Kurukshetra Summary May 2018

SPACE TECHNOLOGY FOR RURAL DEVELOPMENT

- Recognizing the key needs for rural employment sector, space technology application in the form of Web GIS was initiated in addressing decentralised planning through Space based Information Support for Decentralized Planning (SIS-DP) programme and rendering it through BhuvanPanchayat.
- This has been followed by successful initiatives of Watershed monitoring, geo-tagging of completed assets created under MGNREGA as well as geotagging the agricultural infrastructure created under Rastriya Krishi Vikas Yojana.
- Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) aims to achieve high degree of effective water availability and use for Indian farms especially in water scarce regions. Integrated Watershed Management Programme (IWMP), Mission Water Conservation (MGNREGA), Har Khet Ko Pani (water for Every Farm) and Per Drop More Crop are four major pillars of PMKSY which in turn, are linked by principle of water to be delivered preferably for dry land farming. All four programmes are being monitored by ISRO using integrated web GIS based solutions including smart phone apps.

Monitoring Impact of Watershed Management Programmes:

- IWMP aims to bring in ecological stability through conservative utilization of soil and water resources for all IWMP identified watershed projects. Implementation of IWMP ensures that more micro level water sources are created as well as ground water is replenished by controlling run off.
- A Web based GIS application (Srishti) enabling the monitoring and evaluation of IWMP watersheds was developed using satellite remote sensing and sample field data. A mobile smart phone application (Drishti) has been developed for field data collection.
- GIS portal is rendering the most transparent monitoring of development activity including access to citizens.

GeoMGNREGA: Geospatial Applications for cataloguing, monitoring and planning Rural Employment Generation Activities

- Geo-MGNERA, developed by National Remote Sensing Centre (NRSC), is a geo-information enabled web service/portal that assists the planning and management of activities of MGNREGA ranging from support functions to the delivery of work to the end-users.
- Thus, Bhuvan facilitates an inclusive geographic information storage, retrieval, analysis and reporting for completed assets, with a height resolution Indian Remote Sensing Satellite in the backdrop for rural development planning.
- MGNREGA is monitored through Bhuvan Geoportal involving geotagging of completed assets through smart phone application across the country.

VAJIRAM & RAVI

Geospatial Technology for Rashtriya Krishi Vikas Yojana (RKVY):

- A Bhuvan portal has been developed for mapping Assets under RKVY. A smart phone based mobile app was developed by NRCS/ISRO for capturing the assets spread across country.
- As of now, more than 62000 assets have been geotagged, of which about 12000 have been accepted after verification.

Prime Minister Gram Sadak Yojana (PMGSY):

- High resolution satellite data will provide reliable information on the status of rural roads reliable information on the status of rural roads as on the date of satellite imagery.

Development of Waste Lands:

- Department of Land Resources under the Ministry of Rural Development (MoRD), requested NRSC/ISRO, to generate spatial information on wastelands, using remote sensing techniques, with respect to their distribution, extent, nature, degree of degradation and temporal behavior to facilitate the planning and implementation of development strategies for reclamation of wasteland. NRSC had prepared wastelands map and atlases since 1986 and monitored them from 2005-06 onwards.
- To understand the spatial and temporal changes in wastelands, a project on National Wasteland Monitoring was initiated in 2006 with the objective of assessing the status of wastelands and to monitor its changes.
- National Wastelands Change Analysis is unique in the entire wastelands mapping since it facilitates objective comparison of wastelands between 2005-06 and 2008-09. An area of 46.70 m ha (14.75%) have been recorded as wastelands.

Space based Information Support for Decentralized Planning (SIS-DP):

- Reliable information on land & water resources and their optimal management is vital for developmental planning at grass root level. Space based Information is being utilized for support decentralized planning by empowering the local bodies (Panchayats) to prepare developmental plans.
- A geo-portal “BhuvanPanchayat” has also been deployed for visualization, asset mapping, activity planning and monitoring of the schemes at Panchayat level. Under this initiative, it is planned to carryout mapping of assets in about 2.5 lakh panchayats in the country. BhuvanPanchayat Geoportal will be further augmented to enable preparation of locale specific action plans for development planning.

