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INDIAN ECONOMY

E-TECHNOLOGY

IN THE AID OF FARMERS

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E-TECHNOLOGY IN THE AID OF FARMERS

Student Notes:

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1. Introduction

Agriculture sector in India in one of the important sectors. It is the primary source of livelihood for about 58% of India's population. It contributes about 18% of GDP. Growth in GVA in agriculture and allied sectors stood at 1.4 percent in the FY24

> **Electronic-technology (E-technology)** is used as an overarching term incorporating all modes of transmission like electronic devices, satellite communication, mobile, services and applications which help to disseminate information with the help of technology.

- These facts points to major structural issues with the sector in India which has stemmed the growth trajectory of the agricultural sector.
- Farm sector growth has been stunted by low productivity, fragmented landholding, recurrence of over/under production reflecting a clear market asymmetry, lack of good agricultural practices and reforms in farm marketing.
- Globalization has also posed newer challenges for the sector where the farmers have to produce quality product at par with world market at reasonable prices
- Thus, the farmers need to be well informed and well trained in the management of natural resources and production of agricultural commodities.
- E-technology can play an important role in addressing these challenges and uplifting the livelihood of Indian farmers.

> **E-agriculture** is a term to study the role of Information and Communication Technology in agricultural development. Simply speaking, it is a way of harnessing the power of ICT in agricultural domain.

2. Uses of e-technology for farmers

E-technology can help agriculture sector, particularly in the following ways:

- **Improved decision making** by dissemination of **relevant and timely information** to farmers regarding:
  - Agro-inputs such as seeds, fertilizers, pesticides etc.
  - crop and soil health management
  - Weather forecasting and disaster preparedness
  - Agro processing, market support and marketing of agriculture produce
  - Agro-finance and management of farm agri-business
  - Suitable government schemes
  - Localized information on specific farm and agriculture related subject around village/block/district/state
- It can help in **improving skills and productive capacities** of farmers while ensuring cost effectiveness, viability and sustainability of the farming practices.
- It can facilitate linkages with academia, industry and government agencies.
  It will help farmers access information and knowledge about emerging technologies and find suitable markets for their produce.

Experts opine that introduction of IT in agriculture can bring **another Green Revolution** in India with **easy and cost effective information** to the farmers at the right time.

3. Drivers of E-technology in Agriculture

Following main trends have been the key drivers of the use of e-technology in agriculture:

- low-cost and pervasive connectivity and adaptable and more affordable tools due to booming mobile, wireless, and Internet industries
- advances in data storage and exchange due to continuous research in IT sector
- innovative business models and partnerships with government and private sector collaborations
- the democratization of information, including the open access movement and social media

Student Notes:

4. Initiatives Related to E-technology to Aid Farmers

Governments and private sector have launched a number of e-technology initiatives to harness the potential of e-technology to tackle various challenges. Some of these initiatives are:

4.1. National e-Governance Plan in Agriculture (NeGP-A)

The Government is implementing a Centrally Sponsored Scheme **"National e-Governance Plan in Agriculture (NeGP-A)"** in the entire country. The Programme aims to achieve **rapid development of agriculture in India** through **ICT enabled multiple delivery channels such as Internet, Touch Screen Kiosks, Krishi Vigyan Kendras , Kisan Call Centres (KCC), Agri-Clinics, Common Service Centers (CSCs), Mobile Phones (Broadcast, IVRS, interactive messaging using unstructured Supplementary Service Data and Voice Recognition** for ensuring timely access to agriculture related information for the farmers of the country. A number of applications in agriculture and allied sector have been developed under the project for providing integrated ICT based services to farmers.

4.2. Information Technology Vision 2020

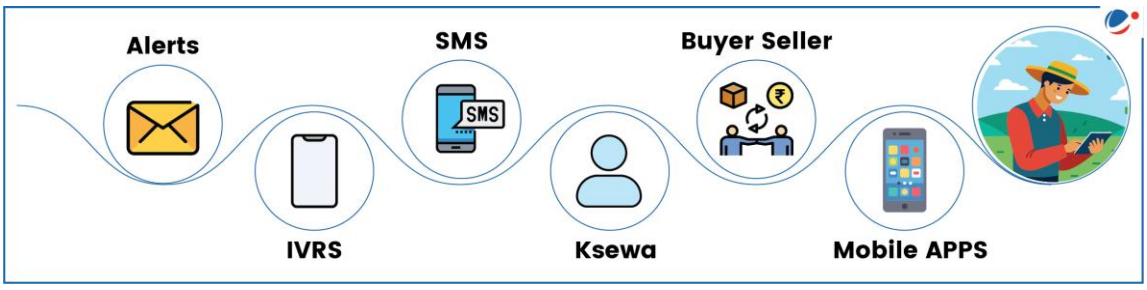
The **National Agricultural Policy** lays emphasis on the use of Information Technology for achieving a more rapid development in India. Accordingly, the Department of Agriculture and Cooperation (DAC) has formulated information technology vision 2020. This **vision states** that:

- Information relating to agriculture sector would be available to the ultimate users–the farmers for optimizing their productivity and income.
- Extension and advisory services making use of information technology would be available to the farmers on round the clock basis.
- The tools for information technology will provide networking of agriculture sector not only in the country but also globally and the Union and State Government Departments will have reservoirs of data base and

Department of Agriculture & Cooperation has also developed more than 80 portals, applications and websites (primarily in collaboration with the National Informatics Centre) covering both the headquarters and its field offices/ directorates. The important portals include SEEDNET, DACNET, and AGMARKNET (discussed later).

