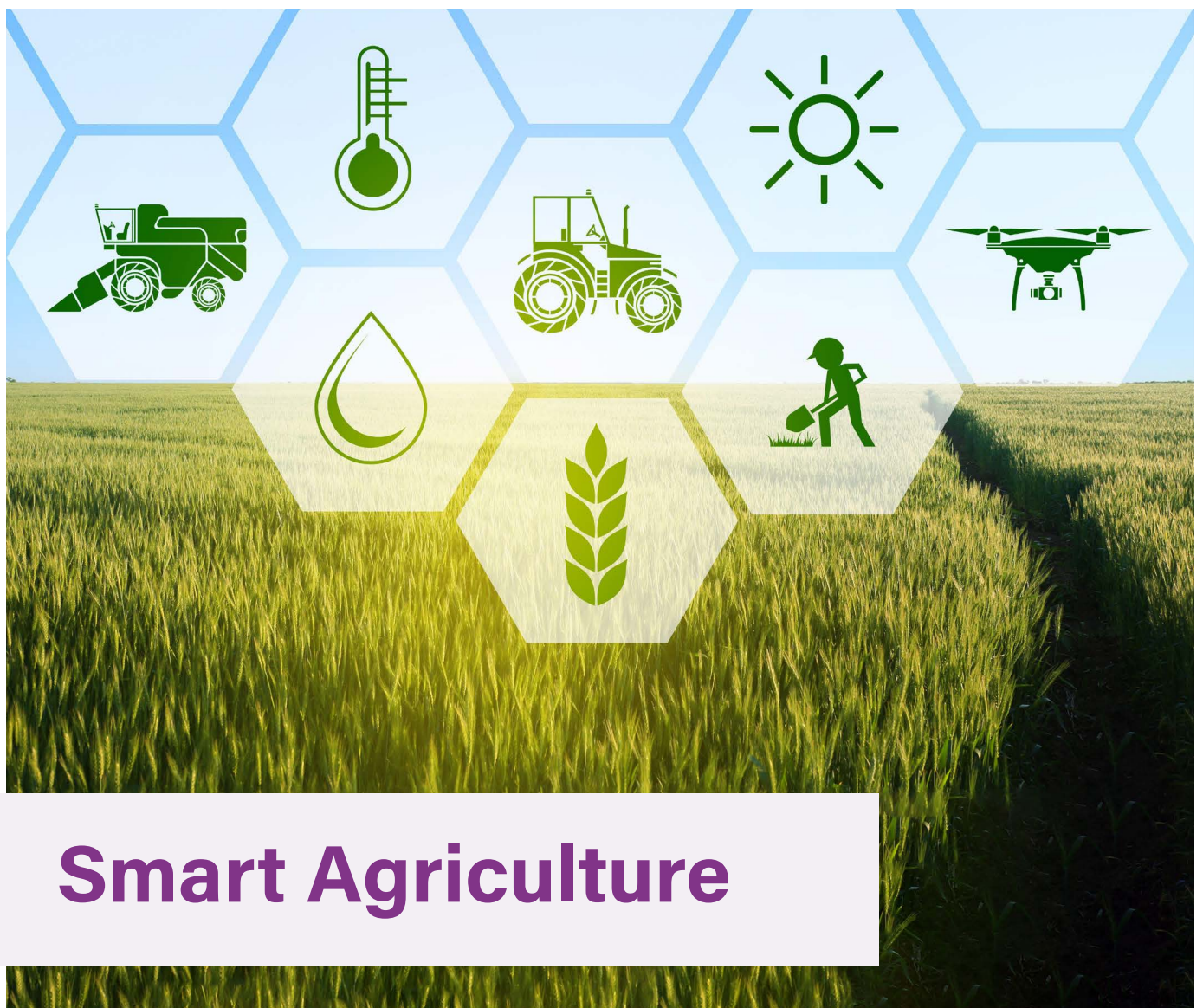


Gist of KURUKSHETRA

January 2022



Smart Agriculture

Agri-Start-ups

e-NAM

Agricultural sector
contributing to
Rural Development

Renewable Energy

Smart Farming

Prioritising the **Climate**
Smart Agriculture

Outstanding performance by BYJU'S students in IAS 2020

Congratulations to our toppers

02

Ranks in
Top 10

18

Ranks in
Top 50

36

Ranks in
Top 100



RANK 02

Jagrati Awasthi



RANK 8

Kartik Jivani



RANK 13

Gaurav Budania



RANK 14

Karishma Nair



RANK 17

Sarthak Agarwal



RANK 25

Vaibhav Rawat



RANK 26

Pulkit Singh



RANK 28

Divya Mishra



RANK 30

Divyanshu
Choudhary



RANK 31

Megha Swaroop



RANK 32

Rallapalli Jagat Sai



RANK 35

Aparna Ramesh



RANK 37

Narwade Vinayak



RANK 38

Varuna Agarwal



RANK 41

Aswathy Jiji



RANK 42

Pooja Gupta



RANK 46

Jubin Mohapatra



RANK 50

Abhishek Shukla

Incredible Results

CSE 2019

4 Ranks
in top 10

13 Ranks
in top 50

22 Ranks
in top 100



Rank 3
Pratibha Verma



Rank 6
Vishakha Yadav



Rank 8
Abhishek Saraf



Rank 10
Sanjita Mohapatra

CSE 2018

11 Ranks
in top 50

28 Ranks
in top 100

183 Ranks
in the final list



Rank 11
Pujya Priyadarshni



Rank 16
Dhodmise Trupti Ankush



Rank 21
Rahul Jain



Rank 24
Anuraj Jain



Rank 31
Mainak Ghosh

CSE 2017

5 Ranks
in top 50

34 Ranks
in top 100

236 Ranks
in the final list



Rank 3
Sachin Gupta



Rank 6
Koya Sree Harsha



Rank 8
Anubhav Singh



Rank 9
Soumya Sharma



Rank 10
Abhishek Surana

CSE 2016

8 Ranks
in top 50

18 Ranks
in top 100

215 Ranks
in the final list



Rank 2
Anmol Sher Singh Bedi



Rank 5
Abhilash Mishra



Rank 12
Tejaswi Rana



Rank 30
Prabhash Kumar



Rank 32
Avdhesh Meena

CSE 2015

5 Ranks
in top 50

14 Ranks
in top 100

162 Ranks
in the final list



Rank 20
Vipin Garg



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
overall selections



Rank 4
Vandana Rao



Rank 5
Suharsha Bhagat



Rank 16
Ananya Das



Rank 23
Anil Dhameliya



Rank 28
Kushaal Yadav



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Team BYJU'S

Gist of Kurukshetra January 2022 Issue: Smart Agriculture

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Chapter 1: Agri-startups and Enterprises

Impact of Agri-startups on Indian Agriculture:

- Agri-startups are providing affordable and innovative solutions to the challenges faced in the value chain.
- These startups are leaving a ripple effect on the socio-economic fabric of India's demography.
- Agriculture in India has been slow in adopting technology. Agri-startups are disrupting this drawback and empowering the farmers digitally.
- Agri-startups have brought in fundamental changes in the way agriculture functions, with novel technologies like Artificial Intelligence (AI), Machine Learning (ML), and Data analytics.
- With the use of mobile applications, farmers are now able to access information and credits more conveniently.

Government Initiatives:

- **National Centre for Management and Agricultural Extension (MANAGE)** –It has been set up in Hyderabad with a focus on accelerating agritech start-ups by providing mentoring, networking, and investor guidelines.