Space Application in Agriculture and Water Resources Sectors:

NRSC developed following Geo-Spatial solutions in Agriculture and Water Resources sectors, which contribute to the development of Rural areas in terms of food production, farmer’s income, water availability for localized irrigation and aqua culture:

- Crop Insurance Decision Support System (CIDSS) – A Web-enabled Integrated package for implementing Pradhan Mantri Fasal Bima Yojana (PMFBY);

- Crop Intersification-Bringing Green Revolution to Eastern India – Satellite-based mapping of post-kharif rice fallows (National Food Security Mission);
- Mapping & Evaluation of High Value Crops;
- Agricultural Drought Vulnerability;
- Mapping Horticulture Crops;
- Fibre Crop Information System;
- Water Body Information System.

Benefits of Geo-Spatial Solutions

- Enhanced ease of governance with improved monitoring and evaluation for integrated development activity.
- Geo-Spatial solution is transparent and efficient compared traditional approach with manual surveys in the field.
- Linking management information system to geo-spatial visualization.
- Comprehensive planning and development at local level as it provides an opportunity to spatially analyze the impact of having assets by combining the data from multiple projects.
- It also aids in qualifying the need for having an asset at a particular location and knowing if there is any damage caused to the assets due to human or natural causes.

Bhuvan Geo-Portal:

- Bhuvan, an Indian Geo-platform of ISRO, provides a host of services covering satellite data visualization, free data download, thematic map display, download and analysis, timely information on disaster and project specific GIS applications since August 2009.

Conclusion:

- Governance of rural areas especially for improving potential has received a welcome boost through initiatives which have enabled geo-tagging of all created assets, bringing in unprecedented level of transparency and verification by functionaries and citizens alike.

TECHNOLOGY INTERVENTIONS IN RURAL AREAS

- "Access to technology" is a major differentiator between the urban and rural areas and is often considered as a solution to the development issues faced by the underdeveloped communities.
- Considering the present situation in rural areas, the technical interventions need to mainly aim at drudgery reduction, efficiency improvement and overall sustainability.

Initiatives by RuTAG IIT Bombay:

- RuTAG was established as a mechanism to enhance rural development through science and technology (S&T) interventions by engaging the expertise available in the IITs. There are RuTAGs set up in 7 IITs (Madras, Kharagpur, Delhi, Roorkee, Guwahati, Kanpur and Bombay) and RuTAG IIT Bombay was established in 2010.
- So far, RuTAG IIT Bombay has initiated 20 projects in rural development. Some technologies such as 'Floating fish cages for aquaculture' have been successful and appreciated by the Government.
- RuTAG projects are 'demand driven', i.e. the problem has to come from the end users. This also helped in getting better engagement from the stakeholders, ensuring success of the intervention.
- While designing the prototype, care is taken to incorporate the following features;
    - Easy to assemble
    - Low cost
    - Engagement of Local Fabricators
    - Use of locally available material

Examples of RuTAG Interventions:

1. Floating Fish Cage Structure for inland Fisheries
2. Old Sari Cutting Machine for Handlooms Operated by Visually Challenged Individuals
3. Cow Lift for a "Downer cow"
4. Hybrid Solar Food Dryer
5. Design of Protective Suit for Wild Honey Bee Harvesters

NEW TECHNOLOGIES IN IRRIGATION SECTOR

- With a net irrigated area of 68.1 Mha (2013-14) by canals, tubewells and wells and other sources; and a gross irrigated area of 95.77 Mha, India has the largest irrigated area in the world. Still only about 49 per cent of the gross cropped area is under some degree of assured irrigation and rest of the 51 percent cropped area is dependent upon the seasonal rainfall.
- Largest share of irrigated area is concentrated in the north-west India (Punjab, Haryana and Western Uttar Pradesh) and presently, Punjab is the only one state in India which has almost 100 per cent irrigated agriculture.
- Both surface and groundwater irrigation in India is under great stress and needs a paradigm shift in the technical designs; efficient conveyance, distribution and application systems; innovative operation & maintenance and pricing, sustainability and water quality; inclusive and balanced regional development through policy changes in energisation and resource development and use of modern technology and ICT to reach the millions of irrigators so as to achieve the laudable objectives of "*Har Khet Ko Pani- Irrigation to Every Farm" and "More Crop per Drop – Higher productivity and value from each unit of water"*.

New Initiatives in the Irrigation Sector:

Comprehensive Matrix Approach for New Initiatives in the irrigation sector in India:

i. Improving Conveyance Efficiency of Surface Irrigation:

The states and the centre can take steps/interventions to cover larger areas with the already created irrigation potential. This is possible through improved distribution and conveyance pipes, underground, distribution systems, affordable and reliable energy to lift water from shallow depths and innovative and differentiated energy policies.

