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Gist of KURUKSHETRA

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Digital India

Realising 'Digital India' through its Different Pillars

Towards **"Sarve Santu Niramaya"**- India's eHealth Revolution

Sturdy Progress in **Rural e-Governance**

E-Learning: Access and Scope of Digital Education

Precision Agriculture and IoT-based Solutions

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RANK 14
Anmol Jain

RANK 16
Gunjan Singh

RANK 19
Shresta Anupam

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RANK 34
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RANK 66
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RANK 69
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RANK 81
Anil Kumar Rathore

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Jivani Kartik Nagjibhai

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Shubhank Mishra

RANK 96
Hardik Aggarwal

RANK 98
Y Megha Swaroop

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Pujya Priyadarshni


Rank 16
Dhodmise Trupti Ankush


Rank 21
Rahul Jain


Rank 24
Anuraj Jain

CSE 2017

5 Ranks in top 50 | **34 Ranks** in top 100 | **236 Ranks** in the final list


Rank 3
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Rank 6
Koya Sree Harsha


Rank 8
Anubhav Singh


Rank 9
Soumya Sharma


Rank 10
Abhishek Surana

CSE 2016

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Rank 5
Abhilash Mishra


Rank 12
Tejaswi Rana


Rank 30
Prabhash Kumar


Rank 32
Avdhesh Meena

CSE 2015

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Rank 24
Khumanthem Diana Devi


Rank 25
Chandra Mohan Garg


Rank 27
Pulkit Garg


Rank 47
Anshul Agarwal

CSE 2014

6 Ranks in top 50 | **12 Ranks** in top 100 | **83 Ranks** in the final list


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Rank 5
Suharsha Bhagat


Rank 16
Ananya Das


Rank 23
Anil Dhameliya


Rank 28
Kushaal Yadav


Rank 39
Vivekanand T.S

CSE 2013

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Team BYJU'S

Kurukshetra – December 2020
Digital India

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'Digital India's is a flagship programme of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy and enable its citizen to access and avail government services electronically and with ease-of-use. The initiative aims in strengthening the IT-infrastructure, enhancing the digitalized-solutions and Internet connectivity.

- To uplift the rural economy, this digitalization drive needs to be expanded equally in rural India with services in e-governance, banking, financial, education, healthcare; and services along with mobile, DTH recharge, e-ticketing, online shopping, etc.
- Further initiatives like e-health, e-education and a wide-ranging variety of citizen services, large-scale skill development programmes are adding great value to the rural economy. And also promotes inclusive rural entrepreneurship and innovation especially for rural youth and women. Digital education and virtual learning by using government-run TV channels have enabled access to the last-learner in remote villages, with realistic and adoptable innovations for enabling e-learning.
- The National Digital Health Mission (NDHM) is also a landmark initiative of the government. Under this scheme, a user's health account is created with details of all diagnostic-tests, diagnosis of diseases/disorders, doctors' consultation, medicines prescribed and progress achieved, etc.

The Indian economy's growth prospects lie in the adoption of digitalization technologies for empowering agriculture, rural sector, agri-food value chain and processed-food industry. The future of the agriculture sector depends on its digital transformation like farmers' making data-driven and profitable decisions during the entire agri-cropping cycle, by using Internet of Things (IoT) based solutions like precise weather forecasts or using sensors for soil, water, fertilizers, pest-disease management, etc.

Read more on Digital India.

Chapter 1: Realising 'Digital India' through its different pillars

The Digital India programme has been recognized to have a transformational effect on India's digital landscapes as well as the economic scenario of the country. Bridging the digital divide in India makes it possible for the country to uplift major sections of the society and leverage the underlying potential to achieve a global leadership status. Digitally connecting the remotest villages of the country through broadband and high-speed internet is one of the crucial infrastructure necessities of the nation.

Digital India Programme

- The Digital India programme is a ‘flagship programme of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy”.
- The vision areas under this programme include ‘Digital Infrastructure as a Core Utility to Every Citizen’, ‘Governance and Service on Demand’ and Digital Empowerment of Citizens’.
- Under this programme, the government aims to provide high-speed Internet connectivity across the country.
- It also aims to establish and leverage the unique identity (Aadhar) as a mode to ensure digital identity, financial inclusion, and easy access to the Common Services Centres (CSCs).
- The Digital India programme aspires to provide seamlessly integrated services across departments or jurisdictions by adopting a single-window framework, promotes the use of Open source and Open API, to ensure interoperability of all e-governance applications and provide access to data and services for promoting the participation of citizens.
- Digital Literacy is a key element necessary to successfully implement the eGovernance initiatives under the Digital India programme.
- The CSCs would be responsible for carrying out standardization of services and capacity building of stakeholders.

Pillars of the Digital India Programme

1. **Broadband Highways**

- The Internet has evolved as one of the basic necessities of modern life.
- This pillar has three components including Broadband for rural, Broadband for urban and National Information Infrastructure.
- 2,00,000 village panchayats are being brought under the ambit of the National Optical Fibre Network under the Broadband for Rural project.
- The National Information Infrastructure aims to integrate India's Network and Cloud Infrastructure to facilitate high-speed connectivity as well as cloud platform for different government entities.

2. **Universal Access to Mobile Connectivity**

- Under this pillar, the Ministry aims to connect over 50,000 villages which do not have mobile coverage, with an aim to bridge the digital divide.

3. **Public Internet Access Programme**

- Aims to establish the infrastructure mechanisms for enabling access to public internet for the common people.

- It has mainly two components including CSCs and transforming Post Offices as multi-service centres.
- Under the Digital India programme, the Ministry under the CSC 2.0 project aims to establish a self-sustaining network of 2.5 lakh CSC centres at the gram panchayat level.

4. **e-Governance - Reforming government through technology:**

- Under this pillar, the government has different focus areas including form simplification and form reduction, online applications and tracking, online repositories and integration of services and platforms.

5. **e-kranti, Electronic delivery of Services**

- Step towards making government services accessible to the common man, through service delivery outlets, to transparency and reliability of services at an affordable price.

