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Artificial Intelligence in Agriculture

Shilpa Kaushal[1], Shivam Kumar[2], Sayed Tabrez[3]

[1, 2, 3]University Institute of Agricultural Sciences, Chandigarh University, Gharuan, Mohali- 140413, Punjab, India
[1]*shilpa.e9509[at]cumail.in*
[2]*shivamkr3003[at]gmail.com*
[3]*tabrezsayed942[at]gmail.com*

Abstract: ***Technologies like computer science, Internet, giant information Analytics, Block Chain Technology etc. computer science provides correct and timely data regarding plants, land, climate and insects etc. for farmers; so, it's going to improve crop production at a reduced risk resulting Agriculture faces major challenges. Increasing production by seventieth to full-fill world demand over subsequent fifty years could be a risky goal because of restricted resources, temperature change and different short-run and regional threats. Agriculture is that the largest sector within the world. Doubtless, it's the most important supplier of livelihoods in Asian nation; particularly in rural India. Agriculture is that the backbone of the Indian economy. The Indian government has set itself the goal of doubling farmers' financial gain by 2022 and also the Agricultural Export Policy has set a target to extend agricultural exports. Digital technology will play a transformative role in modernization and coming up with however rural Asian nation performs its agricultural activities in improved financial gain for farmers. Objectives: This present study explores how (AI) Artificial intelligence can help in fulfilling the demand which is going to rise in future and helps in producing agricultural produces in bulk quantity, also role of AI in nutritional assessment and management of soil.***

Keywords: Artificial Intelligence, Machine Learning, Mobile Computing, Agriculture

1. Introduction

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, GDP development (O. October 2014), 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.

Knowledge development. The current agricultural business uses advanced advances, for example, robots, temperature and sogginess sensors, flying images, and GPS improvements. These push-up devices and the accuracy of agribusiness and machinery systems enable organizations to benefit continuously, become stronger, gradually protected, and even above ground by neighbours. The rise of e-commerce investments and related heads has opened up a wealth of new data openings. Remote sensors, satellites, and UAVs (unmanned aerial vehicles) can collect information 24 hours a day throughout the arena (J.Gupta 2019). These can check crop fertility, soil condition, temperature, durability, etc. Part of the data these sensors can do is beyond power, and numerical criticism is hidden in the uncontrolled slide of that data. The idea is to allow farmers to build an unparalleled awareness of the situation on the ground with the development of the front line, which can expose them more to their status than they can see with their own eyes. Moreover, much faster than seeing him walking or passing through fields. As we see that these new approaches are widely accepted and will continue to be accepted by farmers, we can investigate part of the benefits associated with the accuracy of agribusiness start-up. The main concepts of using these new improved methods include: Efficient use of inputs such as raw materials, compost, water, fuel, etc. vision, Reduce Risks. (Kumar 2019). Artificial Intelligence (AI) is also growing rapidly and entering the commercial, business and government sectors, the source of which could be universities operating as resource centers. (Goralski and Tan 2020; Lentner,2007). Agriculture is facing major new challenges today. The rate of global food production should increase by 60-110% to feed 9-10 billion people by 2050. (J. Rockstrom et al., 2016). Thus, the sustainability of the agricultural sector is key to ensuring food security and poverty alleviation for the ever-growing population. In addition, due to the emergence of several food safety scandals and incidents in the food industry such as bovine spongiform encephalopathy and dioxin in chickens a well-documented tracking system has become a requirement for quality control in the food chain. In addition, climatic conditions and climate change, as well as sustainable water management due to water scarcity, are significant challenges in the coming years. For these reasons, urgently, the development of a strategy to transition from the current vision of agricultural product development to agricultural sustainability is needed. Expecting effective solutions, helping farmers and stakeholders improve their decision-making by adopting sustainable agricultural practices is an important decision, especially the use of digital technologies including Internet of Things (IoT), Artificial Intelligence (AI), and cloud computing. Additionally, sub-sets of AI (machine and in-depth learning algorithms) integrated with local intelligence technology are widely used. The aim of our review is to introduce key application technologies and mechanized learning strategies in the agricultural food sector. (R. Ben et al., 2013).