Setting up piped water facilities to connect dams/canals and micro-irrigation system can reduce water loss and increase the overall water uses efficiency up to 90 percent. At present, considering the conveyance loss of surface irrigation, only about 40 percent of irrigation water actually reached the farmer's field from the source dam.

ii. Micro-Irrigation for Improving Application Efficiency of Irrigation:

Micro-irrigation (drips, sprinklers, micro-sprinklers, tapes guns) is a suitable option to enhance the coverage under irrigation, improve land and water productivity and quality of the produce. In case

of commonly practiced flood irrigation method, the rate of water application loss is around 35 percent, while in micro irrigation techniques, the application loss is only 10-15 per cent.

Instead of promoting micro irrigation as just a water saving technique, it should be popularized among the farmers as an yield enhancing and input cost saving method, considering the incremental yield and electricity and fertilizer saving associated with the techniques.

iii. Solar Irrigation:

Solar irrigation system needs to be further promoted to ensure assured and timely irrigation water availability in electricity deprived interior villages particularly in the eastern region.

Assured grid connection must also be provided to the farmers to encourage them to divert the excess solar power generated in fields to the state grids, thereby ensuring the judicious use of solar power for groundwater extraction. Successful models such as *Solar Power as Second Remunerative Crop* (SPaRC) at Dhundi are working and can be scaled by by NABARD and other agencies.

iv. Underground Taming of Floods for Irrigation (UTFI):

Innovative and economically viable techniques have now been developed to utilize the excess flood water for ground recharge through construction of a battery of vertical shafts in the unused village ponds.

v. Laser Land Lavelling, Zero Tillage, Aerobic Rice and System of Rice Intensification for Saving Water and Energy and improving Yields.

These are some of the promising new initiatives adopted by progressive farmers which initiatives adopted by progressive farmers which help in saving irrigation water up to 15-25 per cent saving of farm energy by up to 20% and improving the crop yields up to 20-25 per cent.

vi. New Programs and Policy Initiatives in the Irrigation Sector:

- Command Area Development and Water Management Programme
- Major and Medium Irrigation Project
- Accelerated Irrigation Benefits Programme
- Repair, Renovation and Restoration of Water Bodies
- National Water Mission
- National Mission on Micro Irrigation
- National Program on Aquifer Mapping & Management
- Prime Minister Krishi Sinchayee Yojana
- Regulation for delayed Transplanting of Paddy to Save Groundwater

REDUCING DRUDGERY THROUGH TECHNOLOGY

- In Agriculture, One grey area is always left out which is the fatigue and drudgery faced by the farmers and farm labours. Women farmers are in integral part of all these farm activities. According to an estimation of the International Labour Organisation, Women perform one-third of the world's counted labour.
- Heavy workloads and drudgery are resulted in stress and poor health in agricultural work which usually have been overlooked.

Types of Drudgery for Farmers:

- It is seen that farmers, especially women farmers and farm workers are engaged in a number of agriculture and farm operations such as seeding, transplanting, weeding, thinning, harvesting winnowing etc. All these labour intensive works lead to drudgery or fatigue in the form of physical or mental stress. Researchers have found that due to farming related drudgery, most of the farmers suffer from frequency headache, backache, sleep disorder, abdominal pain, sore throat or running nose with fever.
- When women farmer's drudgery combines with the constraints of illiteracy, malnutrition and unemployment, the situation becomes more vulnerable.
- If farmers be made aware with the available drudgery reducing tools and equipments, these would not only contribute in drudgery reduction; but also increase their capability, productivity and improve efficiency.

Minimizing Drudgery:

- Many institutions have developed a number of tools and technologies which assist drudgery reduction to the farmers and farm workers. These are:
    - Seed Drill
    - Hand Ridger
    - Twin Wheel Hoe
    - Improved Sickle
    - Bhindi Plucker
    - Coconut Dehusker

Government Schemes and Awareness Generation:

- About 25 to 50 per cent subsidies are made available to farmers by the Government to ensure the machinery or drudgery reducing technologies/tools/equipments at a better and affordable price. However, the Government has provided ceiling limits to all categories of farmers for the purchase of various agricultural equipments under various schemes of the Department of Agriculture and Cooperation. A few such schemes are *Macro Management of Agriculture, National food security Mission (NFSM), Rasthriya Krishi Vikash yojna (RKVY), National Horticulture Mission etc.*