6. **Information for All**

- This pillar aims to ensure transparency and availability of reliable data generated by the line ministries for use, muse and redistribution for the people of India.
- The open data platform has been developed by the Ministry for online hosting of information and documents and is facilitating easy access to information for citizens.
- The aim is to pro-actively leverage social media and web-based platforms to inform and interact with citizens.
- The Mygov platform promotes government-citizen interactions.
- All these steps help ensure transparency and accessibility of information to the citizens of India.

7. **Electronics Manufacturing**

- Electronics is deemed as the backbone of technology development for a company.
- Electronics manufacturing in India has not taken off in a big way.
- There have been policy interventions that draw global interest for electronics manufacturing In India.
- The recent policies including Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS), Production Linked Incentive Scheme (PLI) for Large Scale Electronics Manufacturing and the Modified Special Incentive Package Scheme (M - SIPS) have been monumental in strengthening electronics in India.

8. **IT for Jobs**

- The IT/ITeS sector is one of the most promising sectors for the Indian economy.

- This pillar focuses on skill development of the Indian youth in rural and urban areas for making them skilled for the IT/ITeS sector.

9. **Early Harvest Programmes**

- This pillar consists of a group of different short-term projects which have an immediate effect on the Indian digital ecosystem.

Implementation

The Ministry of Electronics and Information Technology has been the nodal agency for several projects. A digital platform named as "myGov" (http://mygov.in/) has been established to facilitate collaborative and participative governance under this programme.

Challenges

The Digital India programme faced several challenges including technical, organizational and economic challenges.

1. **Technical Challenges**

- The integration and alignment of different network, interfaces/platforms across different states have been a major challenge in the implementation of Digital India.
- Challenges include interoperability of solutions, privacy, security and multi-service interaction.
- With increasing digitisation, the digital infrastructure would be exposed to privacy and security threats.
- Digital illiteracy is another major challenge which has prevented the effective utilization of the projects.

2. **Organizational Challenges**

- With several central and state entities in play, ensuring coordination and communication is key.
- The huge population, presence of different languages and the distributed control of subject between the state and the centre are recognized as the major challenges in the implementation of the programme.

3. **Economic Challenges**

- The programme's scale warrants huge budget outlay, which has been a major challenge in the implementation of the programme.

Way Forward

The adoption of the following measures could successfully address the major challenges.

1. **Improving the Regulatory Framework**

- A robust regulatory framework has to be developed by the government.
- Regulatory clarity and transparency is pivotal to establish a robust regulatory ecosystem.

2. **Effective Implementation of Projects**

- There should be a focus on two aspects namely, the skill enhancement of the workforce and the futuristic planning of the projects.

3. **Optimization of Resources**

- An output-outcome based monitoring framework effectively highlights the issues and thus, such a framework must develop for individual projects and the programme.

4. **Bridging the Digital Divide**

- While designing and developing the digital product/service, the government should confirm its compatibility in terms of language.
- In addition, factors such as ease in user experience most also be taken into account.

5. **Driving Inclusive Participation in Projects**

- Inclusive efforts with the participation of industry and academia are crucial to the widespread success of the Digital India Programme.

Chapter 2: Towards "Sarve Santu Niramaya" – India's eHealth Revolution

The National Digital Health Mission (NDHM) was announced recently. The National Digital Health Blueprint was prepared after a holistic survey of the global best practices in the adoption of digital technologies. Under this scheme, Health ID will be given to every Indian, that will contain details of every test, every disease, the doctors visited, the medicines taken and the diagnosis.

eHealth

- What is eHealth? Simplistically put, the use of technology to deliver health sector services, solutions, interventions and services that ride on digital platforms can all be clubbed under this broad term.
- According to World Health Organization (WHO), it is defined as: "...the cost-effective and secure use of information and communication technologies in support of the health and health-related fields including healthcare, health surveillance and health education, knowledge and research.
- "10 e's in eHealth" are efficiency, enhancing quality, evidence-based, empowerment, encouragement, education, enabling, extending of scope, ethics, and equity.

National Digital Health Mission (NDHM)

- The Union Health Ministry has embarked upon a consistent endeavour to explore and widen the mediums of delivery of efficient, accessible and cost-effective, as well as affordable health interventions to the last person in the chain of delivery.
- The information contained in the health IDs of citizens will be very useful as it is portable and easily accessible even if the patient shifts to a new place and visits a new doctor.
- The National Digital Health Mission is a holistic, voluntary healthcare programme which will integrate doctors, hospitals, pharmacies, insurance companies and make a digital health infrastructure.

Other eHealth Initiatives

- National Health Portal (NHP): The National Health Portal provides information to citizens and stakeholders in different languages.
- The e-Hospital@NIC, a Hospital Management System, is a workflow based ICT solution for hospitals specifically meant for hospitals in the Government Sector.
- In order to improve the ease of services for citizens, the Online Registration System (ORS) was launched.
- 'Mere Aspatal' is a Health Ministry initiative to capture patient feedback for the services received at the hospital through user-friendly multiple channels.
    - This platform aims to help the government to take appropriate decisions for enhancing the quality of healthcare delivery across public facilities which will improve the patient's experience.

Mobile Applications

To harness the wide penetration of mobile connectivity ($1 billion connections), various mobile apps have been launched so far.

1. Vaccine Tracker for Indradhanush/Immunisation services

2. India Fights Dengue
3. Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) Mobile App, for reporting pregnancy care

In addition to the above, the Ministry has used digital platforms for efficient service delivery and tracking:

Health Management Information System (HMIS)

- HMIS is a web-based portal for monitoring the programmes under the National Health Mission (NHM) that includes monthly service delivery data reporting from public health facilities to improve program monitoring and management.

Mother and Child Tracking System (MCTS)/ Reproductive Child Health (RCH) Application

- It is an individual-based tracking system to facilitate timely delivery of antenatal and postnatal care services and immunization to children with an object of improving IMR, MMR, & morbidity. It provides appropriate health promotion messages to beneficiaries. Currently, over 12 crore pregnant women and around 11 crore children have been registered on MCTS/RCH portal since inception.