- **Innovation and Agriculture Entrepreneurship Development**– Program by the Department of Agriculture, Cooperation and Farmers' Welfare (DACFW) under the Rashtriya Krishi Vikas Yojana to promote entrepreneurship in agriculture.
- **Initiative for Development of Entrepreneurs in Agriculture (IDEA)**– by the Ministry of Development of North Eastern Region to assist in the establishment of agri-business and make them profitable.

Challenges:

- Small and scattered land holdings of the farmers reduce the scope of use of technology.

- The rate of return on investment is still poor compared to IT-based startups.
- High-cost tech solutions are unaffordable for small and marginal farmers.
- Most of the new technologies are non-localized to current markets.

Recommendations:

- More than 25% of farmers currently have smartphones, there is a need for mobile training programs for farmers and help them adopt new technologies faster.
- Increased and timely support to early-stage startups will further boost the sector.
- There is a need for collaborating large companies with startups.
- Academia should encourage more entrepreneurs to focus on this sector.
- The States should formulate policies on the lines of Karnataka that is home to about 70% of Agri-tech startups.
- Banks and financial institutions must offer creative models of financing that would help both farmers and entrepreneurs.

Chapter 2: e-NAM: Helping Farmers To Earn Better

e-NAM:

- The National Agriculture Market (eNAM) is a pan-India electronic trading system that connects the existing APMC mandis to form a unified national agricultural commodities market.

Objectives:

- To promote uniformity in agriculture marketing by streamlining procedures across the integrated markets.
- To remove information asymmetry between buyers and sellers.
- To promote real time price discovery based on actual demand and supply.
- To integrate APMCs across the country
- To facilitate pan-India trade in agriculture commodities.

Achievements by e-NAM:

For Mandis

- Reduction in book-keeping and reporting system
- Better monitoring and regulation of traders and commission agents
- Transparent system that eliminates scope for manipulation

For Farmers

- Improved and increased options for selling produce
- Access to the national-level market
- It provides higher returns for farmers

For Other parties:

- Access to larger national markets for secondary trading buyers, processors and exporters.
- Reduction in intermediation costs
- Transaction costs are also reduced for the buyers

Other benefits:

- Provides uniformity and streamlining of procedures
- It removes information differences between buyers and sellers
- It provides for transparent auctioning

Challenges faced by e-NAM:

- Governments are having trouble persuading all stakeholders to switch to an online platform.
- There is no evidence that this new approach has benefited farmers in terms of lower commissions to dealers and/or higher profits on their produce.
- The lack of electricity, computers, and internet access, as well as a shortage of people, sorting, and quality testing facilities, continue to be major obstacles for this project.