- Capacity building of farmers has also been encouraged through arranging 43656 Farmer's Field Schools (FFS) at farm level so far.
- A multimedia compendium on women friendly improved farm tools for agro-drudgery reduction has been brought out by *Vigyan Prasar (*An Autonomous Organization under the Department of Science & Technology, Govt. of India).
- The multimedia compendium serves the specific purpose of improving preparedness of stakeholders to use alternative tools/equipment/suitably-adapt practices and as a forerunner to training and capacity building.
- Intervention of farm technologies and drudgery reducing equipments has played a pivotal role in the enhanced agricultural productivity under NFSM(National Food Security Mission).
- This comprised of the production of additional 25 million tonnes of food grains, which included 10 million tonnes of rice, 10 million tonnes of wheat, 3 million tonnes of pulses and 2 million tonnes of millet. This data shows that drudgery reducing equipments boost agriculture productivity.
- Hence, the need of the hour is to empower farmers especially women farmers through technology to reduce drudgery and health problems and to enhance agricultural productivity along with efficiency.

FINANCIAL INCLUSION THROUGH TECHNOLOGY

- Financial inclusion is the process of ensuring access to appropriate financial products and services needed by all sections of society in general and vulnerable groups such as weaker section and low income groups in particular at an affordable cost in a fair and transparent manner by mainstream institutional players.
- Of the underprivileged sections of the rural India – approx 51.4% of farmer households are financially excluded. Of the total farmer households, only 27% access formal sources of credit. One third of this group also borrows from non-formal sources. 73% of farmer households have no access to formal sources of credit.
- There is clear evidence that farm debts are increasing much faster than farm incomes, leading to the most drastic step of committing suicides by farmers in all parts of the country. In comparison, while casting a glance at very small countries like Kenya, we observe that nearly two-thirds of all adults are active customers of a mobile phone-based money transfer and payments service, and 50 percent of mobile phone owners in Tanzania actively use mobile money system.
- Virtually, one of the biggest components of financial inclusion is **financial literacy**.
- Financial literacy has to be based on three principles:
    - Effective use of mediums like computer, mobile and internet to enable people to have the skills, knowledge or information about financial instruments.
    - We must ensure, people have the ability to critically understand the content they have received through digital means.
    - They should apply it to the best of their knowledge and capacity.
- For achieving the gigantic objective of financial inclusion and financial literacy, the conventional banking modes are not feasible, especially for low ticket size of transactions, deposits, loans, etc., in semi-urban and rural areas.
- We need to harness technology for bringing more and more people in the ambit of formal banking sector of commercial banks. As far as, rural India is concerned, the task has been assigned to the apex agriculature and rural development bank (NABARD), which has been working towards bringing the excluded population into the formal banking system by addressing both demand and supply side constraints, appropriately realizing the fact that instead of opening bank branches in rural areas, new players such as Business Correspondents, Business Facilitators, Mobile Operators and fintech companies need to be roped in.
- As an effective alternative credit delivery mechanism, **SHG-Bank Linkage programme,** run country-wide by two major organisations/ departments, has proved to be the biggest mile-stone for achieving financial inclusion.
- Then in 2014 came, **PMJDY**- a National Mission on Financial Inclusion encompassing an integrated approach to bring about comprehensive financial inclusion of all the households in the country in two phases, with clear understanding that **this deeps penetration at an**

affordable cost is possible only with effective use of technology, by way of Every Bank A/c to be on-line with RuPay Card & Mobile Banking Facility, use of e-KYC to ease the account opening process, use of Aadhaar Enabled Payment System (AEPS) for interoperability, support for setting up FLCs, support for demonstrating banking technology (Mobile Van fitted with ATM), on-line Monitoring through system generated MIS and facility of Call Centres & Toll free number.

PMJDY has Six Pillars

1. **Universal Access to Banking**
2. **OD, Rupay Debit card to Households**
3. **Financial Literacy**
4. **Credit Guarantee Fund**
5. **Micro Insurance**
6. **Pension unorg sector**