Kilkari

- It delivers free, weekly, time-appropriate 72 audio messages about pregnancy, childbirth and child care delivery to families' mobile phones.

TB Patient Monitoring System “Nikshay"

- This tracks individuals for treatment-adherence.

Tobacco Cessation Programme

- It is a mobile-based interventional initiative for counseling and helping people to quit tobacco.

mDiabetes Programme

- It is a mobile-based initiative for the prevention and care of diabetes.

Hospital Information System (HIS)

- HIS is being implemented in hospitals for automation of hospital processes to achieve better efficiency and service delivery in Public Health facilities up to CHC level.

Drugs and Vaccines Distribution Management System (DVDMS) ('eAushidhi')

e-Rakt Kosh

- eRakt Kosh has been launched which is a comprehensive, efficient and total quality management approach with the help of online systems.

e-Sanjeevani: Transforming the Medical Landscape

- A digital platform for provisioning of health services, eSanjeevani has silently solved three key obstacles:
    - Non-availability of qualified and efficient Doctors/Specialists in rural areas.
    - High burden on healthcare care facilities due to non-availability of sufficient services at primary centres.
    - Lack of Health Record creation at Primary and Secondary level & lack of interoperability of records.
- Empowers patients and doctors by enabling real-time video-audio based teleconsultations followed by generation of ePrescription for each teleconsultation.
- It is poised to be the world's largest telemedicine system, facilitating equitable delivery of healthcare services across our country with its diverse geography and demography.
- eSanjeevani completed 8 lakh consultations as on 20th November 2020.

eVIN (Electronic Vaccine Intelligence Network)

- Innovative technological solution aimed at strengthening immunization supply chain systems in India implemented under National Health Mission (NHM).
- It is real-time information on vaccine stocks and flows, and storage temperatures across all cold chain points in the country.
- It is streamlining the vaccine flow network and making a powerful contribution to strengthening health systems, as well as ensuring equity through easy and timely availability of vaccines to all children.

Chapter 3: Sturdy Progress in Rural e-Governance

Since a large part of India's population lives in villages, it is crucial that our e-Governance model makes sure that it is accessible to the rural masses in the country. E-Governance is the mechanism for providing and managing government services electronically, which also leads to citizen empowerment through easy access to information.

- Information and Communication Technologies (ICTs) have emerged as a vehicle to bring people together and deliver services at the peoples' doorsteps.
- Since the delivery of these services is through electronic means, many pitfalls of yesterday's systems and practical limitations faced by physical infrastructure have been rendered irrelevant by the modern age technology.
- The rural connect brings both opportunities and challenges, for our e-Governance strategies and the overall mechanism.

What is E-Governance?

- E-Governance is the mechanism for providing and managing government services via electronic means and is expected to help in ensuring a SMART (Simple, Moral, Accountable, Responsible and Transparent) government.
- "E-Government refers to the use by government agencies of information technologies, that have the ability to transform relations with citizens, businesses, and other arms of government to serve a variety of different ends: better delivery of government services to the citizens, improved interactions with business and industry, citizen empowerment through access to information or more efficient government management, less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions."

Digital India and e-Governance

One of the nine pillars of Digital India is 'government process re-engineering' which is indicative of the Union Government's resolve to not just use electronic delivery systems but carry out some fundamental changes in the way government services and processes work.

The guiding principles for reforming Government through technology are:

- Form Simplification and Field Reduction
- Online Applications and Tracking
- Online Repositories: should be mandated so that citizens are not required to submit these documents in physical form.
- Integration of Services and Platforms: facilitate integrated and interoperable service delivery to citizens and businesses.
- Information in Electronic Forms: All databases and information should be in electronic form and not manual.

National e-Governance Plan

As an organised, structured and institutionalized approach towards successful implementation of e-Governance in the country, the Union Government had put together the National a-Governance Plan (NeGP).

- In the beginning, there were 27 mission mode projects (MMPs) under this.
- Four new mission mode projects were added to the plan in 2011 in the form of health, education, public distribution system and posts, taking the number of MMPs to 31.
- NeGP takes a holistic view of e-Governance initiatives across the country, integrating them into a collective vision, a shared cause.
- The ultimate objective is to bring public services closer home to citizens, "making all Government services accessible to the common man in this locality, through common service delivery outlets, and ensure efficiency, transparency, and reliability of such services at affordable costs to realize the basic needs of the common man".

Some e-Governance Projects

A large number of e-Governance projects have been launched by Central and State Governments:

- **e-Panchayats:** This is a Mission Mode Project (MMP) in which 2,50,000 Panchayati Raj Institutions were identified to deliver e-Governance services to rural populations. They provide services like various taxes, death and birth certificates, pensions, and approvals for building constructions.
- **Bhoomi:** A Karnataka government initiative, Bhoomi has been instrumental in the digitization of land records.
- **E-Choupal:** This is a private-sector project, launched by ITC Limited, to address various requirements of farmers, including selling their produce directly to the buyers and ruling out the role of middlemen in the process.
- **Gyandoot:** A project launched by the Madhya Pradesh government

Limitations of Rural India

- The biggest limitation is related to infrastructure; especially telecom/broadband infrastructure and power supply related infrastructure.
- Literacy levels vary in urban and rural areas and we still have a long way to go in terms of ensuring ideal literacy rates, especially among the rural population (67.67 percent). Literacy would have a direct link with the ability of masses to leverage e-Governance mechanism.
- IT awareness and IT literacy is another important aspect of the situation as even among those who are literate, a significant number of people find it difficult to deal with digital equipment and the Internet. They access ICTs in a very limited manner.

- The primary language used in e-governance services is English and this is also a hindrance in the rural areas where the knowledge of this language is limited. It will take some time before the government can make available all e-governance services in all the local languages.