2. Discussion

Typically, crop management systems provide a link to a comprehensive crop management that covers each component of farming. The concept of using AI method in plant management was first proposed in 1985 by Mc Kinion and Lemmon in their paper "Agricultural Specialist Programs. (J.M, Mc kinion et al., 1985).

This Special Phase highlights the use of AI techniques in many areas of agricultural research to understand the scope of AI-enabled solutions within ARS.

Agricultural Production Management- Agricultural production is a very complex chain of supply chain. AI changes the way our food is produced, distributed, and consumed. Researchers use powerful AI technology to provide information and guidance on crop rotation planning, planting seasons, water and nutrient management, pest control, disease control, good harvesting, food marketing, product distribution, food security, and other agricultural-related activities throughout the food supply chain. (Peter et al 2021). Using AI to transform agriculture and to promote agricultural research, "provides an overview of current developments, challenges, and opportunities for AI technology in agriculture. They demonstrate the power of AI using four major components of the food system: production; distribution, use, and uncertainty. They conclude that agribusinesses are essential to the use of AI and other technologies. AI down farm These courses include providing valuable information on the development of accurate and effective irrigation systems and development tools used to recommend high levels of nitrogen fertilization in corn.

Plant Monitoring- The most common methods of monitoring plant health are labor-intensive and time-consuming. Using AI is an effective way to monitor and identify potential plant health problems or nutrient deficiencies in the soil. With the help of in-depth study, applications are developed to analyze crop health patterns in agriculture. Such AI-enabled applications are useful for better understanding, soil health, pest pests, and plant diseases. (Sudduth et al. 2021) .

Figure 1: Plant monitoring with IOT smart phones

Data Science- Farms produce a large number of data points every day. With the help of AI, farmers can now analyze various drivers in real time such as weather, temperature, water use or soil conditions collected on their farm to better inform their decisions. AI technology allows farmers to use the data in their hands to grow healthy plants while using fewer natural resources. (Ramos-Giraldo et al., 2020). "AI Recommendation Program with ML for Agricultural Research," used the AI recommender (RS) program with ML to increase the use of data related to agricultural problems and improve the efficiency of scientific staff while also improving the accuracy of food production estimates. They concluded that RS provides a powerful way to use large amounts of data and scientific expertise in the agricultural business to predict agro ecosystem evolution under changing environmental conditions.

Disease Diagnosis- Plant diseases are a major threat to the environment, the economy, and food security. Early detection of plant diseases is essential for effective disease control. AI-based image recognition systems can detect certain plant diseases with high accuracy, which may open the way for field-based diagnostics using mobile devices, such as smart phones. (Peter et al 2021). "Enhancing agricultural research with artificial intelligence," developed AI-based tools that use location-based science and big data to help farmers and land managers make informed decisions about the environment. These tools provide early warning of pest and disease outbreaks and guide the selection of sustainable crop management practices.

Food Quality- AI and machine vision play an important role in the world of food safety and quality assurance. AI makes it possible for computers to learn from experience, analyze data from both input and output, and perform multiple human tasks with an improved level of accuracy and efficiency. (O Baiden et al 2008).

"Mechanical learning in meet quality tests," ML has been hired to increase the speed and accuracy of carcass quality tests. They tested eight ML algorithms and found an astonishing 81.5% to 99% accuracy in predicting carcass quality features.

Predictive Analytics- A remote sensor used to predict expected crop yields and yields in a particular area. It can also be helpful to determine how much the crop will be harvested under certain conditions. Advances in AI-based data analysis help farmers protect natural resources such as soil, air, and water, and reduce the amount of inputs needed for successful harvesting. (Penning et al). "Remote sensor: Improving agricultural science and agrarian applications," advanced tools using a remote sensor integrated with neural and ML networks to identify dynamic areas within the fields and determine adaptive strategies to maximize the benefits of each field while minimizing environmental impact. through effective use of nutrients and pesticides. AI offers a radical change in advanced ways that will redefine common patterns and limitations of agriculture. AI will drive agricultural transformation at a time when the world has to produce more food using fewer resources. ARS scientists have used AI technology in various laboratories to advance agricultural research and speed up scientific discovery. Unfortunately, many AI-based agricultural research projects in ARS could not be addressed in this limited space. This Special Section is designed to make us as informed as possible about the details of the various AI strategies used in ARS (Hatfield et al.,2021).