- As a part of its financial inclusion plan, RBI started the **Business Correspondent model** in 2006. Business Correspondents (BCs) are representatives appointed by banks to act as their agents, who provide banking services in remote locations, where the bank may not have present, at the doorsteps of the poorest. The two major technological components involved are the hand-held offline device through which financial services are offered to the customers and the smart car provided to each customer for recording to transactions.
- No doubt, the BCs and BFs are providing banking services in far-flung places but they can not be expected to provide their services for free. Especially in NER, given the lower number of transactions, BC model viability has been a major issue. In order to circumvent the problem, a part of the monthly commission subject to a cap of Rs. 3000/- per BC per month is reimbursed from the fund in case of RRBs.
- **The Digital India initiative,** coupled with a payment infrastructure, is laying the cornerstone for a digital economy, keeping in mind the increasing willingness of people to use the internet and the rising data traffic in the country.
- In addition, all the **cooperative banks and Regional Rural Banks have been brought on CBS** platform for providing anytime and anywhere banking to the rural populace. **RuPAY Kisan Cards** have been providing impetus to cashless transactions among the farming community.
- **The technology-levered Aadhaar programme** is likely to be the biggest disruptor in financial inclusion delivery, as innovations leveraging the Aadhaar card are expected to assist in broad-basing the access and acceptance by financially excluded segments.
- **Direct Benefits Transfer** scheme was initiated to facilitate disbursements of governments entitle-ments such as those under the social security pension scheme, handicapped old age pension scheme, etc. of any central or state government bodies, using Aadhaar and authentication thereof, as supported by UIDAI.

- **Payments banks** are a new model of banks conceptualized by RBI. The main objective of payments bank is to widen the spread of payment and financial services to small business, low-income households, migrant labour workforce in secured technology-driven environment in remote areas of the country.
- Since connectivity and power issues can badly affected banking services and more in remote areas, all coop. banks in the NER and A&N Islands, have been made eligible for **support for solar powered V-SATs** from **'Financial Inclusion Fund'.** V-SAT connectivity support is also extended to all banks for new branches being opened in identified **LWE districts,** restricted to 7 branches per district.
- To promote digital transactions for personal consumption expenditure, two scheme viz. **Lucky Grahak Yojana** and **Digi-Dhan Vyapar Yojana** was funded through Financial Inclusion for consumers and merchants respectively.
- Apart from this, the **Financial Literacy Awareness Programmes were recast as d-FLAP,** with an objective of transaction from a cash-based economy to less-cash one.
- Despite this, there is the need for banks to move beyond simply opening bank A/c, to ensuring that the poor customers are confident and comfortable enough to use them. We need a frugal, trustworthy and effective Indian model of technology for financial inclusion.

AKRUTI TECHNOLOGY PACKAGE FOR RURAL ENTREPRENEURS

- Considering the wealth of technology and innovative capability generated in BARC & DAE units as an off-shoot of R&D in Nuclear Energy and its applications in power and non-power areas, Department has launched DAE – Societal initiative for utilization on non-Power Applications (NPAs) and Spinoff technologies in the area of water, land, agriculture, food processing and urban-rural waste management.
- Within this framework of societal initiative, structured programme called "AKRUIT- KRUITK – FORCE" has been formulated and is being implemented by BARC for techno-economic growth of the rural sector, as one of the many schemes for large-scale deployment of BARC technologies – 4th Key Driver of Major programmes of Department of Atomic Energy (DAE) and Vision of NITI Ayog for social outreach and awareness.
- AKRUTI is an acronym for Advanced Knowledge and Rural Technology Implementation initiative.
- This programme has potential to encourage village techno-preneurship based on BARC technologies.

Akruiti Tech Pack for Techno-Economic Activity:

- 'Akruti Tech Pack' (ATP) for Exclusive Rural Development on chargeable basis is a technology package introduced in the year 2009 for desirous technically oriented individuals including women / entrepreneurs / industry / companies in villages and cities, to promote techno-economic activity in rural sector through AKRUTI programme at an affordable price.

ATP Technologies:

- Akruti Tech Pack is made of twelve (12) technologies as given below:

1. Nisargruna – Biogas plant based on biodegradable waste
2. Soil Organic Carbon Detection & Testing Kit (SOCDTK)
3. Vibro Thermal Disinfestor (VTD)
4. Foldable Solar Dryer (FSD)
5. Process for retaining Pericarp Colour and extending shelf life of Litchi, novel process, wherein the fruits after treatment can be stored at low temperature upto 45 days.
6. Domestic Water Purifier (DWP)- a technology to get bacteria free clean drinking water without use of electricity.
7. Solar energy driven Portable Domestic Brackish Water Reverse osmosis (BWRO) technology.
8. Dip N Drink (DND) Membrane Pouch, technology to convert the biologically contaminated water into sterile solution for oral consumption.
9. Banana Tissue Culture (BTC) Technology for mass-production of commercially important banana verieties.
10. Mass multiplication medium of Biofungicide Trichodrerma spp.