Common Service Centres

- Common service centres (CSCs) established in rural areas is a great initiative to address some of these limitations as people can just approach them to get their documents downloaded, fill out government forms or access other government services connectivity.
- The CSC is a strategic cornerstone of the National e-Governance plan (NeGP).
- The CSCs provide high quality and cost-effective video voice and data content and services in the areas of e-Governance, education, health, telemedicine, entertainment, as well as other private services.
- CSC guidelines envisage a wide variety of content and services that could be offered as listed below:
- Agriculture Services
- Education and Training Services
- Health Services
- Rural Banking and Insurance Services
- Entertainment Services
- Utility Services
- Commercial Services

Effectiveness of the ICTs

There are clear advantages of using ICTs for delivery of public services and they have proved their utility over time.

- First of all, the internet virtually rules out the need for administrative infrastructure and local resources. Once communication infrastructure is laid out, it can be used for various objectives including communication, e-education, e-commerce and e-Governance. It saves valuable government resources as well as the time taken in the development of infrastructure.
- Since the internet makes geographical boundaries irrelevant, ICT mechanism helps governments to reach out to the remotest parts of the country which may otherwise be difficult to reach.
- ICTs contribute to making sure government services are available in a transparent and accountable manner.
- E-Governance contributes to eradicating corruption as there is no middleman involved in the process of the delivery and receipt of services. This also helps in reducing red tapes and bureaucratic hurdles, and improving efficiency.
- E-Governance not only makes access to government services convenient and on-demand to a large extent but they also save a valuable financial resource on both sides of the system.

Conclusion

E-Governance services are making impressive advancements in connecting the two important stakeholders of government services at both ends of the system. However, there are many challenges, especially in rural areas, which need to be addressed if we want to tap the full potential of e-Governance and get the desired outcome.

Governments have realised that e-Governance can be a key enabler towards attaining the goal of Simple, Moral, Accountable, Responsible and Transparent (SMART) governance, and is going to remain a priority area for Central and State Governments.

Chapter 4: E-Learning: Access and Scope of Digital Education

Education is a nation-building process and digital education is the progressive education for building a healthy rural India.

- There has been a ceaseless march for accelerating the pace of digital education and remote learning initiatives across India in general and rural India in particular.
- The Government of India has been encouraging and implementing diverse remote learning initiatives through innovative use of digital technology and virtual learning.
- Digital Learning, Virtual Learning, Online Learning, Computer Aided Learning, Learning through ICT, Digital Learning Experience, Digital Learning Resources are the frequently used terminologies that have been used in the field of Indian education and learning.
- There is a use of digital technology as well as Information Communication Technology (ICT) in diverse aspects of modern progressive education.

Digital Education: Concept and Pedagogy

- The COVID-19 pandemic has yielded the effect of fast-tracking digital initiatives, particularly in rural India.
- Further, digital learning is sometimes confused with online learning or e-learning.
- Digital learning is a learning strategy that may include any of or a combination of adaptive learning, blended learning, badging and gamification, online learning, e-learning, ICT integrated learning, computer-aided learning, personalized learning, learning analytics, learning objects, technology-enhanced learning, open educational resources, virtual reality, augmented reality, etc.

Related Terminologies of Digital Education in Rural India

- **Online Learning:** Is learning by accessing available online resources.

- **Web-based Learning:** Web-based learning refers to the process and practice of learning by using web browsers.
- **E-learning:** E-learning is the process of using electronic technologies for teaching-learning processes in which the learning activities take place either entirely or partially online.
- **Blended Learning:** Blended learning generally combines virtual learning with traditional classroom learning.
- Presently, with the development of digital technologies, distance learning is increasingly associated with online learning and the use of virtual classrooms for live online teaching.

Virtual Learning

It is a unique innovative learning experience for people in rural areas that facilitates learning by using computers and/or the internet both outside and inside the facilities of the educational organization.

Salient Features of Virtual Learning

- Remote access to an unlimited array of educational services worldwide
- Individualized learning process
- Use of different learning styles
- Safe and secure learning environment
- Flexible learning in terms of time, location
- Cost-effective and time-effective, etc.

Pedagogy of Rural Digital Education

- Digital education is applied to enhance the learning experience rather than replace traditional methods or pedagogical practices.

Access and Scope

- As per the provisions of the Right of Children to Free and Compulsory Education Act, 2009 (RTE Act) and its subsequent amendments, it is important to ensure equity in education with equal access to quality teaching and learning along with innovative use of resources.

Innovative Digital Education Initiatives

The Kothari Commission is worth mentioning for highlighting the idea that ‘the destiny of India is being built in her classrooms’. And, it is well known and accepted that ‘India lives in her villages’.

All these make us realize the need for joining hands towards the nation-building process by strengthening rural India through the diverse interventions of 'Digital India' including 'Digital Education' and 'Virtual Learning'.

Some major digital education and virtual learning interventions of MHRD/MoE are discussed below:

DIKSHA - Digital Infrastructure for Knowledge Sharing

- Digital Infrastructure for Knowledge Sharing (DIKSHA) was launched in 2017 by the Government of India as a national platform for school education to address the challenge of remote learning, especially in rural areas.
- 'DIKSHA provides access to a large number of curricula linked e-content through several use cases and solutions such as QR coded Energised Textbooks (ETBs), courses for teachers, quizzes and others'.
- NISHTHA, a national teacher training program, targeted for 42 lakh teachers is being rolled out on DIKSHA by NCERT using online courses.

ePathshala

- ePathshala has been a joint initiative of the Ministry of Education, Government of India and the National Council of Educational Research and Training (NCERT), New Delhi for the purpose of 'showcasing and disseminating all educational e-resources including textbooks, audio-video resources, periodicals and a variety of other digital resources.

Swayam Prabha Channels

- This is the access to digital education through TV channels.
- Swayam Prabha DTH Channels support and reach those who do not have access to the internet.
- There are 32 channels earmarked for school education and higher education separately.

NROER - National Repository of Open Educational Resources

- The NROER is a collaborative platform for the sharing of open educational resources.
- NROER hosts a large number of educational resources in many subjects and in different Indian languages for Primary, Secondary and Senior Secondary classes.

