founded in 2017 by Sai Goel, Siddharth Dialani, and Yashwant PM.

BharatAgri assists farmers in all stages of agriculture by utilizing both offline and online technologies like Whatsapp and in-app chat support.The company has transitioned to a B2F model, offering improved agricultural services to farmers requiring technological assistance.Farming technology platform BharatAgri, which helps farmers through a unique algorithm providing a farming calendar for a full year through its mobile app, plans to expand to Gujarat, Karnataka and Telangana. [9][10]

V)Captain Fresh:

Utham Gowda, the founder of the company established in Karnataka in 2019.

Captain Fresh is an e-commerce platform specializing in seafood. The company offers a comprehensive wholesale seafood trading platform that encompasses delivery, payment protection, and quality services. Leveraging cutting-edge technology, Captain Fresh delivers the most efficient and rapidly expanding sales solutions. The company's user-friendly application is accessible on the Android platform.[11]

VI)BigHaat:

Founded by Raj Kancham, Sachin Nandwana and Sateesh Nukala in 2015, BigHaat is a farmer-centric digital marketplace, which offers technical guidance and accessibility to a wide range of high-quality inputs to farmers. [12]

VII)Dehaat:

Founded by the alumni from IIT Delhi, IIT Kharagpur, IIM Ahmedabad & other top institutes - DeHaat is a fully funded start-up with an exceptional growth rate & is certified Great Place to Work 2 years in a row, 2022-2023 & 2023-2024.

DeHaat offers end-to-end agricultural services to farmers, including distribution of high-quality agri inputs, customized farm advisory, access to financial services, and market linkages for selling their produce. [13]

VIII)KhetiGaadi:

KhetiGaadi is the first online portal to compare and buy farm equipment in India.

Farmers can review farm equipment and optimize yield in fewer man hours. They have a network of over five hundred thousand farmers. [14]

IX)Farm2Fam:

Farm2Fam specializes in delivering organic food products directly to consumers, guaranteeing that they receive fresh produce cultivated without the use of pesticides and herbicides. Currently, they employ advanced technology to streamline the supply chain while adhering to traditional farming practices, ensuring that consumers have access to unique and nutritious food options. [14]

X)Apna Godam:

Sanjay Agarwal, from Rajasthan, established this agritech company in 2016. The company focuses on post-harvest solutions and offers a range of services including product support, financial assistance, and logistics services. With the help of Apna Godam and its network of logistics partners, farmers can conveniently sell their produce to buyers across the country without the need to travel. This are few start-ups in India which promotes agriculture sectors. [14]

Indian Government Initiatives:

Indian government take initiative to promote start-up by giving a National Start-Up award 2021 in agriculture sector which is given by Government of India, Ministry of Commerce and industry department for promotion of industry and internal trends.[15]
Following are 4 Winners:

1)Shapos Services Private Limited:

Reshamandi, the pioneering silk supply chain startup in India, is actively engaged in the digitalization, democratization, and empowerment of farmers through technology to improve crop sales and increase revenue.

2)Agrirain Agro Industries India Private Limited:

AgriRain unveiled a fresh and inventive 'Irrigation as a Service (IaaS)' framework incorporating Hosereel irrigation technology, delivering hassle-free, pay-as-you-go, flexible, trustworthy, economical, and readily available irrigation as a full irrigation solution.

3)Zentron Labs:

At Zentron Labs, we excel in streamlining tasks that demand visual verification. Our state-of-the-art Machine-Vision solutions leverage industrial cameras and Computer Vision algorithms to provide innovative and personalized automated optical inspection services.

4)Athreya Global Solutions:

The primary objective of Athreya Global Solutions is to uplift the social and economic conditions of farmers by promoting sustainable smart agriculture. To achieve this, the company has undertaken extensive research in biotechnology to find innovative ways of enhancing crop health and productivity. Through their efforts, they have successfully developed environmentally friendly bioactive formulations called RuBisCO-ACT and Photon-MAX, which require minimal agrochemical inputs.