4.3. Kisan SMS Portal

Government of India, in 2013, developed an SMS Portal for Farmers for dissemination of relevant information, giving topical and seasonal advisories and providing services through SMSs in local languages. It is an integrated Farmers' Portal developed completely in-house by Department of Agriculture and Cooperation.



The **main features** of the Kisan SMS Portal include:

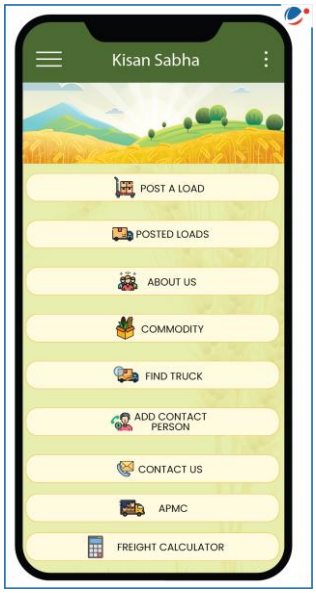
- They can register their queries, about the weather report, soil type, prospects and problems of market and so on by using this SMS portal.
- The relevant information will be provided to farmers in their own or regional languages.

- The SMSs will get transmitted only to the farmers within the territorial jurisdiction of an officer, scientist or experts for the crop or agricultural practice that such a farmer might have opted for.
- The farmers will get the information, services and even some advisories through this portal. The content may include information about the schemes, advisories from the experts, markets.
- The officers can send SMS to the farmers belonging to the entire area of their jurisdiction or a part of it.
- This Portal will also integrate existing farmer database of the farmers.

Possible benefits of the scheme:

- Timely crop advisory will lead to the adoption of relevant and appropriate technologies suited to local condition.
- Information on schemes and programmes of Government of India can help every farmer to reap benefit out of these schemes thus widening the footprint of these schemes.
- On the onset of any adverse weather condition, advice can be provided to the farmers on effective resource to be adopted.
- Outbreak of the disease/pests can be controlled as advisories can be provided immediately to the farmers in and around the area of initial report of the disease/pest.
- Selection of suitable and better variety/breed by the farmer based on the information/ advisory can provided to him/her.
- Timely market information will give better bargaining power to the farmer.

4.4. Kisan Sabha App



- The app aims to provide the most economical and **timely logistics support** to the farmers.
- It also intends to increase the profit margins for farmers by **minimizing interference of middlemen** and directly connecting with the institutional buyers.
- It will also help in providing **best market rates** of crops by comparing nearest mandis, booking of freight vehicles at cheapest cost thereby giving maximum benefit to the farmers.
- It acts as a **single stop for every entity related to agriculture,** be they a farmer who needs better price for the crops or mandi dealer who wants to connect to more farmers or truckers who invariably go empty from the mandis.
- Kisan Sabha also **provides a platform for people who want to buy directly from the farmer**

4.5. Crop Insurance Mobile App

- Crop Insurance mobile app has been developed as an **initiative under Digital India** which can be used to **calculate the Insurance Premium for notified crops** based on area, coverage amount and loan amount in case of loanee farmer.
- It can also be used to get details of normal sum insured, extended sum insured, premium details and subsidy information of any notified crop in any notified area.

4.6. National Agriculture Market (e-NAM)

It is a **pan-India electronic trading portal**, which seeks **to connect existing APMCs** and other market yards to create a unified national market for agricultural commodities.