ICT Scheme under Samagra Shiksha

- The scheme of Samagra Shiksha has integrated the efforts of Computer Aided Learning (CAL) of Sarva Shiksha Abhiyan (SSA) with the ICT interventions of Rashtriya Madhyamik Shiksha

Abhiyan (RMSA) by enabling innovative digitalization in order to improve access, quality and efficiency in school education.

Shaala Darpan

- Shaala Darpan is an e-Governance platform for all Kendriya Vidyalayas in the country including rural areas.

Shaala Siddhi

- The National Programme on School Standards and Evaluation (NPSSE) is known as Shaala Siddhi, which is a comprehensive instrument for school evaluation leading to school improvement.

E-Granthalaya

- E-Granthalaya is an integrated Library Management Software developed by the National Informatics Centre (NIC), Department of Electronics and Information Technology.

Digital Saksharta Abhiyaan (DISHA)

- The Digital Saksharta Abhiyan or National Digital Literacy Mission (NDLM) Scheme imparts IT training to people including Anganwadi workers, ASHA workers and authorized ration dealers in all the States/UTs across the country.

Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA)

- Aims at empowering the citizens of India particularly rural India by training them to access and accelerate the Digital India initiatives by operating computers or digital devices like smartphones and tablets in order to send/receive emails, SMS, browse the internet, access government services, digital payments, etc.

Role of UNISED

Similar efforts have been made by UNISED INDIA for implementing various digital initiatives particularly in rural India that includes Low Cost and No Cost e-Resources, Solar Energy Operated Smart Classes, Projector Based Learning, Computer Aided Learning, ICT integrated Education, formation and use of Professional Learning Groups, Capacity Building on Early Grade Pedagogy and Virtual Learning and unique interventions under Rashtriya Avishkar Abhiyan (RAA).

Conclusion

India is moving towards becoming a global knowledge superpower in which educational technology, digital initiatives and virtual classrooms play prominent roles especially for the people of rural and remote India.

Chapter 5: Precision Agriculture and IoT-based Solutions

Precision agriculture is an integrated and holistic technology-driven approach to manage the entire gamut of agricultural practices, so that agri-production costs are minimized and productivity/profitability of farmers is significantly increased. Internet of Things (loT) in agriculture is an emerging domain, where the farmers are enabled to make profitable decisions based on real-time data and during the entire cropping cycle of agricultural production.

- India is primarily a rural-based economy, where over 60 percent of the population still relies on agricultural and rural systems as the primary source of income for their livelihoods.
- Making a self-reliant India is possible by adopting an integrated development principle of 'diversity, inclusion and equity' for the rural economy.
- This approach intends to address the issues of poverty, agricultural productivity, arresting the post-harvest losses, value addition by processing and marketing in urban markets, and export of agricultural products, etc.
- The Government of India has an envisioned target of achieving a US$ 5.0 trillion economy by 2024 and US$ 7.0 trillion by 2030 from the existing US$2.6 trillion (FY2020-21).
- These envisioned targets are possible and feasible by adopting disruptive approaches to transform the agricultural and rural systems in an integrated manner.
- One method is the extensive usage of 'Precision Agriculture' (PA) and 'Internet of Thing' (loT) based solutions in a variety of farming systems in India.

The Need for 3rd Tech-Revolution in Agriculture

- The global economy is entering the 3rd modern revolution in agricultural and rural development systems.
- The '1st Agricultural Revolution' was focused on the mechanization of agriculture (1900-1940s).
- The '2nd Agricultural Revolution' was directed towards the Green Revolution in Agriculture (1960-1990s), adoption of improved seeds, evolved-farming systems, agro-management technologies, integrated pest-disease-nutrient management practices, etc.
- The '3rd Agricultural Revolution' (1990s onwards) has to dive deep and with a focus on the adoption of hi-end technology, cloud-based solutions, data-driven decision making in agricultural/farm management systems, usage of analytical tools for post-harvest and marketing of agricultural produce, etc.

- The third wave of agricultural revolution is essential for India, especially given the hard realities that the Indian population is projected to be 1.50 billion (2030) from the current 1.37 billion, where the food production has to be doubled (United Nations Report, 2020).

Precision Agriculture and its Significance

The 'Precision Agriculture' (PA) which is also referred alternatively as 'precision farming', or 'site-specific crop management', or 'prescription farming' is one of the emerging systems in agriculture across the globe, since the 1990s.

- Precision agriculture adopts the general cycle with various components like observation, recording the data analysis/evaluation using IT-tools, making useful data-driven decisions using analytics, targeted management and effective implementation with close monitoring and evaluation, so that the agricultural productivity and profitability can be significantly increased. The PA extensively uses the technology-driven solutions for managing the entire set of 'Agricultural Management Systems (AMS)' for various interventions like:
  - Generating the on-site/on-farm data on a continuous basis, thereby using the technological tools to enhance the yield, quality and profits for the farmers in the agricultural production systems.
  - Data-driven decision making in farm management.
  - Adopting latest technologies like big-data and advanced-analytics capabilities, robotics, aerial imagery, sophisticated local weather forecasts, etc., by the farmers in growing agricultural crops.
  - Adopting the technology-based identification, analysis and managing the soil and nutrient management.
  - Using drones for spraying pesticides, insecticides, etc., so that input costs are optimized. Embracing the sensor technologies for efficient and effective water use management, especially in irrigated farming systems.

Benefits of Adopting Precision Agriculture

- Improved set of agricultural practices and choice of crops based on suitability of lands and climate.
- Optimising input resources like water, fertilisers, plants protection measures against pests/diseases.
- Avoiding or minimising wastage.
- Managing water and soil nutrients for agriculture effectively.
- Eliminating the risk and volatility in crop production systems.
- Increasing farmers' incomes.

The Indian Scenario

- The loT is one of the most promising techniques to achieve precision agriculture, which is expected to increase agricultural yields significantly.
- The Knowledge Acquisition framework focuses on collating information from a variety of sources, then making meaningful data-driven decisions on a real-time basis, to address the challenges in agricultural farms.
- LoT-based technologies can facilitate the transformation of the agri-sector.
- However, the implementation of loT-based solutions in agriculture/precision agriculture is encountering challenges, like huge initial investments in loT-systems for PA and non-tech savvy farmers in India.