- Farmers are unable to adopt the e-NAM plan due to a lack of information about it.

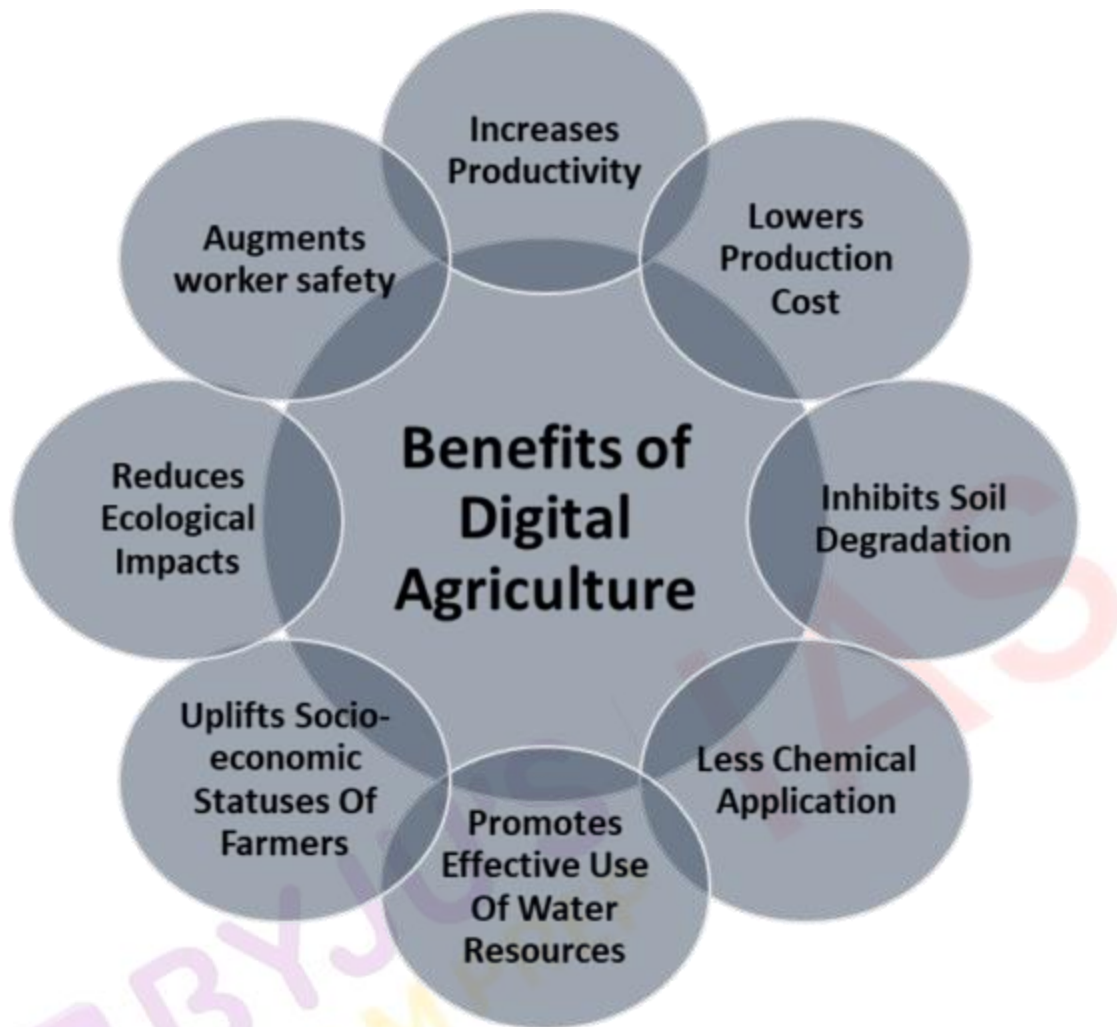
Recommendations:

- The government can ensure the creation of a nationwide network of cost-effective assaying facilities for all commodities in agricultural markets across the country.
- State-of-the-art technology should be included in the e-NAM mechanism to allow for speedy and accurate assaying at a reasonable cost.
- Startups should be able to test the product's quality. They should be paid a set amount.
- Assaying should be required for all e-NAM transactions.
- Private players may be asked to construct additional warehouses on the mandis location.
- Farmers should be able to receive fast payment for their produce if they use electronic payments.
- Inter-mandi trade and movement of produce should be supported by a new entity. The product should be auctioned concurrently in all APMC marketplaces across the country, as well as in the private market, on a single shared electronic platform.
- To accomplish market integration, there should be a regular flow of information on prices and deals completed on e-NAM.