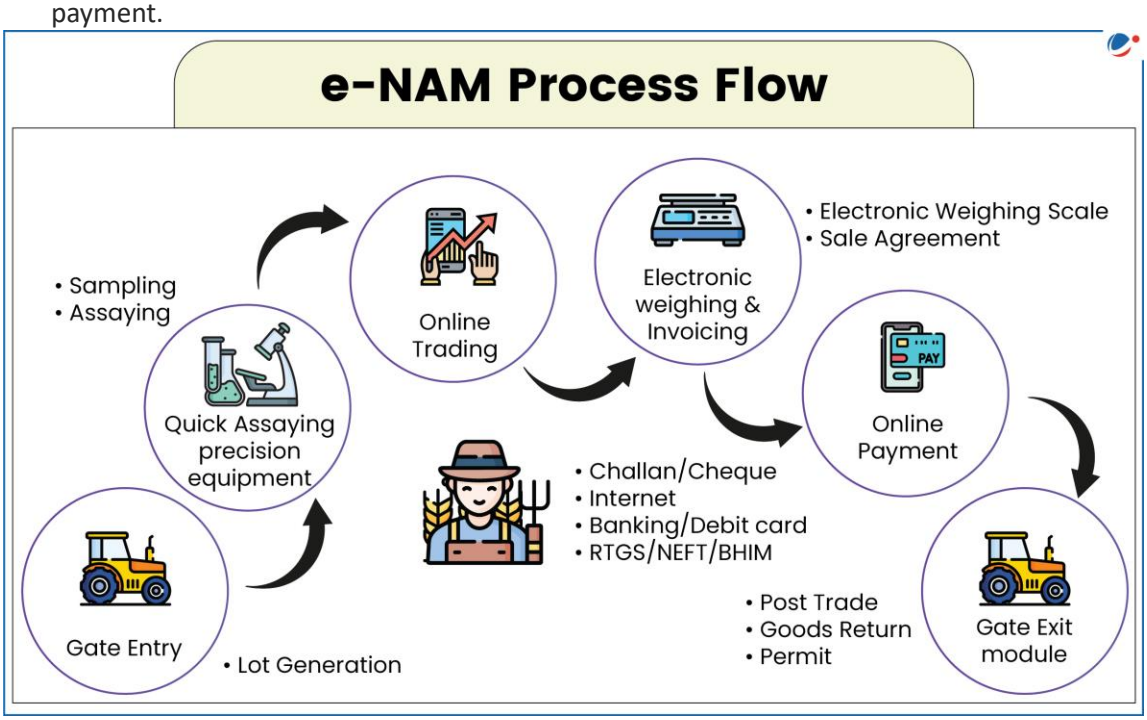
Student Notes:

Vision

- To promote uniformity in agriculture marketing by streamlining of procedures across the integrated markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply.

Mission

- **Integration of APMCs** across the country through a common online market platform to facilitate pan-India trade in agriculture commodities, providing better price discovery through transparent auction process based on quality of produce along with timely online payment.



Some key features:

- **Integration of Negotiable Warehouse Receipt System (e-NWRs) Module with e-NAM:** It will enable small and marginal farmers to directly trade their stored produce from selected Warehousing Development and Regulatory Authority (WDRA) registered warehouses which are declared deemed market by the State.
- **Farmers Produces Organization (FPO) module:** It will enable Farmer Producers' Organisations (FPOs) to upload the picture of their produce and quality parameters from their premise/collection centres for bidding. Distant bidders can visualise the produce before bidding by seeing the pictures and quality. After successful bidding, FPOs can deliver the produce from their premises or by bringing it to mandi.
- **Logistic Module:** A provision has been made for linking large logistic aggregator platforms providing choices to users. Presently, e-NAM provides a database of individual transporters to the traders. Traders will be able to use the link to navigate to the logistics provider's website and select appropriate services. With these additions, more **than 3,75,000 number of trucks from large logistic providers would be added for logistic purpose. This will help in seamless transportation of agri-produce.** This will promote inter-state trade by providing online transport facilities for distant buyers.

Potential benefits of the schme

- **Increase operational efficiency** and transparency in the mandi operations
- **Enhance market access** and more options for farmers through warehouse based sales
- Larger national market for secondary trading for the local trader in the mandi

Student Notes:

- **Reduction in intermediation costs** for bulk buyers, processors, exporters etc.
- Eliminate information asymmetry
- It will lead to common procedures for issue of licenses, levy of fee and movement of produce. In coming years, it will result into higher returns for farmers, lower transaction costs to buyers and stable prices and availability to consumers
- It will also help in emergence of **value chains by promoting scientific storage** and movement of agricultural goods.
- As on March 16, 2023, 1361 mandis of 23 States and 4 UTs have been integrated with e-NAM platform.