Technologies that support the development of smart agricultural forums, including: IoT; Big Data Analytics

(BDA); Cloud Computing (CC); Mobile Computing (MC); and Artificial Intelligence (AI).

Internet of Things (IoT): IoT is a technology aimed at connecting all intelligent objects within a single network, namely the internet. Includes all forms of computer technology, both

a) Hardware (i.e. smart boards and sensors) and
b) Software (i.e. advanced operating systems and AI algorithms).

Its main purpose is to develop device applications, to enable monitoring and control of a specific domain.
It is widely used in agriculture in the management of agricultural products within real-time data collected, beside:

1) Reasoning
2) Tracing
3) Caution
4) Control
5) Management
6) Testing
7) Performance

within the supply chain. (H.Channe et al., 2016)

Mobile Computing (MC): MC refers to the infrastructure where data processing and data storage takes place outside of a cell phone. When MC systems collect and send daily data to farmers, informing them of both production conditions and weather conditions. It is important to use Radio Frequency Identification (RFID) automatic tracking systems to store and access data on electronic data chips in a very fast and accurate way. It is mainly used in the use of industrial products, for the purposes of identifying and evaluating delivery processes. (K. Ghai et al., 2016).

Robots: these are developed and designed to handle basic agricultural activities (i.e. harvesting crops) much faster and with higher power than human workers. Examples of robot applications include: (a) See and Spray (i.e. weed control robot) and (b) CROO harvesting (i.e. crop harvesting robot). Agricultural robots have the potential to be important AI applications, namely milking robots. (J.V. Albellan et al., 2010).

Monitoring Crop and Soil: This uses computer-assisted and deep-learning algorithms to process data taken from plant sensors and soil health, i.e. the PEAT pest and soil problems, based on the in-depth study using known as Plantix diagnostics. nutrient deficiencies in the soil. Another example is Trace Genomics, a machine-based learning service to diagnose soil degradation and provide soil analysis services to farmers. This uses mechanical learning to give farmers your sense of both the strengths and weaknesses of their land, with an emphasis on preventing poor crops and improving the ability to produce healthy crops. SkySquirrel technology is an example of using drones and a computer-assisted crop analysis concept. (S.S Kale et al., 2019)

Guessing Statistics: This analysis captures data, based on machine learning models that are able to track and predict various environmental impacts on crop yields, i.e. climate change. Examples of such AI technologies include (a) Where (i.e. weather forecasting and crop stability) and (b) farm images (i.e. monitoring plant health and sustainability). Plant and soil monitoring technologies are important programs to address the problems associated with climate change. (K. sennar et al., 2019)
The research methodology is divided into:

a) Smart Sustainable agricultural model domains
b) Proposed IOT / AI SSA forum as a solution
c) Proposed IoT / AI architecture of the SSA platform.

Smart Sustainable agricultural model domains:
Human resources: This refers to the people, policies and procedures in the agricultural sector, as important as any other sector, such as climate and technology. Human resources are receiving increasing attention, due to their significant impact on productivity, as well as financial and marketing decisions. In any case, agricultural concerns require good human resource management and planning, which includes hiring and retaining busy, efficient and effective staff. Providing the most up-to-date information opens up ways to embrace intelligent technology in the agricultural sector. (K. Lakwani et al., 2019)

Crops: This means a plant that can be grown and harvested extensively for the benefit or benefit of
(1) Food Crops (I.E. For Human Consumption);
(2) Food Crops (I.E. Livestock Feed);
(3) Fiber Plants (I.E. Rope And Textiles); And
(4) Oil Plants (ie for commercial or industrial use). (Pycno 2019)

Climate: This plays a key role in determining the success of agricultural processes. Many field crops and livestock depend solely on the weather to provide water and life sustenance. Bad weather can cause losses in agricultural production, especially during critical stages of growth. Climate factors (sunlight, temperature, rain, humidity and wind) influence natural science and the production of agricultural plants and animals. Bad weather (i.e. storms, droughts, floods, hail and hurricanes) can cause extensive damage and damage to fields and livestock.