Chapter 3: Agricultural Beacons Digital Transformation

Digital Agriculture:

- The use of digital technologies and data to drive agricultural operations and choices is referred to as digital agriculture. Irrigation optimization, soil condition monitoring, yield estimate, livestock monitoring, and insect identification are all examples of digital agriculture.
- It aids in the efficiency, transparency, productivity, profitability, and social responsibility of the entire agriculture sector.



Current Initiatives under Digital Agriculture in India:

Scheme	Description
Digital Agriculture Mission 2021–2025:	It aims to support and accelerate projects based on new technologies, like AI, block chain, remote sensing and GIS technology and use of drones and robots.
National e-Governance Plan in Agriculture (NeGPA):	NeGPA aims to achieve rapid development in India through use of Information & Communication Technology (ICT) for timely access to agriculture related information for the farmers.
National Agriculture Market (eNAM):	eNAM is a pan-India electronic trading portal that links the existing Agricultural Produce Market Committee (APMC) mandis, to create a unified national market for agricultural commodities.

Direct Benefit Transfer (DBT) Central Agri Portal:	The DBT Agri Portal is a unified central portal for agricultural schemes across the country. The portal helps farmers adopt modern farm machineries through government subsidies
‘AgriStack’	It is a unified platform to provide end-to-end services across the agriculture food value chain to farmers.
Agricultural Digital Infrastructure (ADI):	Cisco developed an Agricultural Digital Infrastructure (ADI) solution in 2019, that enhances farming and knowledge sharing.

Challenges:

- Only large-scale farms can afford digital farm management systems. Despite the fact that small farms suffer the same issues as large farms, they are unable to invest and may be left behind.
- Farmers still have to enter in a lot of information manually because interconnectivity between apps and software isn't always available and information can't always be shared. A major difficulty on the field is also a poor internet connection.

Way Forward:

- **Low cost technology:** There should be increased emphasis on low cost technology to make such technology affordable to small farmers.
- **Portable hardware:** Because most Indian farms are tiny, plug-and-play hardware has a better chance of succeeding in the Indian market.
- **Renting and sharing platforms for agricultural equipment and machinery:** Due to limited financial resources and small farm plots, digital platforms that offer equipment renting and sharing services rather than outright purchases are becoming more popular.

Chapter 4: Agriculture Sector Contributing in Rural Development

Significance of Agriculture in Rural Development:

- Farming and related activities are integral to rural life, contributing significantly to the general health of rural areas in terms of job and business prospects, infrastructure, and environmental quality.
- **Employment:** Farming is the backbone of rural society, and it is the primary source of income in rural areas. The proportion of the rural economy that farming makes up, and hence its relative importance as a sector, impacts its economic contribution to rural development.
- **Related economy.** Every country's farm industry supports a variety of ancillary and service sectors, producing revenue in supply and distribution chains as well as processing industries.
- **Remote and peripheral areas:** Farming is likely to be one of a restricted range of economic activities available to sustain the region's economic viability in remote and peripheral areas.

- **Environmental and cultural services:** Agriculture may help rural development by providing environmental and cultural services to society in rural areas. Agriculture is the most common land use in rural areas around the world, and it is a critical component of rural sustainability.

Challenges:

- Where the farming sector currently provides the majority of employment, maintaining proper levels of farm employment is a major challenge.
- Small and isolated economies, particularly those whose trade is reliant on a small number of agricultural products, may be sensitive to global market conditions.
- Reduced public sector support for agriculture, as well as a reduction in the provision of goods and services to producers, has resulted from a fall in investment in agriculture and rural development throughout much of the last two decades.
- Agricultural protectionism and agricultural subsidies have tended to benefit farmers in developed countries while limiting trade prospects for small farmers in rural areas and smaller countries.
- Climate change is also having an impact on the rural population, putting additional strain on already resource-constrained agricultural systems and a weak natural resource base.

Way Forward:

- If we want to boost overall rural income, we need to focus more on agricultural-related sectors in addition to agriculture. Improvements in industrial and service sector jobs will be crucial in raising rural income.
- Better irrigation systems, technological advancements, diversification toward higher-value-added crops, and increased crop intensity can all help to boost farm output.
- The other major step that can help improve income is better price realization for farmers.
- A mechanism must be in place to prevent agriculture prices from falling below the minimum support prices (MSP).
- Measures to increase the growth and productivity of the livestock sector will have a substantial influence on reducing rural misery.

Chapter 5: Renewable Energy: Transforming the Face of Rural India

Renewable energy scenario in India:

- India stands 4th globally in terms of total installed Renewable Energy capacity. India stands 5th in solar power and 4th in wind power installed capacities.
 - The core drivers for growth and expansion of Renewable Energy in India have been energy security, energy access, increasing power demand and climate change.
- Recently India has crossed the milestone of 100 Gigawatt (GW) installed capacity in renewable energy.
 - India has an estimated RE potential of about 900 GW from commercially exploitable sources.