SAAGU-BAAGU PROJECT : Initiative taken by Telangana Government in July 2023

The "Saagu Baagu" project, part of the AI4AI initiative, has indeed made a significant impact on the agricultural sector in Telangana. It has been reported that the project has helped 7,000 Chili farmers from the region by doubling their earnings through the use of advanced agritech and effective data management practices [16][17].
This initiative is a collaboration between the Government of Telangana, the World Economic Forum, the Bill and Melinda Gates Foundation, and Digital Green, aiming to transform the agriculture value chain with emerging technologies [16].
The pilot phase, which ran from May 2022 to March 2023, showed promising results in increasing farmers' profits [16].
Following its success, there are plans to expand the project to potentially impact 500,000 farmers across five value chains [17].
This demonstrates the vast potential of AI and technology in revolutionizing agriculture and enhancing the livelihoods of farmers.

III.RESEARCH METHODOLOGY

The research method uses a secondary source i.e. Review of Literature and articles, news etc. Conduct a comprehensive review of existing literature on Agriculture practices in India, traditional way of farming, AI based solution for farming. Identify key studies, frameworks, and methodologies relevant to the research topic.

The research method used is survey method. The survey method is to create questions related to knowledge of AI tools in agriculture using a google form and conduct a survey of 100+ respondents. [18][19]

IV.RESULTS:

The result of survey of Awareness of AI tools used in Agriculture .[18][19]

Survey on awareness about AI used in Agriculture
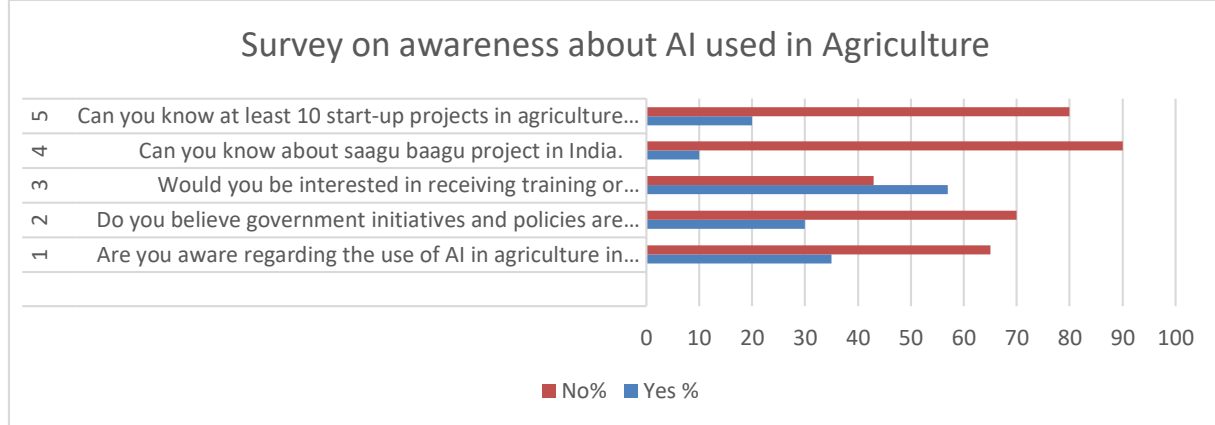
According to this chart ,we understand that there is a lack of awareness amongs the indian people about the new technology AI used in agriculture.This research paper helps people to get idea about AI tools used in agriculture,start-up projects,Government intiatives .

V. OBJECTIVE:

1)I aim to raise awareness about AI-driven technology in the agricultural sector and provide information about the services offered by start-up companies and government policies or initiatives in India through this research paper. My goal is to reach every Indian and ensure they are well-informed about these important topics.
2)Identifying and profiling AI-powered startups operating in the agricultural sector in India.
3)Analyzing the specific AI technologies and solutions being employed by these start-ups.
4)Assessing the impact of AI-driven innovations on various aspects of agricultural practices in India, such as crop management, pest control, soil health monitoring, and yield optimization.
5)Evaluating the challenges and opportunities faced by AI-powered start-ups in the Indian agricultural ecosystem.
6)Taking overview of services are provided by agriculture start-up's in India.
7)Evaluating awareness of AI technologies and solutions for agricultural amongst Indian farmers and conman man.

VI.CONCLUSION:

AI-based enterprises can play a crucial role in accelerating agricultural innovation in India, fostering sustainable development, and catering to the evolving requirements of the agrarian sector. Through harnessing the transformative power of AI, India can unlock new prospects for growth, resilience, and prosperity in agriculture, ultimately contributing to food security, rural livelihoods, and environmental sustainability.

It is crucial to acknowledge the obstacles and constraints linked to the implementation of AI in agriculture. These include challenges such as lack of awareness among individuals, the expenses and accessibility of necessary infrastructure, affordability concerns, and the level of digital literacy.

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