Soil: This creates an important element of successful farming, which is a source of nutrients used for growing crops, which are later transferred to plants and passed on to humans and animals. Healthy soil produces healthy and rich food; however, soil health tends to decline over time, forcing farmers to relocate to new fields. Soil health depends on regional and climatic conditions, and soil nutrients are at high risk of degradation in dry climates, especially if irrigated, which, if not managed properly, leads to salinity, i.e. formation of salts and water-containing chemicals. Healthy and rich soils can be accessed through IoT sensors to monitor their chemical condition, using specific sensors (e.g. moisture sensors), their data readings are transferred to the data control and analysis layer for analysis, assisting decisions about fertilizer requirement. . (H Cadavid et al., 2018)

Insects: These include any living organism that invades, or harms, plants, livestock or human structures. Pests often occur in large numbers, which damage agricultural products. It is important to control and monitor these creatures with

IoT / AI technology, to prevent serious diseases, including disease and malaria, as well as plant and livestock diseases.

Fertilization: Soil naturally contains many nutrients, namely nitrogen, phosphorus, calcium and potassium. Plants cannot function properly and produce high quality food when their nutritional value is low. The natural level of nutrients in the soil needs to be increased by adding nutrients once the plants are harvested. Fertilizers have been used since the beginning of agriculture, but it is now well-known that their excessive use can harm the environment, if not properly managed. Therefore, farmers use IoT sensors to read and test soil samples for basic testing so that they can add fertilizer using appropriate and appropriate measurements. Fertilization is an important means of maintaining sustainable agricultural production systems.

Figure 4: Fertlization through Drones

Agricultural Products: These are derived from the cultivation of crops or livestock in order to sustain or improve human health. People also use a wide range of agricultural products on a daily basis, namely food and clothing. Agricultural products fall into the following categories: (a) grain; (b) food; (c) fuel equipment; (d) threads; (e) livestock; and (f) equipment. Food is the most productive agricultural product. (M. S Mekala et al., 2017)

Irrigation / Water: The demand for water in agriculture is now increasing worldwide and especially in the Mediterranean countries, increasing the pressure to keep the water sources available. Therefore, smart, sustainable agricultural practices should focus on new and effective strategies

Figure 3: Irrigation with IOT

Big Data Analytics (BDA): BDA refers to the large amount of data collected from different data sets over a long period of time, namely sensor, internet and business data. The data sets used in this technology override the computational and analytical capabilities of standard software applications and standard website infrastructure. The use of BDA in agriculture focuses on managing the supply chain of agricultural products, in order to improve decision-making and reduce production costs. It is also used to analyze the properties of different types of soil for fragmentation and development. In addition, it is useful for improved forecasting and crop production. (S. Chen et al., 2014)

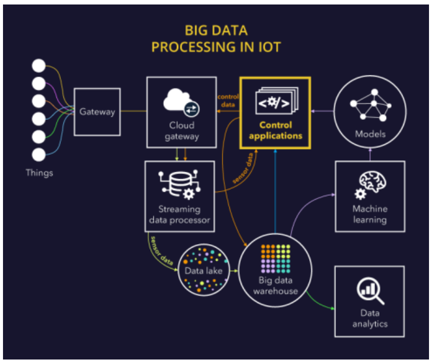

Figure 2: Big Data Anlysis

(B) Proposed IOT / AI SSA forum as a solution

The SSA environment, performs the following functions:

a) Manage and control the flow of data between SSA domains
b) Facilitate the integration of the various components of SSA Architecture
c) To deal with interaction issues caused by the use of different tools and software
d) Provide easy-to-use interactive facilities
e) Provide the ability to generate reports based on real-time data and keep it updated
f) Store the generated data in a secure repository (i.e., Cloud), so that it can be permanently recorded for future use.
g) To separate the different layers in order to advance the development process in the future
h) Forum should have fewer notes. (M.S Mekala et al., 2017)

(C) Proposed IoT / AI architecture of the SSA platform

Virtual Hardware and Storage Layer: This layer consists of powerful computer hardware handling equipment, as well as a dedicated storage, cloud storage solutions or integrated storage solutions. Contains the supporting hardware of IoT devices available online for Thins and Sensing layer.