11. Microfine Neem Biopesticide
12. Nanocomposite Ultrafiltration Membrane Device for Domestic Water Purification W.R.T. Arsenic, Iron and Microbial Contaminations.

Concluison:

- The basic need of opportunities for innovation, work and entrepreneurship for the rural areas can be accomplished by canalizing modern indigenous know-how and technologies through this structured program “AKRUTI-KRUTIK-FORCE” with the existing financial support in the initial stage. This will enable the villagers to deploy and make use of the technologies with local adaptation for themselves, which itself will generate village entrepreneurship and make this activity self-sustaining and wide spread.

ROLE OF ICTs IN RURAL DEVELOPMENT

- Rural areas in India still face challenges like sustainable employment in agriculture/ allied sectors; quality education; marketing infrastructure, over exploitation of natural resources; inadequate electricity, transport, communication, health food and storage facilities etc.
- Information and Communication Technology (ICT) can play a vital role in management of rural development programmes to ensure that benefits reach to actual beneficiaries in time.
- The integration of ICT and welfare schemes has resulted into latest buzz word called as "New India" or "Digital India".
- Latest technologies like Remote Sensing (RS), Geographic Information System (GIS), and Global Positioning System (GPS) strengthen the software applications to capture and manage massive Geospatial/Geographical data. These advanced ICTs help to deploy applications for better land use, management of wastelands, village planning, water exploration, environmental conservation, ecosystem studies, disaster management etc.

Digital Divide:

- The existing marked differences in the access and ownership of various ICT aids/facilities between urban and rural areas indicate towards the Digital-Divide.
- In this era of digitization, cashless economy, web/mobile applications etc., we have to bridge the gap of digital divide and need to place ICTs infrastructure in rural areas.

Digital India:

- It aims to ensure that government services are made available to citizens electronically thereby reducing paperwork.
- Digital India mainly has three core components, a) creation of digital infrastructure; b) delivering services digitally and c) digital literacy. Under Digital India and National e-Governance Plan, central and state governments are undertaking various Mission Mode Projects (MMPs) on cashless economy, agriculture, e-district, land records, gram panchayats, health, education etc.

ICTs for Rural Development:

ICTs hold tremendous potential to be used as a tool by the Government for reaching out to the rural masses and provide benefits of rural development schemes and other basic G2C services to the rural people. Some of the potential roles and applications of ICTs for rural development are listed below:

- **ICTs for Management of Rural Development Programmes**

  Availability of the real time information of various projects help the central/state government agencies to effectively plan, implement and monitor execution of their schemes at ground level.

- **ICTs for e-Governance (including Services Delivery System)**

  Through ICTs, all Government services can be accessible to common man in his locality, through common service delivery outlets.

Various services under G2B, G2G, G2C models of e-governance can be delivered effectively as compared to the physical application/ file/noting system.

- **ICTs for Agricultural Extension Services and Marketing**

  ICTs can help in extending research from lab to the field. Especially, FM, community radio, mobile telephony, soil sensors and testing devices are most compelling for making Smart Farmers.

  ICTs based applications can also facilitate electronic trading like where-to-buy/sell, when-to-buy/sell and how-to-buy/sell etc.

- **ICTs for Climate Change and Natural Resource Management**

  Using ICTs, climatology and agronomics, latest information on weather/climate change can be given to farmers.

- **ICTs for Rural Health Care Services**

  Telemedicine services can enable access to professional doctors (through web camera, VSAT etc.) irrespective of geographical location.

- **ICTs for Diaster Management in Rural Areas**
- **ICTs for Rural Connectivity**

  ICTs based system help to maintain database of rural road network, project proposals, sanctioned projects, contractor's details, physical and financial progress, quality monitoring etc.

- **ICTs for Education**

  Availability and accessibility to computers/laptops/tablets with internet facility within the village itself can help rural youth to fulfill their educational needs and enhance their ability to compete with outside world. A dedicated TV channel for educational program also facilitates the rural youth to get guidance from the eminent subject experts.

- **ICTs for Social Justice and Empowerment**

  Direct Benefit Transfer (DBT) should be implemented in all the schemes/programmes in order to ensure transparency, reduce the duplicate/fake beneficiaries and eliminate leakages.

- **ICTs for Public Distribution System**

  ICTs facilitate to implement the Electronic Public Distribution System (ePDS) in more transparent and effective manner.