- India is aiming to achieve 40 percent of installed electric power capacity from non-fossil sources by 2030. India has also enhanced its target to install 450 GW of RE capacity by 2030 to 500 GW under the new climate action commitments announced at the Glasgow COP26.

Renewable energy in Rural India:

Biogas and Biomass:

- Biogas is the first clean and renewable source of energy that was developed specifically for rural areas. Biogas plants are reliable source of clean, low-cost and green (environment friendly) fuel for cooking, lighting and fulfilling small power needs of farmers, cattle owners and individual households.
- Additionally, the digested slurry obtained from the biogas systems is an enriched organic fertiliser with huge potential in Indian agricultural sector.
- Along with the use of animal manure, of late toilet-linked biogas system has been developed that eliminates the task of frequent emptying of faecal sludge from septic tanks or twin pits and dumping in drains or landfill sites. This can hence also help tackle the issue of hygienic disposal of human waste in rural areas which lack adequate and quality sewage systems.
- Notably apart from reducing the electricity needs and associated costs, the biogas systems can also help increase the income of farmers. The farmers can also sell out surplus biogas/electricity to other households in off-grid mode.
- MNRE is running a comprehensive 'New National Biogas and Organic Manure Programme' (NNBOMP) for dissemination and deployment of biogas plants in remote, rural, and semi-urban areas of the country. Under the scheme subsidy and other financial support is provided for construction of biogas plants.
- Biomass is another abundant source of clean power in rural areas which is being promoted by MNRE for large scale adoption. Example- bagasse cogeneration in sugar mills.

Solar Power:

- Solar energy/power is the chief renewable energy source driving transformation in rural areas. Solar energy based decentralised and distributed applications have benefitted millions of people in villages by meeting their cooking, lighting and other energy needs in an environment friendly way.
- The solar projects also have many social and economic benefits like enhanced employment generation and livelihood opportunities at village level. This has ultimately led to improvement in standard of living and creation of opportunities for various economic activities in villages.
- The Ministry of new and Renewable energy runs a comprehensive Off-grid and Decentralised Solar Photovoltaic (PV) Applications Programme for deployment of solar street lights, solar study lamps and solar power packs to meet out the electricity and lighting needs in rural areas.
- Government of India started the 'Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM-KUSUM)' in 2019 with the objective to provide energy and water security to farmers, enhance farmer's income, reduce use of diesel in the farm sector and reduce environmental pollution. The innovative scheme is one of the largest initiatives of the world to provide clean energy to more than 35 lakh farmers by solarising their agriculture pumps.

Small Hydro Power:

- The renewable energy ministry runs a special Small Hydro Power (capacity up to 25 MW) Programme to meet the power requirements of remote and isolated areas in a decentralised manner.

Significance of renewable energy in rural areas:

- Deployment of renewable energy in rural areas has impacted and energised lives of millions of rural dwellers including those living in remote and difficult areas. Renewable Energy can help provide clean energy to various development programmes and it can help improve the quality of life of millions of rural dwellers.
- Amid current COVID-19 crisis, local renewable energy solutions in villages can generate new livelihoods for internal migrants.
- Apart from supporting jobs and entrepreneurship with better power supply, renewable energy has ample potential to address critical issues such as energy poverty, agri-productivity, food security, health and climate variability.
- The renewable energy projects can also help in enhancing participation of women in education, social and livelihood activities.

Chapter 6: Transforming Lives of Rural Youth

Demographic dividend:

- India is home to around a fifth of the world's youth. Half of India's population of more than 1.3 billion belongs to the age of 25.
- India's young population provides a unique demographic advantage. This huge workforce can help aid economic growth of India.

Deen Dayal Upadhyaya Grameen kaushalya Yojana:

- Given the need to have a competent and trained manpower pool, under Skill India Mission, the Government of India is implementing more than 40 programmes through more than 20 Central Ministries and Department for skill development for youths including youth living below poverty line especially in the rural areas.
- The Deen Dayal Upadhyaya Grameen kaushalya Yojana (DDU-GKY) is a placement-linked skill training program being financially supported by the Ministry of Rural Development. The rural development ministry revamped its existing skill development program called Aajeevika scheme as DDU-GKY which emphasised on greater access, coverage and quality.
- DDU – GKY aims to build the placement-linked skills of the poor rural youth and place them in wage employment across various sectors of the economy. The programme has an outcome led design with guaranteed placements for at least 70 percent of the trained candidates.
- Key features of DDU-GKY include ensuring market-led, placement-linked training programmes for rural youth undertaken in a Private Public Partnership mode, mandatory assured placement to 70 percent of the trained candidates and special focus on those rural youth who come from poor families in the age group of 15 to 35 years. The program ensures social inclusion of candidates through mandatory coverage of socially disadvantaged groups.