Artificial Intelligence and Data Management System: This layer is responsible for managing processes and controlling business thinking, focusing on three main functions: (i) data analysis and processing, data mining and intelligent statistical analysis of generated data; (ii) data classification and modification, using ontologies, and machine learning to distinguish and modify analyzed data; and (iii) data translation, representing data that has been converted into information to make machines intelligent. (A. Kamlaris et al., 2017)

Network Layout: This layer contains all the different types of network connections available, with this cloud covering wired / wireless network devices / devices. It is important that this layer uses the latest network technologies to keep pace with the latest developments in other areas. Its main function is to facilitate the transfer of all data to and from different layers within buildings.

Security Layer: This layer is responsible for the security of data transmitted between different layers and should be a way to deal with any security concerns and vulnerability in all other IoT / SSA layers, i.e. malware, spyware and viruses. It should use updated security solutions and AI algorithms to prevent and isolate any threat to the environment. (W. Garzon et al., 2017)

Application Layers: This layer collects various applications related to sustainable agricultural agriculture. Built on AI and data management layers. At Many smart, sustainable agricultural applications can be developed and integrated into this framework, namely crop monitoring applications and drone-controlled applications. This layer focuses on the data flow monitoring and migration feature across all layers and can provide an accredited center with full or partial control over data transfer, processing and access.

Internet of Things (IoT) and Sensory Layout: This forms the first layer of interaction with SSA domains. It uses and handles a wide variety of IoT devices (e.g. sensors), which are able to collect data from real-world objects, and share it to provide real-time data. Most cloud sensors are hosted and integrated within this layer, namely moisture sensors, humidity sensors and weather monitoring systems. In addition, the team is responsible for using robotic and drone actuators to assist in the movement of smart machines in the agricultural area. So it allows smart machines to move between places, to cover a wide area. (G. Soto Romereo et al., 2019)

Table 1: Uses and Implementation of AI Technology in Agriculture

Artificial Intelligence	Uses	Implementation
• ROBOTS	• Fruit Picking • Driverless Tractor • Shearing of Sheeps • Weeding • Harvest Automation	• The robots takes images and maps and detects the fruits and pick it as well as can keep acc. to size. • A driverless tractor is an autonomous farm vehicle that delivers a high tractive effort at slow speeds for the purpose of tillage and other agricultural task. • Robots with mechanical arms sets with trimmer can help in shearing of sheep. • Specially designed wheel scrub the top layer of soil disrupting weed seed as they germinate, if any weeds mange to grow the turtle cuts them down. • The robots detect and localize the fruits on tree using computer vision can also detect the fruits shadowed by another fruits and harvest it.
• DRONES	• Soil and Fields Analysis • Crop Monitoring • Plantation • Livestock Management • Crop Spraying	• For efficient field planning, agricultural drones can be used for soil and field analysis. They can used to mount sensor to evaluate moisture content in the soil. • Crop surveillance is the supervision of crops progress from the time seeds are sown to the time for harvest. • Can be useful in plantation which helping save fuels and labor also replaces huge tractors, as they emit harmful gases. • Drones are useful in manage huge livestock as their sensor have high resolution infrared cameras, which can detect a sick animals and swift take actions accordingly. • Agro-Drones can be used to spray chemicals as they have reservoirs, which can be filled by fertilizers and pesticides which save time as compared to traditional method.

3. 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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Figures

Figure 1
https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DOL7TNx9RquE&psig=AOvVaw2H5E2NhADg2tVgIpXjyoPQ&ust=1653559340320000&source=images&cd=vfe&ved=0CAwQjRxqFwoTCJiD8eay-vcCFQAAAAAdAAAAABAJ

Figure 2
https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.scnsoft.com%2Fblog%2Fiot-big-data&psig=AOvVaw2UzFDTfV6bBUQv-s24skhD&ust=1653559544933000&source=images&cd=vfe&ved=0CAwQjRxqFwoTCMDLkr2z-vcCFQAAAAAdAAAAABAJ

Figure 3
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Figure 4
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