- **ICTs for Rural Tourism**

  Promotion of tourist places within the village or nearby locations can be done in better and cheaper ways making web sites/portals that provide information about remote tourist locations, photos of key features, location map, etc.

Some of the important ICTs based Centre/State initiatives concerned with the rural development under various sectors e.g. wage employment, rural housing, watershed management, panchayati raj, education, health etc. are

- **MIS for MGNREGA:** Management Information System (MIS) for planning, implementing and monitoring of MGNREGA programme is named as NREGASoft.
- **MIS for Pradhan Mantri Awaas Yojana (PMAY)-Gramin :** AWAASSfot is an ICT based solution for MPAY-G. This empowered the masses especially, beneficiaries by providing interface for checking the beneficiary selection, transfer of fund to beneficiary bank account, complaint lodging etc.
- **MIS for Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) erstwhile IWMP:** IWMP-MIS is a web based system which can be accessed by all stake holders to enter the date related to IWMP projects.
- **Panchayat Enterprise Suite (PES) :** The Ministry of Panchayati Raj (MoPR) has undertaken e-Panchayat, a Mission Mode Projects (MMP) under Digital India Programme that seeks to completely transform the functioning of Panchayati Raj Institutions (PRIs), making them more transparent, accountable and effective.
- **mKisan and eNAM:** mKisan Portal for farmers enables all Central and State government organizations in agriculture and allied sectors to give information/ services/advisories to farmers by SMS/ IVRS in their language, preference of agricultural practices and location. For agriculture marketing presently, eNational Agriculture Market (eNAM) is a pan-India electronic trading portal which networks the existing APMC mandis to create a uified national market for agricultural commodities.
- **ePathsala:** The ePathsala educational portal, a joint initiative of MHRD and NCERT has been deployed for providing all educational e-resources including textbooks, audio, video, periodicals, and a variety of other digital resources to the students.
- **Common Service Centre (CSC):** CSCs are providing the citizen centric services including issue of various certificates driving license, vehicle registration, etc.
- **Aadhaar enabled Public Distribution system (AePDS):** Haryana State is implementing AePDS for online ration cards, supply chain management, ration distribution through PoS devices at FPS using Aadhaar based authentication.
- **Online Grievances Redressal System**
- **eUpchar and Hospital Management System:** Through eUpchar patients get a unique identification number to store their health records and that can be referred online at any hospital of Haryana with the help of Hospital Management Information Systems (HMIS)

Challenges of ICTs in Rural Development:

- Continuous Supply of Electricity
- Low level of Digital Literacy
- Shortage of ICTs Personnel
- Lack of Access of Telecommunications and Internet Services
- Unavailability of Web Content in Local Language

- Acceptance in Rural People
- Unethical Use of ICTs

GENERATING CLEAN ENERGY FROM WASTE

- In India, about 234 million tonnes of surplus biomass with a potential of Rs. One lakh crores fossil fuel import replacement has been estimated. However, burning of crop residues, cow dung cakes, exhaust of vehicles, tractors, untreated sewages, residues of milk, meat, vegetable and fruit processing and methane liberation from cattle dung heaps pollute air and pollute environment.
- Some of the first generation technologies of animals dung (Gobar) gas, ethanol from sugars and starch, bio-diesel production and power generation are not competitive due to market forces and availability of better alternative technologies. Mulching and incorporation of crop residues into soil, with heavy machinery liberates green house gases and is not being adopted by farmers in spite of heavy fines as it leads to a higher cost of cultivation.
- Controlled burning of biomass into stream boilers for electricity generation also liberates air polluting gases and farmers lose very valuable organic manures which ultimately deteriorates soil health.
- Tariff rates of generated electricity of Rs. 7.50 to 8.1 per unit is unviable as compared to Rs. 2.44 per unit of solar and wind power. Latest Anaerobic Digestion technologies for crop residues have made Bio CNG cheaper than Fossil CNG Anaerobic digestion of mixed feed stocks of paddy straw with cattle dung; industrial wastes and activated sewage sludge has further raised the productivity of CNG.
- India is a polluted country with 1.6 million pre-mature deaths and 49 million disability adjusted life years due to household and ambient air pollution. Burning of crops residues, animal dung cakes, fossil fuels, solid wastes, untreated sewage, dust particles etc. are the major **sources** of pollution.
- Co-digestion or co-management of crops residues and other biomasses with animal dung, wastes of milk, meant, vegetable, fruit, sugarcanes processing and activated sewage sludge etc. can generate bio-fuels, compost for maintaining soil health, reduce import bill etc. Crops residues, industrial and other wastes, provide rural employment, enhance income of the farmers and reduce pollution.
- Budget 2018-19 envisages incentives for **"Waste to Wealth"** including **GOBAR-dhan** scheme for bio-CNG generation.
- **First Generation Technologies:** Khadi and Village Industries commission is promoting bio gas production from animal dung for many decades but could not scale up to the competitive marketing.
- Bio-diesel plantations of *Jatropha, Jojoba,* Olive oil and other oil bearing trees especially on waste lands could not end up into success stories. Ethanol production also led to competition for the so vital food and nutrition securities under declining per capita availability of land, water and other resources. Technologies of solar and window energy with tariff rates around Rs. 2.44 per unit has made some of the first generation bio fuel and other technologies irrelevant.
- **Second Generation (2G) Bio Fuel Technologies:** First generation technologies focused primarily on sugar, starch, plantations etc. and competed for limited land and other resources,