4.7. Seednet

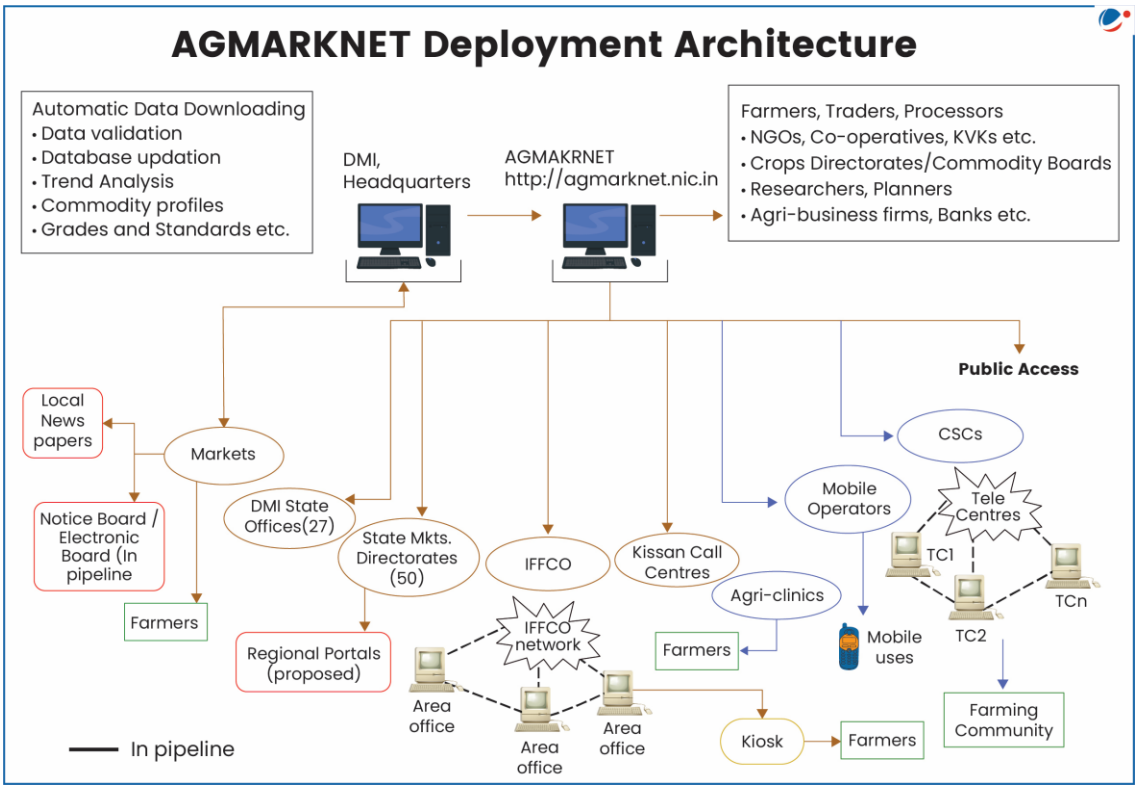
- Seednet India Portal is a National Initiative for information on Quality Seeds by Union Ministry of Agriculture and Farmers Welfare.
- Users can find **information on seed sector in India**, quality control, seed replacement rate, seed multiplication ratio, breeder seeds, foundation seeds, certified seeds, etc.
- Details related to seed varieties, seed bank, seed testing labs, seed dealers, test laboratories, certification agencies, etc. are also available on the portal.

4.8. DACNET

- Department of Agriculture and Cooperation (DAC) Ministry of Agriculture launched a project called DACNET to take the benefit of information technology in services that it provides and improving its governance.
- DACNET has proved very useful in reducing the processing time for certain services provided by the department from more **than one year earlier to less than three months.**
- DACNET's key criteria included ease-of-use, speed of information delivery, low incidence of errors, reduction in corruption, and affordable services.

4.9. AGMARKNET

- AGMARKNET, (Agricultural Marketing Information Network) is a joint venture of the Directorate of Marketing and Inspection (DMI) and the National Informatics Center(NIC).



Student Notes:

- Currently, **it covers** 3245 **market nodes and 300 commodities** and provides information in ten languages. It has increased the efficiency in marketing activities by establishing a nation-wide information network, which provides information on prices, arrivals, availability, trends, analysis, laws etc.
- These **timely information data** are helpful to producers, traders and consumers. It has been connected to 2784 agricultural produce markets and State Agricultural Marketing Boards and Directorates.
- Each **AGMARK portal of wholesale market** provides daily information to AGMARK portals of its respective states, and then each state's AGMARK portal sends the information to the AGMARKNET portal.
- The National Information System maintains all of these portals. The food processing units, traders and different village kiosks, to help the farmers in taking the right decisions mainly use these portals.

4.10. Kisan Call Centres (KCC)

- **"Kisan Call Centres (KCCs)",** launched in 2004, is aimed at answering farmers queries on a telephone call in farmers own dialect. This Scheme provides agriculture related information to the farming community through toll free telephone lines.
- **A countrywide common eleven digit number has been allotted for Kisan Call** Centre. The number is accessible through all mobile phones and landlines of all telecom networks including private service providers. Replies to the farmers' queries are given in **22 local languages.**

4.11. AGRISNET

- Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India is implementing a Central Sector Plan Scheme **"Strengthening/ Promoting Agricultural Informatics & Communications"** of which one of the component is AGRISNET.
- The objective of AGRISNET is to provide improved services to the farming community through use of Information & Communication Technology(ICT).

5. Private Sector Initiatives

5.1. Green SIM

- This programme is implemented by **IFFCO Kisan Sanchar Limited (IKSL).** The features of IKSL services include delivering up to four free voice messages on areas of interest, and have a helpline services managed by experts and organize phone-in programmes and mobile-based quizzes.
- **Farmers' queries are given in 22 local languages.** The messages are delivered daily in regional languages and have content in 16 different categories which includes Agriculture, Horticulture, Animal Husbandry, Floriculture, Poultry, Irrigation, Fertilizers, Insurance, Banking, Rural Health and so on.
- To increase the access of information, **IKSL have an online portal** (voice, text and images) which can be accessed by anyone anytime and even on a mobile app.