Role of Stakeholders in Precision Agriculture

It is pertinent to mention that PA is an evolving technology in the field of agricultural science, especially in India, but it has vast potential for integration, by all the major stakeholders, by ensuring:

- Formulation of precision agriculture policies by the Government of India and State Governments across India.
- Creating awareness among the Indian farming community about the benefits of precision agriculture.
- Demonstrating the multiple benefits of PA, through Central/State Agricultural Universities (CAUs/SAUs).
- Ensuring the availability of adequate and timely agricultural credit for the newer technologies of PA/loT-solutions, from all the financing agencies.
- Adopting and innovating the newer PA-technologies suitable to the Indian context.

Challenges in Adopting Precision Agriculture

The practical challenges for the Indian agricultural system include the following:

- The information technology infrastructure systems and service facilities oriented to the agricultural sector (which are locally accessible, cost-effective and user-friendly) are inadequate.
- Agriculture in India primarily consists of small and marginal landholdings. Most of these small marginal farmers are not fully aware of the benefits of PA.
- Socio-economic factors in villages, where Indian farmers are generally acquainted with their traditional systems of agricultural practices, and are generally reluctant to try something new like PA/tech-driven agriculture.
- The banking and financial institutional systems have preferential bias in financing/funding the industrial/service sector, when compared to lending to the agricultural sector, owing to its uncertainty.

The Way Forward

Although precision agriculture took its birth in the 1990s, India is yet to harness its benefits in its fullest potential. Precision agriculture can be promoted, nurtured and implemented on a large scale by adopting the following measures:

- The strategic policy formulation and effective implementation should be robust, at both central and state government levels, for PA/loT-based solutions for agri-sector.
- The adoption of technology-oriented Agricultural Management Systems (AMS) and data-driven decision making in crop production requires more of a mindset shift and cultural transformation in both the bottom-up approach (adoption process by farming community) and the top-down approach (i.e., in policy formulation, infra-building, financing, marketing of agri-products from all the major stakeholders).
- The large-scale investments for both PA and loT-based solutions should involve policy push from governments, and significant investments from all parties concerned including government, private players, corporates, CSR-funding, Fll-funding, etc.

The policy support, adequate & timely financing and active involvement of major stakeholders in PA/loT-based solutions will certainly enhance the desired benefits that can percolate down to every farmer/last citizen in rural India.

Chapter 6: Farming 2.0: Digitizing Agri Value Chain

Digital technologies hold tremendous potential to transform the Indian agricultural economy and impact the lives of Indian farmers and other stakeholders. Major challenges confronting Indian agriculture include unsustainable usage of resources, declining farm productivity, rapidly growing demand for high quality and safe food, stagnating farm incomes and fragmented landholdings. These can be overcome through the sustainable and scalable deployment of digital technologies and infrastructure.

- The digitalization of agriculture is widely accepted as the next agricultural revolution with the potential to change the way of food production as well as consumption.
- In agriculture, drones, satellites, sensors and robots have the potential to revolutionize farming, even at a small scale.
- Sensors and satellites provide information on soil moisture, temperature, crop growth and livestock feed levels, enabling farmers to achieve better yields by optimizing crop management and reducing the use of fertilizers, pesticides, feed and water.
- Digital agriculture could help farmers to be more precise with inputs through precise weather forecasts or sensors scanning the soil.
- Also, through the use of robotics or autonomous machines, farmers will be able to curb down labour costs which might lead to unemployment in the sector.

Leveraging Social Media in Agri Value Chain

- There is a growing focus on the farm-to-fork movement.
- Social networking through Facebook and Twitter opens a wide range of doors in terms of connecting farmers and retailers with consumers.

Mobile and Internet Penetration in India

- The use of Information and Communication Technology (ICT) to support the transmission of localized information and services working towards making farming socially, economically and environmentally sustainable, while contributing to the delivery of nutritious and economical food for all – this comprises Digital Agriculture.
- This has led to many mobile apps that help existing government schemes, and other agriculture-based information to reach farmers in rural India.

Early initiatives under the e-Governance

- This includes computerization of land records in collaboration with NIC to ensure that landowners get computerized copies of ownership.
- So far, only two states (Karnataka-Bhoomi Project and Odisha) and three Union territories have completed 100 percent computerization of land records.
- Project Gyandoot and Lokvani in Uttar Pradesh, FRIENDS in Kerala, e-Mitra in Rajasthan, e-Seva and Smart Gov in Andhra Pradesh, Khajane in Karnataka, Sustainable Access in Rural India (SARI), are other examples of e-governance.

Past Experiences of Digitalizing Farming

- Farmer's portal of the Department of Agriculture and Cooperation is a platform for farmers to seek any information related to agriculture.
- Kisan call centre services launched by the Ministry of Agriculture sought to harness the potential of ICT in agriculture.
- IFFCO Kisan Sanchar Limited (IKSL), IFFCO iMandi, m-kisan, e-sagu, e-Arik (e-Agriculture), e-Villages, e-AgriKiosk and m4agriNEI of the Central Agricultural University, in Arunachal Pradesh and Meghalaya states of North-east, Community Radio (CR), e-choupal, etc. are other initiatives.

Recent Initiatives in Digitalizing Agriculture

- In order to promote ease of agricultural exports from India, the government launched digital initiatives by Export Inspection Council (EIC).