environmental, food and nutritional security. 2G technologies aim at cost effective, import substitution and pollution free bio fuels production.

- **Crop residues as Fuel:** There are vast quantities of paddy and other straw but they have low calorific values. Most of them are loose bulky material, which require densification and bracketing for fueling the steam boilers for power generation.
- **Bio-Refineries:** Plants are being established for producing ethanol from paddy and other biomasses. However, this process generates 37% less energy as compared to Bio CNG.
- **Anaerobic Digestion Technology:** This resolves many limitations of thermal power generation. In fact, the first anaerobic digester for human excreta in the world was demonstrated in India in 1859 near Mumbai for lighting up a lepers colony set away from the city.
- The 2G technology focus on Bio CNG generation ordered by the Supreme Court of India for public and other transport for improving air quality and pollution reduction.
- After producing bio gas, the remaining residue (digestate) is very good manure free from seeds of weeds and other harmful elements.
- It will also create primary and secondary level employment both for the skilled as well as unskilled persons.
- **Advanced Technology:** Bio-gas needs further purification by removing carbon dioxide and Hydrogen sulphide for arriving at BIS standards compressed CNG for vehicular and other purposes. Advanced technologies are in the pipe line even to convert carbon dioxide to methane which has relatively high calorific value and is better in quality in terms of environment externalities as compared to imported fossil CNG. It will be cheaper than imported CNG by Rs. 10-15 per kg and will survive even in competitive marketing.
- **Convergence, coordination, co-generation and co-placement:** Rice straw with high carbon content is a difficult feed stock and mixing it with low carbon and relatively high nitrogen animal dung, food waste, spoiled potatoes, activated sewage sludge, wastes of milk, meat, vegetables and fruit processing plants increases the overall productivity of both bio and methane gas.
- Mixing of rice straw and cattle dung in 80:20 ratio produces 70 per cent more as compared to rice straw alone.
- It requires coordination of various departments of agriculture, horticulture, animal husbandry, dairy, sewage treatment and rural development to optimize complementarities and suplementarities. It will lead to sustainably benign healthy India and generate employment, income, goods, services and pollution free environment.

GOBAR-DHAN: RE-EMPHASIZING INDIA'S TRADITIONAL PRACTICES

- The Galvanizing Organic Bio Agro Resources Dhan (GOBAR-DHAN) scheme was announced by the Finance Minister during the budget speech on February 1, 2018. The scheme would contribute towards management and conversion of cattle dung and solid waste in farms to compost, fertilizer, bio-gas and bio-CNG.

What is GOBAR DHAN?

- It is aimed at ensuring cleanliness in villages and generating wealth and energy by converting cattle dung and solid agricultural waste into Compost and Bio Gas.
- The sale of compost and biogas would augment the income of the farmers whilst improving levels of sanitation in villages and increasing farm yields.
- While clearly biogas could easily be a solution to wet waste management and a substitute in the form of a cleaner fuel, it is imperative that we learn and evolve from constraints faced historically. Implementation of a self-sustainable business model is key. We many take cue from success stories such as the Gobar Bank model in Surat or metered cooking gas initiative by Cooperative Service Society in Punjab.
- The government must streamline and fast track implementation and disbursement of eligible subsidy either under National Biogas and Manure Management Programme or GOBAR-DHAN Yojana to ensure sustainable replicability. Technical support and capacity building to address aging or ailing plants are the other key factors aiding growth of biogas based models in the country.