5.2. Facebook for Farmers and Extension Workers

- The social media platform such as Facebook is being effectively used in Kerala for reaching out to farmers and extension workers. Based on the success of using Facebook by the

Student Notes:

Vattamkulam Krishi Bhavan (Malappuram District, Kerala), the Government of Kerala has decided to officially include Facebook as an important tool to strengthen the extension activities of the Department of Agriculture.

- The **state agriculture department** has urged all the officials under it to extend the activities of the department through the social media to enhance the productivity and profitability of farming.
- All the farmers registered with the department will have to maintain a social media account to be in touch with the local Krishi Bhavan. The government has mandated that all agricultural officers should have active Facebook accounts.

5.3. E-choupal

- The **e-Choupal initiative of ITC Ltd.** to provide farmers the information they need to be more successful.
- This platform also enables buyers to come to the farmers instead of having to haul the produce to market, where oftentimes traders manipulate the market in order to exploit the farmers out of their proper earnings.
- The **initiative also provides access to storage services** and agricultural equipment in addition to other important assets for rural farmers.
- 'e-Choupal' services today reach out to over 4 million farmers growing a range of crops (soyabean, coffee, wheat, rice, pulses, shrimp etc.) synchronizing the efforts of 35000 villages through 6100 kiosks across 10 states (Madhya Pradesh, Haryana, Uttarakhand, Uttar Pradesh, Rajasthan, Karnataka, Kerala, Maharashtra, Andhra Pradesh and Tamil Nadu) to produce greater quantities of better produce and profit.

5.4. SasyaSree

- **"SasyaSree** – a One Stop Telugu portal for Information Dissemination" was initiated based on the identified need of having locally specific, demand driven knowledge solutions in local language through a web portal.
- The project caters to eight districts in Andhra Pradesh by documenting the best crop management practices, information related to Government schemes, market price and other information needs of the farming community in local language by means of video, audio, photographs etc. The project also tries to integrate with other public extension initiatives and provide information on other allied sectors such as animal husbandry, poultry etc.

5.5. mkrishi

- Tata Consultancy Services (TCS), India's leading IT firm, offers personalized advisory services in voice and visual formats using communication devices such as mobile phones through its **mKRISHI platform**.

5.6. eSagu

- eSagu is an IT-based personalized agro-advisory system developed by IIIT Hyderabad. . It aims to improve farm productivity by delivering high quality personalized (farm-specific) agro-expert advice in a timely manner to each farm at the farmer.

6. Weather based Information through various e-initiatives

- Weather based information on natural calamities like drought etc. is one of the identified services under **NeGP-A** pertains to "**Providing information on Forecasted Weather**" and aims at providing disaggregated District level information in each agro-ecological sub-region on forecasted weather and agro-met advisories through multiple service delivery channels to the farmers (including SMS) .

Student Notes:

- Weather related advisory service to farmers under **Gramin Krishi Mausam Sewa** (GKMS) is being implemented by the Department of Agriculture, Government of Maharashtra and India Meteorological Department (IMD), Ministry of Earth Services (MoES), Govt. of India.
- Development of **need based content** on weather information and advisories to farmers has been initiated by IMD, Department of Agriculture, Government of Maharashtra and GIZ, New Delhi under the project on "**Climate Change Knowledge Network – Indian Agriculture (CCKN-IA)**"
- Mahalanobis National Crop Forecast Centre (MNCFC) regularly (on monthly basis) carries out drought assessment at District/sub-district level using **satellite based remote sensing data, rainfall data and ground information** with respect to sowing progression, irrigation percentage, under the **National Agricultural Drought Assessment and Monitoring System** (NADAMS) programme etc. These assessments are communicated to concerned Departments in States including Maharashtra and are also available online on MNCFC website
- IMD in consultation with SAUs, State Department of Agriculture (including Maharashtra) carries out **monitoring of drought and other calamities** at district level based on the observed rainfall and other parameters like Aridity Index, Standardised Precipitation Index, NDVI etc.
- The Union Ministry of Earth Sciences launched two mobiles apps 'Mausam' and 'Meghdoot' to propagate data from the India Meteorological Department (IMD) for public users and those involved in agriculture to track weather updates and other features. The data being fed to the app comes from the state- and district-based IMD weather stations across the country.