- The mission of DDU-GKY is to reduce poverty by enabling poor households to access remunerative and sustainable employment that provides regular salary. The aim is to diversify the income of poor rural families and cater to the professional aspirations of rural youth.
- DDU-GKY follows a three-tier implementation architecture in PPP mode, with the national unit responsible for policy, funding and technical support, State Rural Livelihood Missions or State Skills Missions responsible for funding of state share, Implementation and monitoring controls, and Project Implementing Agencies (PIAs), mostly private training partners, responsible for mobilisation, training and placements.
- Under the DDU-GKY, two special programs are also being implemented. Roshni program is being implemented in 27 left wing extremist affected areas of nine States. Himayat programme is being implemented for all the youth of the UTs of Jammu & Kashmir and Ladakh.

Significance:

- The government's thrust on providing skills training to poor rural youth through Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) has boosted rural income as more than seven lakh youth have gained employment in various sectors of the Indian economy. The increased household earnings have resulted in an increase in spending levels and ultimately to increase their standard of living.
- Skill development can be an important driver to develop gainful employment opportunities for the rural youth. It will help reduce poverty by improving employability, productivity and help to achieve sustainable enterprise development and inclusive growth.

Chapter 7: Smart Farming: Towards Sustainable Agriculture

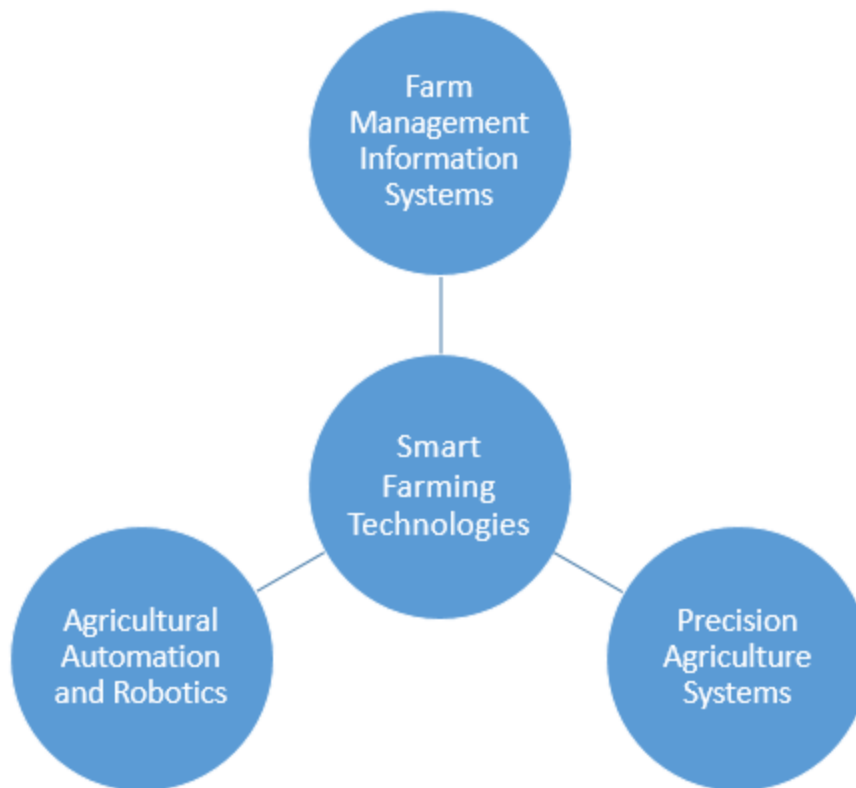
Challenges in agricultural sector:

- Dwindling natural resources, increasing population pressure and food demand in the 21st century agriculture generate multiple challenges for the agricultural sector.
- The climate change phenomenon and the abrupt weather fluctuations around the world have put huge pressure on agricultural food products for quality and sustainable food production.
- Challenges like soil degradation through salinity, nutrient deficiencies, low soil organic carbon content, lower ground water table, etc. add to the woes of agricultural sector.

Smart farming:

- 'Smart Farming' is an emerging concept that refers to managing farms using modern information and communication technologies like IoT, geo-positioning systems, big data, robotics, drones and AI to increase the quantity and quality of products while optimising the human labour required by production.
- Smart farming involves performing of agricultural operations smartly with more precision and it mainly relies on the use of artificial intelligence (AI) and Internet of Things (IoT) in cyber-physical farm management.

