Innovation in Agriculture

Prelims: Artificial Intelligence, Precision Agriculture, Machine Learning, National e-Governance Plan in Agriculture.

Mains: Need of IoT and AI in Agriculture.

Why in News?

Recently, the government of India has taken various initiatives related to Agriculture by using **Internet of Things (IoT)** and **Artificial Intelligence (AI).**

- **IoT** is a **computing concept** that describes the idea of everyday physical objects being connected to the internet and being **able to identify themselves to other devices.**

What is the Need for IoT and AI in the Agriculture Sector?

- Even as agriculture remains a priority sector accounting for the livelihoods of around 58 % of the country's population, **adoption of technology in the sector is at a transitory juncture and faces several challenges across the value chain.**
- These challenges require **disruptive interferences which can be provided by technological solutions such as the** IoT and AI etc.
- Adoption of AI technologies can **pave the way for higher production with the optimum utilization of available resources** and facilitate predictive analysis, crop health management, enhance quality and traceability among others.
- The adoption of innovative and transformative smart farming practices in **the country is gradually becoming a major trend.**
- Globally technology advancements in recent years are **re-engineering both the upstream and downstream segments of the agri value chain,** which makes it **important to adapt innovation in Agriculture.**
- Cutting-edge technologies in AI such as IoT, **ML (Machine Learning)**, **cloud computing**, statistical computing, deep learning, Virtual Reality (VR) and Augmented Reality (AR) can enable the Agriculture Sector to **overcome the challenges of productivity, quality, traceability and carbon emission with enhanced profitability.**

What is the Usage of AI in Agriculture?

- **Analyzing Farm Data:**
    - Farms produce hundreds of thousands of data points on the ground daily. With the help of AI, **farmers can now analyze a variety of things in real-time such as weather conditions,** temperature, water usage or soil conditions collected from their farm to better inform their decisions.
    - Farmers are also using AI to create seasonal forecasting models to improve agricultural accuracy and increase productivity.
- **Precision Agriculture:**
    - Precision agriculture uses AI technology to aid in **detecting diseases in plants, pests, and poor plant nutrition on farms.**

- AI sensors can detect and target weeds and then decide which herbicides to apply within the right buffer zone.
- This helps to **prevent over-application of herbicides and excessive toxins** that find their way in our food.
- It would **increase productivity by introducing precision agriculture.**
- **Tackling the Labour Challenge:**
  - With fewer people entering the farming profession, **most farms are facing the challenge of a workforce shortage.**
  - One solution to help with this shortage of workers is AI agriculture bots. These **bots augment the human labour workforce and are used in various forms.** For example:
    - These bots can **harvest crops at a higher volume and faster pace** than human labourers, more accurately identify and eliminate weeds, and reduce costs for farms by having around the clock labour force.
    - Additionally, farmers are beginning to turn to chatbots for assistance. Chatbots **help answer a variety of questions and provide advice** and recommendations on specific farm problems.

What are the Related Initiatives taken?

- **National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS):**
  - It was launched in **2018 by the Ministry of Science and Technology** with an outlay of Rs. 3,660.00 crore for a period of five years to encourage innovation in new age technologies.
  - Under the Mission, 25 Technology Innovation Hubs (TIHs) have been set up in premier institutes of **national importance across the country in advanced technology verticals.**
  - The Mission can act as an engine of growth that would benefit national initiatives in health, education, energy, environment, agriculture, strategic cum security, and industrial sectors, **Industry 4.0**, **SMART Cities**, Sustainable Development Goals (SDGs) **etc.**
- **Digital India initiatives**:
  - Under the Digital India initiatives government has set up Centres of Excellence on Internet of Things with the objective to enable **India to emerge as an innovation hub in IoT through democratization of innovation and realization of prototypes.**
  - One of the focus areas of Centres of Excellence on IoT is on **Agri-tech and it connects various entities** such as startups, enterprises, venture capitalists, government and academia.
- **National e-Governance Plan in Agriculture:**
  - Funding is given to **State Governments for Digital Agriculture projects** using emerging technologies like Artificial Intelligence and Machine Learning (AI/ML), IoT, Block chain etc.
- **Innovation and Agri-Entrepreneurship Development:**
  - This programme is operational under Rashtriya Krishi Vikas Yojana (RKVY) from 2018-19 with the objective to **promote innovation and entrepreneurship** by providing financial support and nurturing the incubation ecosystem.
  - In this connection, **five Knowledge Partners (KPs)** and 24 Agribusiness Incubators (R-ABIs) have been appointed across the country. The **five KPs are:**
    - National Institute of Agricultural Extension Management (MANAGE), Hyderabad.
    - National Institute of Agricultural Marketing (NIAM) Jaipur.
    - Indian Agricultural Research Institute (IARI) Pusa, New Delhi.
    - University of Agriculture Science, Dharwad, Karnataka.
    - Assam Agriculture University, Jorhat, Assam.

Way Forward

- With the recent reforms in the agriculture sector, there is a likelihood of increased investments in contract farming and **infusion of technology for better yields and productivity.**
- This will further **push the adoption of AI in agriculture.** Further, in order to help these AI solutions, scale increased investments needed, both from the public and private sector.
- A huge surge in the emergence of agritech start-ups is **being witnessed in India, driven by**

- **advanced technology penetration** coupled with a conducive policy environment.
  - This can only be seen as a starting point for the penetration of advanced technologies like AI, ML, IoT and Blockchain in the agriculture ecosystem.
  - These collective technologies **come as a great boon to the agricultural sector which is heavily reliant on unpredictable climatic conditions.**

UPSC Civil Services Examination, Previous Years Question (PYQ)

Prelims

Q.1 With the present state of development, Artificial Intelligence can effectively do which of the following? (2020)

1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:

(a) 1, 2, 3 and 5 only
(b) 1, 3 and 4 only
(c) 2, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Ans: (b)

Q.2 When the alarm of your smartphone rings in the morning, you wake up and tap it to stop the alarm which causes your geyser to be switched on automatically. The smart mirror in your bathroom shows the day's weather and also indicates the level of water in your overhead tank. After you take some groceries from your refrigerator for making breakfast, it recognises the shortage of stock in it and places an order for the supply of fresh grocery items. When you step out of your house and lock the door, all lights, fans, geysers and AC machines get switched off automatically. On your way to office, your car warns you about traffic congestion ahead and suggests an alternative route, and if you are late for a meeting, it sends a message to your office accordingly. (2018)

In the context of emerging communication technologies, which one of the following terms best applies to the above scenario?

(a) Border Gateway Protocol
(b) Internet of Things
(c) Internet Protocol
(d) Virtual Private Network

Ans: (b)

Mains

Q. How is science interwoven deeply with our lives? What are the striking changes in agriculture triggered off by science-based technologies? **(2020)**

[Source: PIB](#)