7. Digital India and Agriculture Sector

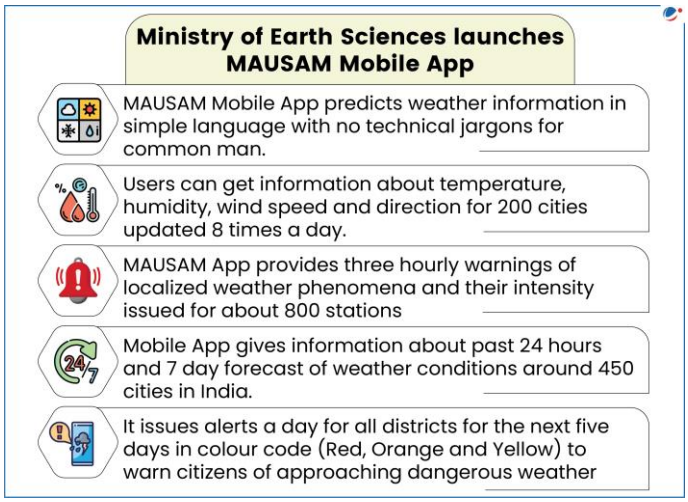
Introduction

- Launched in 2015, the "Digital India" programme envisions empowering citizens with e-access to government services and livelihood related services, among others.
- The project has three core components, viz.
  - digital infrastructure,
  - digital services and
  - digital literacy.
- The mobile phone is the preferred delivery medium with focus on mGovernance and mServices.
- The mAgriculture and mGramBazar, out of the seven components covered under mServices, directly impact agricultural extension and marketing services.

Benefits to the farmers

The programme seeks to

- Transform rural India into a digitally-empowered knowledge economy
- Provide universal phone connectivity and access to broadband in 250,000 villages
- Extend timely services to farmers through information technology and its tools
- Enhance efficiency in agricultural governance through digital literacy and electronic delivery of services.



Student Notes:

8. Challenges in E-agriculture

- **Lack of awareness** and literacy among farmers about the use and benefits of e-agriculture.
- **Lack of digital infrastructure** which includes lack of accessibility and affordability to internet, mobile phones, and other ICT devices.
- **Digital Divide** also poses a challenge in adoption of e-agriculture.
- Even where farmers have access to mobile phones, they are reluctant to talk on phone themselves and may employ a middle man who can distort the communication.

9. Way Forward

Harnessing the full potential of e-agriculture will require the implementation of a complex set of policy, investment, innovation, and capacity-building measures, in concert with beneficiaries and other partners, which will encourage the growth of locally appropriate, affordable, and sustainable ICT infrastructure, tools, applications, and services for the rural economy. Some of the suggestions to accomplish these tasks are following:

Enhancing Rural Access

- Government should introduce and promote the concept of **smart villages** in the policy making as well as administration in order to make villages more techno-savvy and environmental sustainable.
- While investing in communication infrastructure the focus should be on **financially viable and socially acceptable** approaches that are accessible to the rural poor.
- Foster public-private collaborative efforts and cost sharing arrangements to ensure sustainability of rural information centers.
- There is a need to raise awareness and ensure capacity building of rural communities in using and maintaining ICT.
- Also the focus should be on the adoption of information into formats and languages relevant for rural areas. Investment is needed to repackage technical information for farmers and make it available in local languages.
- Existing conventional methods of information sharing (e.g., extension services, radio stations) should be integrated with new communication technologies, which are accessible to farmers.

Education and Sensitization

- Agriculture should be introduced as a subject in school curriculum and computer education should be an important part of Agriculture Education System.
- Development of digital libraries in rural areas can play an immense role in providing adequate learning environment, imparting literacy to rural communities and in transfer of agricultural technologies to farmers
- In India, farmers are reluctant to move away from their traditional methods. They do not want to utilize the system, even if the cost incurred by them is very low. Thus, it is necessary to change the attitude and mindset of the farmers through Behaviour Change Communication (BCC) and make them aware of the benefits of ICT in agriculture.

Market chains

- The growth of communication networks needs to be supported amongst actors in the chain (farmers, transporters, buyers, traders, etc) in order to ensure more equitable, timely and collaborative access to markets for small holders.
- Government should put policies into place that systematically capture local knowledge, ensure appropriate research agenda setting and support the functioning of intermediary organizations.
- Government should aid the process of identification and vertical integration of diverse ICT tools that are employed in present day agricultural practices.

Research and Innovation

- Researchers and extensionists require continued training in how to interact and share knowledge more effectively using the new digital technologies.
- Academic and research data in agriculture, available in the form of journals and research paper needs to be digitalized to facilitate cross flow of information.
- At local and sub-national level, there should be institutional mechanism, mainly multi-stakeholder, to link rural communities with universities, research agencies through intermediary organizations.

10. Previous Years UPSC Mains Questions

1. Q3. There is also a point of view that Agricultural Produce Market Committees (APMCs) set up under the State Acts have not only impeded the development of agriculture but also have been the cause of food inflation in India. Critically examine.(2014)
2. How can the 'Digital India' programme help farmers to improve farm productivity and income? What steps has the Government taken in this regards? **(2015)**
3. How can biotechnology improve the living standards of farmers? **(2019)**
4. How is science interwoven deeply with our lives? What are the striking changes in agriculture triggered off by the science-based technologies? (2020)
5. How and to what extent would micro-irrigation help in solving India's water crisis? (2021) .
6. What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification? (2021)
7. What are the main bottlenecks in upstream and downstream process of marketing of agricultural products in India? (2022)
8. How does e-Technology help farmers in production and marketing of agricultural produce? Explain it. (2023)

11. Previous Years Vision IAS GS Mains Questions

1. Highlight the role that drone technology can play in the agriculture sector. Also, highlight the challenges in this regard.