Smart Farming technologies:



- Farm Management Information Systems represent mainly software systems for collecting, processing, storing, and disseminating data. It is aimed at optimising input use based on recording technologies to observe and measure inter-and intra-field spatial and temporal variability in crops, aiming to improve economic returns and reduce environmental impact. It could also involve using remote sensing technologies for data gathering with either satellite platforms for space imagery or aircrafts/UAVs for aerial applications, along with combined use of sensors for, ground data acquisition, wireless networks for interconnecting them, and decision support systems (DSSs) for optimised farming decision-making.
- Agricultural automation and robotics involve applying automatic control, artificial Intelligence techniques, and robotic platforms at all levels of agricultural production. Increasing automation has been observed in agricultural activities like weed control, harvesting, etc in recent years.

Pillars of Smart Farming:

- The main pillars of smart farming include IoT, internet connection, and smart sensors.

Sensors:

- A sensor is a device that produces an output signal for the purpose of sensing of a physical phenomenon. The major applications of sensors in monitoring and decision support system of smart farming include soil health monitoring, smart irrigation systems, disease identification systems and smart animal husbandry.

Internet connection:

- The 5G network provides a very high speed internet to transform data in low time.

Application of Smart Farming in Indian Context:

- Use of drones for the purpose of spraying pesticides and fertilizers on agricultural crops. Usage of drones in irrigation, monitoring crop health, planting, crop inspection, and soil analysis. It can be used to monitor crop conditions and diseases, plant health indicators, vegetable density, plant count, plant height measurement etc.
- Agricultural robots are being used to perform many agricultural practices. Now robots are being used in agricultural operations such as harvesting and weeding.
- Smart Decision Support Systems (SDSS) in the agriculture sector are helping farming in making proper decision in irrigation management and fertilisation process.
- Yuktix Technologies – an agritech start-up based in Bangalore is providing handy digital tools for agriculture farm monitoring and risk management. These small digital tools help farmers to make decisions and implement best practices that increase yield and reduce losses.
- There has been the increased use of automatic watering and irrigation systems in India.

Benefits of Smart Farming:

- Increasing the amount of real-time data on the crop. This can help in accurate and timely decision-making.
- Accurate evaluation of soil and crops
- Remote monitoring and controlling of farms
- Management and monitoring of pests and diseases in different crops
- Controlling water and other natural resources usage in production process. This can help ensure greater resource use efficiency.
- Improving livestock management
- Improving agricultural production
- Eco-friendly farming by avoiding the misuse of fertilisers and pesticides.

Challenges:

- The main challenge in increased adoption of smart farming in India is the small landholdings and fragmented farms in India. The small land holdings makes it economically unviable for such farmers to adopt smart farming techniques wherein the upfront adoption costs continue to remain high.
- The limited knowledge and skills of the farmers acts as another impediment in the adoption of smart farming in Indian farms.
- The lack of quality and affordable internet connectivity is another major challenge. Most villages and farming communities do not have access to Internet all the time. This makes the adaption of smart farming difficult.
- Global Positioning System signal transmission is difficult in heterogeneous topography like hilly, forests and field with a dense tree planting.

- Data collection and processing centres and many IoT based sensors need uninterrupted and continuous energy for a successful application running out of energy resources. The lack of affordable and quality energy source can thus act as a major hindrance for large scale adaptation of smart farms in near future.

Recommendations:

- There is the need to understand the challenges associated with smart farming in India. There is the need to design smart tools and techniques which can be customised according to typical Indian small and marginal farmers.
- The key factors to succeed in smart farming in India are affordability of technology, ease of access and operations, easy maintenance of systems and appropriate policy support.
- Robust research and development in the field of smart farming is needed so that smart farming can empower Indian farmers to sustain their farm productivity and livelihood.
- There is the need for focus on low cost technology, simple and easily portable tools, and custom hiring system module and credit facility to help mainstream smart farming adoption in India.

Chapter 8: Prioritising Climate Smart Agriculture

Challenges posed by climate change to Indian agriculture:

- Climate change has emerged as a matter of concern to Indian agricultural sector.
 - Overall, the countrywide decline in major crop yields due to climate change effects between 2010 and 2039 could be as high as 9 percent. This will only worsen further with time. The estimated impacts of both historical and future climate change on cereal crop yields in different regions indicate that such yield loss can be up to 35 percent for rice, 20 percent for wheat, 50 percent for sorghum, 13 percent for barley, and 60 percent for maize depending on the location, future climate scenarios and projected year.
 - Higher temperature eventually reduces yields of many crops while also encouraging weed and pest proliferation. The higher temperature could lead to higher incidence of plant diseases.
 - Also the large variations in rainfall due to climate change effects can also have an adverse impact on the major food crops.
- This will have serious implications of food insecurity, loss of employment opportunities of those dependent on agricultural sector. This could further fuel rural to urban migration.
 - Around 54.6 percent of India's total workforce is engaged in agriculture and allied activities.
- At the same time, agriculture is also a major contributor to the climate problem. Agriculture is a fuel and water intensive business and generates 19-29 percent of total global greenhouse gas emissions.
- The impact of climate change will be all the more severe on small farmers due to the following reasons.
 - Most small farmers are dependent on rainfall for their irrigational needs. Hence they are vulnerable to weather patterns and volatile yields.