- The government has launched a mobile application Meghdoot to help farmers by providing forecast relating to temperature, humidity, rainfall, wind speed and direction, and how to take care of the crops and livestock.
- Kisan Suvidha Mobile App and Pusa Krishi Mobile App have been widely downloaded.
- Soil Health Card Scheme was launched in 2015 - the scheme has been introduced to assist State Governments to issue Soil Health Cards to all farmers in the country.
- eNAM portal of Ministry of Agriculture – is an online trading portal of the National Agricultural Market (NAM). Read more on e-NAM.
- Agri Market App is a mobile application that has been developed with an aim to keep farmers abreast with the crop prices and discourage them to carry out distress sale.
- AgroPad is an Al-powered technology helping farmers check soil and water health. AgroPad10, developed by IBM, is a paper device about the size of a business card.
- Companies like AgriDigital are making headway in creating more transparent and efficient supply chains through the use of blockchain technology.
- The Government of India recently launched the 'Swamitva scheme' under which drones will draw a digital map of every property falling within the geographical limits of a village and demarcate the boundaries of every revenue area.
- Ergos have a "Grain Bank model" that is providing doorstep access to end-to-end post-harvest supply chain solutions to small and marginal farmers.
- Digital Green, an organization that trains Indian farmers in sustainable practices is developing a voice-enabled WhatsApp chatbot.
- In 2018, the Karnataka government launched "Plantix", to smartly detect pests, plant diseases, and nutrient deficiencies.

Challenges Faced by Farmers in Adopting Digitalization in Agriculture

- There are no policy and operational guidelines to use digital media and ICTs for the agriculture digitalization.
- The capacity and skill in effectively using digital media and technologies are limited.
- The lack of timely information on farm inputs, unorganized credit, and the absence of market linkages are the major hurdles faced by farmers in adopting new technologies.
- In rural areas, the reach of e-technology is really poor.
- Insufficient connectivity, along with the lack of basic computer and smartphone usage skill and knowledge, high costs for services and less literacy hinder rapid development of digitization in agriculture.

Way Forward

Key challenges in digital farming are poor connectivity in rural areas, less awareness of the varying farm production functions, the small size of individual management zones, barriers to entry for new terms,

lack of scalability and configuration problems, and limited skill and knowledge of digital media and technologies of the agricultural extension professionals.

The key factors that will determine the success of digital farming in India are affordability of technology, ease of access and operations, easy maintenance of systems, timely grievance redressal and appropriate policy support.

- Innovations must focus on lowering the cost of technology so that it is available and affordable for the smaller farmers.
- Digitalization of farming-related reliable and quality data is of paramount importance to harness the potential of digital agriculture initiatives.
- The full potential of ICT, big data, Artificial intelligence, Internet of Things (loTs), Blockchain and Machine learning and precision agriculture will need to be harnessed.
- The private sector can play a crucial role in expanding e-commerce and other platforms into food supply chains.
- More and continuous long term investment is needed in the public sector to scale-up digitally connected and decentralized agricultural knowledge-technology-food processing supply chain.
- There is a need for robust research and development so that digital farming can empower Indian farmers in a meaningful way.

Chapter 7: Public Private Partnerships for Digitalization in Rural India

Digitalization can help rural India in e-governance services, banking and financials, education and healthcare, mobile/DTH recharge, e-ticketing, online shopping, etc.

- Globally, 70 percent of the people have access to mobile phones, 40 percent have internet access and there are major initiatives underway to connect those left behind especially in rural areas.
- The fact remains that the rural economy contributes about 46 percent to the national income, despite recent increases in the country's urban footprints.
- So far, the rural economy had been informal and cash-oriented with most of the rural working population engaged in the "Earn and Pay" segment.
- With the rural economy getting more diversified, the non-agricultural sector contributes to about two-thirds of household incomes.

Government Initiatives

Below are some of the schemes already rolled out by the government:

Kisan Suvidha

- Kisan Suvidha is an omnibus mobile app developed to help farmers get relevant information instantly in the form of details such as weather, market prices, seeds, fertilizers, pesticides, agriculture machinery, dealers, agro advisories, plant protection and IPM practices, extreme weather alerts, market prices of commodity in nearest area and the maximum price in the state, etc.

Farmer Portal

- This Portal is envisaged to make available relevant information and services to the farming community and private sector through the use of information and communication technologies.
- With this, the Indian farmer will not be required to sift through the maze of websites created for specific purposes.

mKisan

- mKisan SMS Portal has been conceptualized to give a quantum leap in coverage of farmers and geographical area in a timely, specific, holistic and need-based knowledge dissemination among the farmers by leveraging the power of mobile telephony.

NREGA

- NREGA soft provides information to citizens in compliance with the Right to Information Act (RTI Act).

Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA)

- PMGDISHA is a scheme to make six crore persons in rural areas, across States/UTs, digitally literate, reaching to around 40 percent of rural households by covering one member from every eligible household by 31st March 2019.

Pradhan Mantri Jan-Dhan Yojana (PMJDY)

- PMJDY is a National Mission on Financial Inclusion encompassing an integrated approach to bring about comprehensive financial inclusion of all the households in the country.
- The plan envisages universal access to banking facilities with at least one basic banking account in every household, financial literacy, access to credit, insurance and pension facility.
- The initiative envisages channeling all government benefits (from Centre/State/Local Body) to the beneficiaries' accounts and pushing the Direct Benefits Transfer (DBT) scheme of the Union Government.

Read more on PMJDY.

BHIM (Bharat Interface for Money)

- Bharat Interface for Money (BHIM) is an app that makes payment transactions simple, easy and quick using Unified Payments Interface (UPI).

e-Panchayat

- e-Panchayat is an e-Governance initiative for the rural sector providing comprehensive software solutions attempting automation of Gram Panchayat functions.

E-NAM

- National Agriculture Market (NAM) is a pan-India electronic trading portal which networks the existing APMC (Agriculture Produce Marketing Committee) mandis to create a unified national market for agricultural commodities.

Pusa Krishi

- With the vision to take technology to the farm fields, Pusa Krishi application was developed that offers information related to new varieties of crops developed by the Indian Council of Agriculture Research (ICAR), resource-conserving cultivation practices as well as farm machinery.

Soil Health Card

- The objectives of the Soil Health Card (SHC) scheme are to issue soil health cards to farmers every two years so as to provide a basis to address nutritional deficiencies in fertilization practices.

GARV Grameen Vidyutikaran Mobile App

- The mobile application provides real-time updated data of ongoing electrification process to all users/stakeholders and provides information about government schemes and electrification data.