Approach:

- Introduce with the recent context of drone technology in agriculture.
- Discuss various benefits of using drone technology in the agriculture sector.
- Highlight challenges in adopting this technology in agriculture.
- Conclude accordingly.

Answer:

As agriculture is the chief source of income and employment in India, continuous measures are being taken to upgrade technology in this field. In this context, recently, the Ministry of Agriculture & Farmers' Welfare released the Standard Operating Procedure (**SOP**) for use of **Drones in Pesticide Application for Crop Protection and for spraying Soil and Crop Nutrients.**

Benefits of using drone technology in agriculture

- **Quick decision-making**: Drone surveys back farmers with accurate data processing that encourages them to make quick and mindful decisions without second-guessing, allowing farmers to save the time invested in crop scouting. It also helps them in case of insurance claims through data capturing.
- **Soil and field planning:** Drones can be used for soil and field analysis for irrigation, fertilization and planting activities including checking nutrient levels, moisture concentrations, and erosion among others.

Student Notes:

- **Enhancement in Production**: The farmer can improve production capabilities through comprehensive irrigation planning, adequate monitoring of crop health, increased knowledge about soil health, and adaptation to environmental changes. UAVs fill the gap of human error and inefficiency by traditional farming methods.
- **Greater safety of farmers**: It is safer and more convenient for farmers to use drones to spray pesticides in terrains challenging to reach, infected areas, taller crops, and in areas where high voltage power lines are installed.
- **Less wastage of resources**: Agri-drones enable optimum usage of all resources such as fertilizer, water, seeds, and pesticides.
- **High field capacity and efficiency**: Drones have very less turnaround time and other field operational delays. The drone can spray 50-100 acres per day depending upon the capacity of the drone, which is 30 times more than the traditional knapsack sprayer.

Challenges in adopting drone technology in agriculture

- **Unviable commercial operation**: High initial cost and maintenance issues makes it less viable for most of the farmers as input cost is more than output due to small and scattered landholding. E.g. according to the Agriculture Census (2015-16), around 86% of farmers in India hold land less than 2 hectares.
- **Limited flight time and range of drones**: Drones mostly have a short flight time between 20 min to 60 min, thus limiting the acreage that it can cover for every charge.
- **Knowledge and skill issues**: It needs specialized skills and knowledge from farmers to utilize drone inputs.
- **Concerns over misuse of drones:** Its usage sometimes requires various clearances due to security and other reasons (especially in border areas).
- **Weather dependence with difficulties**: Drones are heavily dependent on good weather conditions. Under rainy or windy weather conditions, it can become useless.

Looking further into the future, drone technology is going to change the agriculture sector. However, it needs mature reforms, capacity building as well as research for optimizing operation protocols.

2. Discuss the significance of technology in the Indian agricultural sector. Also, state the challenges in realising its potential to improve agricultural efficiency and increase the income of the farmers.

Approach:

- Introduce by highlighting the issues faced by Indian agriculture.
- Explain the benefits of technology in Indian agriculture for improving efficiency and farmer income.
- State the challenges in realizing the full potential of technology in Indian agriculture.
- Suggest a way forward and conclude appropriately.

Answer:

Agriculture is the primary source of livelihood for about 58 per cent of India's population. But various reports highlight the issue of low productivity of Indian agriculture in comparison to the developed countries and low income of Indian farmers with many living below the poverty line.

In this context, existing as well as new technologies such as Machine Learning (ML), Internet of Things (IoT), Big Data Analytics (BDA), and Cloud Computing become significant to improve efficiency and income of farmers:

Student Notes:

- **Improved productivity from mechanization of agriculture:** Agricultural mechanization has the potential to directly and indirectly affect yields through reduction in post-harvest losses and increase harvest gains.
- **Climate/ weather prediction through artificial intelligence:** Modern equipment and tools based on AI enable data gathering and assist in precision farming and informed decision-making using vital information on temperature, rainfall, soil, humidity, etc.
- **Resilient crops developed via use of biotechnology:** Genetic engineering helps in increasing crop resistance to pests, and the development of high-yielding varieties which makes improvements to livestock.
- **Agriculture Sensors:** Sensors help farmers in determining soil composition and moisture content, nutrient detection, location for precision, airflow, etc. and thus allow farmers to maximize yields using minimal natural resources.
- **Supply chain management using Big Data:** With the help of data analysis, farmers can receive information about the prevailing market prices of crops, demand and supply situation, and platform to buy and sell their products quickly. This greatly reduces their inventory cost, post-harvest loss, and transportation costs.
- **Livestock monitoring:** Use of chips and body sensors can help prevent disease outbreaks and are crucial in large-scale livestock management. Similarly, ultrasounds can be used to judge the quality of meat.