- The small farmers hold small land holdings. The average size of landholdings have come down to 1.08 hectares, with two-thirds of all holdings being below 1 hectare. Such fragmentation prevents economies of scale and holdings below and around 1 hectare (i.e. marginal holdings) tend to be insufficient to provide for a family's consumption needs. Marginal holdings are particularly vulnerable to the effects of climate change.
- Small farmers tend to have very little technical know-how. The incorrect use of fertilizers and pesticides in such farms is a major concern. The problems of salinization, desertification, and degradation are direct consequences of poor agricultural practices adversely impacting productivity of arable land.

Climate Smart Agriculture:

- Climate-smart agriculture (CSA) is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices.

Three Pillars of CSA:

Productivity:

- CSA aims to sustainably raise agricultural productivity and incomes from agricultural and allied activities while balancing concerns relating to the environment. It aims to promote food and nutrition security.
- A key concept related to raising productivity is sustainable intensification, described as “an approach using innovations to increase productivity on existing agricultural land with positive environmental and social impacts.

Adaptation:

- CSA aims to reduce the exposure of farmers to short-term risks, while also strengthening their resilience by building their capacity to adapt and prosper in the face of shocks and longer-term stresses.

Mitigation:

- The minimisation of emissions and the maximisation of carbon capture is a core concern of CSA. The prevention of deforestation, adoption of sustainable practices, and the management of soils and trees in ways that maximises their potential to act as carbon sinks and absorb carbon from the atmosphere is a part of the mitigation strategy.

Characteristics of CSA:

- CSA attempts to address climate change's causes and effects: CSA systematically integrates climate change into the planning and development of sustainable agricultural systems.
- CSA integrates multiple goals and manages multiple trade-offs: CSA's three primary pillars are interrelated concerns- increased productivity, enhanced resilience and reduced emissions.
- CSA aims at maintaining ecosystem services: Ecosystems provide the agricultural sector with a number of 'unpaid' services-clean natural water, materials, food, sunlight, etc. CSA attempts to ensure the sustainability of these services, preventing their degradation.

- CSA has multiple intervention points at different levels: Insurance schemes, value chains and the strengthening of institutional and political enabling environments. It also involves multiple interventions at the food system, landscape, value chain or policy level.
- CSA involves the marginalised: The vulnerable and marginalised sections like women often remain the most vulnerable to climate events like drought and floods. CSA involves building the adaptive capacity of these vulnerable stakeholders.

Key Government Initiatives on CSA:

National Innovations on Climate Resilient Agriculture:

- Indian Council of Agricultural Research (ICAR) launched a flagship project 'National Innovations in Climate Resilient Agriculture' (NICRA) in 2011.
- The project aims at strategic research on adaptation and mitigation, demonstration of technologies on farmers' fields and creating awareness among farmers and other stakeholders to minimise the climatic change impacts on agriculture.

National Mission for Sustainable Agriculture:

- National Mission for Sustainable Agriculture derives its mandate from Sustainable Agriculture Mission which is one of the eight Missions outlined under National Action Plan on Climate Change (NAPCC).
- The NMSA aims at promoting sustainable agriculture through a series of adaptation measures focusing on ten key dimensions encompassing Indian agriculture namely; 'Improved Crop Seeds, Livestock and Fish Cultures', 'Water Use Efficiency', 'Pest Management', 'Improved Farm Practices', 'Nutrient Management', 'Agricultural insurance', 'Credit Support', 'Markets', 'Access to Information' and 'Livelihood Diversification'.

National Adaption Fund for Climate Change:

- The overall aim of NAFCC is to support concrete adaptation activities which mitigate the adverse effects of climate change. National Bank for Agriculture and Rural Development (NABARD) is the National Implementing Entity for NAFCC.

Pradhan Mantri Krishi Sinchayee Yojana:

- Pradhan Mantri Krishi Sinchayee Yojana has been formulated with the vision of extending the coverage of irrigation with the motto as 'Har Khet ko pani' and improving water use efficiency ensuring 'More crop per drop'.

Zero Budget Natural Farming and Organic Agriculture:

- Zero Budget Natural Farming offers a commercially viable and environmentally friendly alternative to the chemical intense farming methods.

Recommendations:

- **CSA linked credit:** The provision of agricultural finance to farmers willing to adopt, or those having adopted CSA techniques will be a key catalyst in accelerating the process of adoption. Specific concessions and offers in this regard can set up positive incentives for farmers.

- **Extension Services:** The proper adoption of CSA requires consistent, comprehensive, and grassroots extension services for the farmers.
- **Innovation:** Indian agri-startups have been providing affordable, scalable solutions in the field of soil testing, disaster early warning, and farm management, etc. Holding contests with possible procurement tenders for such products by the government can incentivise scientific innovation in the field.



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