Public-Private Partnerships – Lending a Crucial Helping Hand

Private sector initiatives along with the government through the time tested public-private partnership (PPP) model where the government can provide and co-finance the back-end of the value chain, while the private sector and farmer carrying out the rest, can be a gamechanger in this field.

It is at this juncture that the government, regulatory bodies, financial service providers and fintech companies need to collaborate and set the ball rolling. Some basic steps that need to be taken in this direction include:

- To facilitate digitalization of rural incomes, encourage digital payments, improve efficiency, increase the speed of payments, reduce the cost of disbursement, enhance security, lower the incidence of associated crime, and increase transparency.
- To focus on issues related to safeguarding digital payments and digital identities; putting in place consumer protection rules is critical to safeguarding people from fraud, especially rural women and low-income groups, who are most likely to be financially inexperienced.
- Targeted financial literacy and capability training can have a positive impact in such areas by increasing savings and promoting financial skills.
- Fintechs can put new technologies to work in order to shrink distances, expand customer segments, offer customized experiences, and bring in efficiency.

Outlined below are some of the key areas where the PPP model could be of critical use:

- **Providing Cutting Edge Tools**

Through PPP, India's rural and agriculture sector would have the potential to transform itself - raise production levels. Farmers could connect themselves with the marketplaces or financial institutions for micro-funding.

- **Insulating from Vagaries of Nature**

The agriculture sector is constantly threatened by factors like flooding and droughts that could be disastrous for their produce. The Maharashtra government has rolled out its Maharashtra Public-Private Partnership for Integrated Agricultural Development (PPPIAD) project. PPPIAD is a successful PPP enterprise that is developing integrated value chains for selected crops through PPP and co-investment.

- **Helping the Food Processing Industry**

The public-private partnership could help the food processing industry in particular. The government's role besides funding through the partnership can also be to provide tax rationalization, duty exemptions, increase in public spending, priority sector lending and foreign direct investment (FDI). These measures could increase private sector investments in supply chain infrastructure and services.

- **Agri-start ups**

Agritech Startups are providing relevant and innovative solutions to a number of challenges faced all across the agricultural value chain.

Conclusion

The success of a new and efficient India hinges on the inclusion of rural areas into a digital framework and make the benefits of technology accessible to all sections of society. Other areas that would be of critical help would be in healthcare, education, virtual kirana stores and even digital voting.

E-commerce portals with a focused approach to cater to the needs of the rural population are gaining popularity. This rural awakening is also creating fresh opportunities for rural entrepreneurship providing digital services and ensuring its quicker adoption. Digital Society is broader than 'digital economy.' In this decade of broadband, realizing the vital importance of connectivity as a social and economic development tool becomes a critical component of smart society. It is an opportune time for both the industry and the government to work in synergy to bolster India's socio-economic development through digital empowerment. The initiatives of e-health, e-education and a wide variety of citizen services, can be delivered to rural India together with the joint participation of the entire ecosystem.

Chapter 8: Pulsus Scenario in India

A major intervention by the Government to improve the yield of pulses is the National Food Security Mission (NFSM). NFSM was launched in 2007-08 to increase the production of rice, wheat and pulses through area expansion and productivity enhancement; restoring soil fertility and productivity; creating employment opportunities; and enhancing farm level economy. NFSM-Pulses is being implemented in more than 600 districts of the country.

Pulses

- Pulses are a crucial element in the food basket of the predominantly vegetarian population in our country to ensure nutritional security.
- It is the relatively most inexpensive source of proteins and bestows immense positive externalities to the environment enriching soil fertility being a water-efficient crop.
- The annual mismatch between demand and supply may not always be completely bridged by imports (both in the short and long runs).

Production

- Production of pulses reached record levels of 231.3 LMT and 254.2 LMT during 2016-17 and 2017-18, respectively. However, fluctuation in production levels is still witnessed. There are adverse price movements implying not only uncertainty in expected and actual remunerations to the farmer but also widely varying retail prices for the consumer.

- There are marked differences in yield both across time periods for a given State as well as across States for a given time period. There is scope for bridging the gap w.r.t variability in yield which would also enhance absolute production levels.
- A 'Green Revolution' for pulses is needed to regain ground. This is more so given the fact that global yields are about 1.5 times that of India, whereas productivity in Myanmar, China and the US are about 2-3 times more than that of India.

Buffer of stock of pulses

- Procurement of pulses at the MSP is undertaken in the Price Support Scheme (PSS) under the Umbrella Scheme of Pradhan Mantri Annadata Aay Sanrakshan Abhiyan (PM-AASHA).
- The rationale is to provide a guaranteed price and assured market (i.e., procurement by Government agencies) to protect growers from adverse price fluctuations.
- Price Stabilization Fund (PSF) scheme implemented by the Department of Consumer Affairs is largely utilized towards the creation and maintenance of buffer stock of pulses.

Imports of Pulses and Trade Policy

- More than 95 percent imports have been from Least Developed Countries (LDCs) with Myanmar, Mozambique, Malawi, Tanzania and Sudan contributing 93-99 percent of total tur imports.
- Import of Urad is at least 4-5 times that of Moong.

Price variation

- Prices of all pulses witnessed sharp spike during 2015-16/2016-17 due to supply-side shocks.
- Thereafter, bumper production of pulses was recorded in the subsequent year.
- Subsequently, prices of gram have stabilized around Rs 70/kg.
- Prices of Tur have shown a steadily increasing trend.
- However, prices of Urad and Masur have witnessed a considerable increase since November 2019.

Conclusion

As noted, significant price variations in pulses are observed on a year-on-year basis compared to relatively milder alternating movement between harvesting and lean season within a year. Accordingly, the trade policy may also be aligned to suit adequate domestic availability. Key emphasis should be laid down in stabilizing domestic production levels in a sustainable manner with a balance between price and non-price interventions ensuring adequate incentives to the farmer. Scientific storage and its decentralization is the key infrastructure to ensure smooth availability round the year and stability in prices.

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