However, following challenges in realising the potential of technology in agricultural sector need to be addressed:

- **Poor communication of science to farmers:** While agri-tech companies have good expertise of emerging technologies, they often lack the application-level domain expertise required for testing and validation for credibility among farmers and scaled field deployment. Moreover, low literacy levels of farmers makes it more difficult.
- **Subsidies structure:** The existing subsidy regime does not provide incentives and support for adopting agriculture technologies and innovations rather it prevents diversification, promotes excessive reliance on fertilisers and encourages usage of more water and electricity.
- **Small landholdings:** India has more than 650 start-ups that offer agri-tech innovations in partnership with industries and financial institutions, but lack scale due to the very high costs of serving smallholding farmers and building their own distribution system.
- **Issues in adoption**: Poor IT infrastructure, high deployment costs, lack of awareness and trust towards technology coupled with the fear of being replaced by it is increasing the technophobia in farmers.
- **Lack of seamlessness**: Limited expertise, existing gaps in agricultural research, poor data quality and lack of access to data, and a lack of collaboration among different stakeholders affects the integration of different data under one roof.
- **Funding for Agri-Techs:** Agri-techs have seen very good development in the last decade. However, they are still faced with limited funding and yet to be validated business models in Indian agriculture systems.

India has potential economic value of $50-65 billion through digital agriculture by 2025 translating to 23 per cent addition to the current value of agricultural produce. Thus, there is an urgent need to work towards the success of Digital Agriculture.

Student Notes:

3. Bring out the benefits of e-technology for the Indian farmers. Also, highlight the steps taken by the government in this context.

Approach:

- Briefly highlight the importance of e-technology for agriculture.
- Mention the benefits of e-technology for the Indian farmers.
- Discuss the steps taken by the government in this regard.
- Conclude accordingly.

Answer:

Agriculture in India is the core sector for food security, nutritional security, sustainable development and poverty alleviation. It contributes approximately 15% of the GDP in India, with the potential to contribute more. In this context, e-technologies such as artificial intelligence (AI), machine learning (ML), remote sensing, big data, block chain and IoT, are transforming agricultural value chains and modernizing operations.

The **benefits of e-technology for Indian farmers are**:

- **Improved decision-making:** By having the necessary information, farmers make improved decisions concerning their agricultural activities based on various factors. For instance, weather advisories help the farmers to sow the seeds at relevant time to enhance productivity.
- **Better planning:** E-technology helps to continuously monitor the land so that precautions can be taken at an early stage. It increases productivity, reduces manual work, reduces time and makes farming more efficient. For instance, **big data** collected through mobile imaging, satellite imagery, drone patrolling, GPS / RFID is useful in better planning of available resources like water.
- **Community involvement:** There are several programmes which are made possible by IT applications which promote community involvement in agriculture. With the application of IT, there can be better coordination among the local farmers. This will further lead to improved crop productions facilitating better farm income.
- **Agricultural breakthroughs:** E-technology makes the spread of information concerning the latest agricultural breakthroughs more possible. Sharing information regarding new technologies and inventions to help everyone progress is made easier through resources made available and accessible by IT.

The following steps have been taken by the government towards use of e-technology in agriculture:

- **AGMARKNET**: This e-governance portal facilitates generation and transmission of prices, commodity arrival information from agricultural produce markets, and web-based dissemination to producers, consumers, traders, and policymakers transparently and quickly.
- **Kisan Suvidha app:** It is an omnibus smartphone app that helps farmers by providing them relevant information regarding weather, dealers' market prices, plant protection, agro advisories, IPM practices etc.
    - Various other apps have been launched such as **AI-Sowing app** for optimal date of seed sowing, **Crop Insurance app** to calculate insurance premium, **Agri Market app** for information of market price of all crops within a 50-kilometre radius, **Pusa Krishi app** for information about various crops etc.
- **Bhuvan platform**: ISRO's geo platform, Bhuvan provides valuable data on plantation, pest surveillance and weather.
- **Direct benefit transfer (DBT) Central Agri Portal**: It is a unified central portal for agricultural schemes across the country to help farmers adopt modern farm machineries through government subsidies.

Student Notes:

- **e-NAM**: The National Agriculture Market scheme envisages initiation of e-marketing platforms at the national level and supports creation of infrastructure to enable e-marketing in regulated markets across the country.
- **Unified Farmer Service Platform (UFSP)**: It is a combination of Core Infrastructure, Data, Applications and Tools that enables seamless interoperability of various public and private IT systems in the agriculture ecosystem across the country.

Further measures are required to address lack of awareness, establish digital infrastructure in rural areas, overcome digital divide and encourage adoption of e-technologies to ensure increased agricultural productivity and income.

Heartiest Congratulations to all Successful Candidates

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