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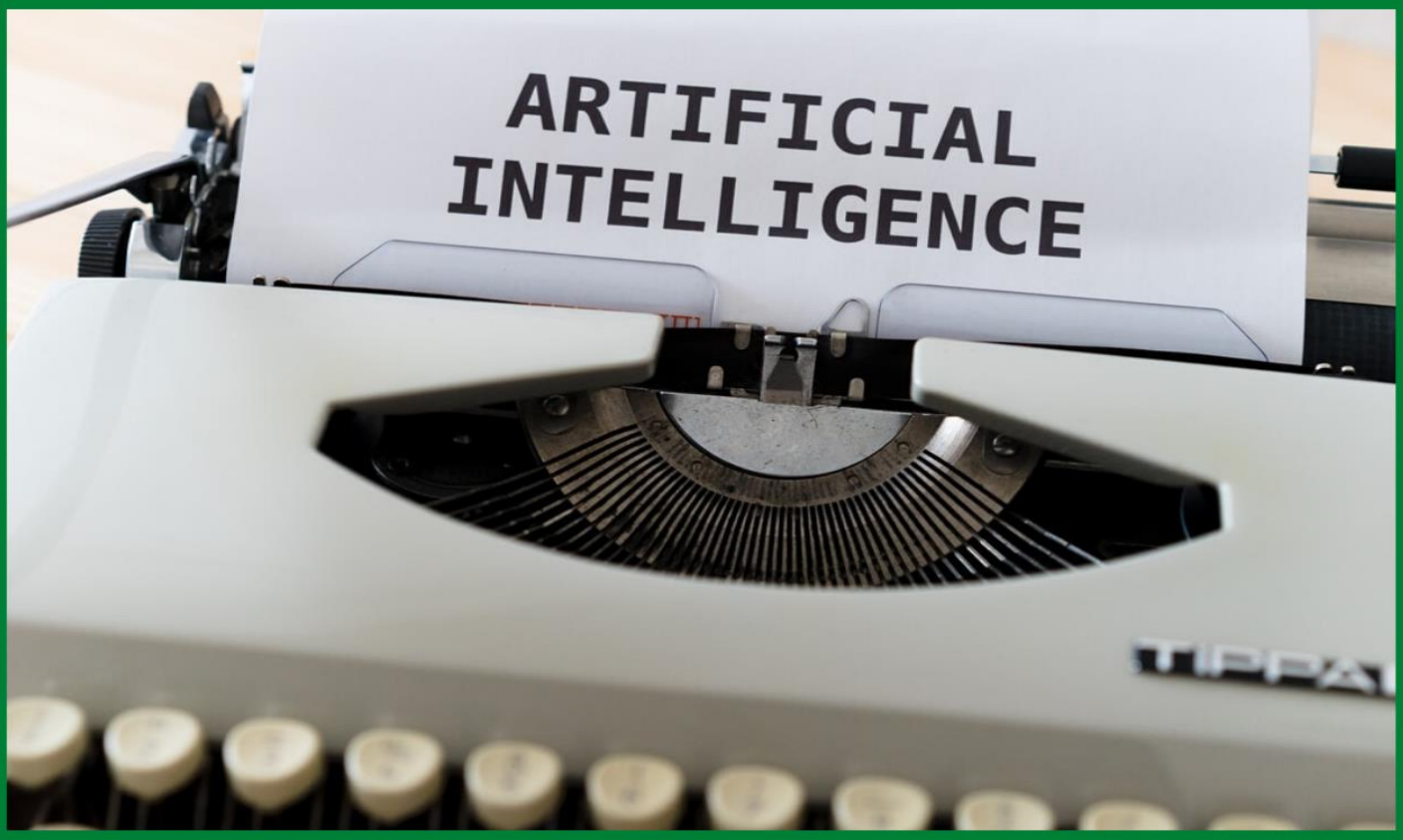
TECHNOLOGY

IRRIGATION AND WATER CONSERVATION

BY IASBABA



Preface

This is our 63rd edition of Yojana Gist and 54th edition of Kurukshetra Gist, released for the month of June 2020. It is increasingly finding a place in the questions of both UPSC Prelims and Mains and therefore, we've come up with this initiative to equip you with knowledge that'll help you in your preparation for the CSE.

Every issue deals with a single topic comprehensively sharing views from a wide spectrum ranging from academicians to policy makers to scholars. The magazine is essential to build an in-depth understanding of various socio-economic issues.

From the exam point of view, however, not all articles are important. Some go into scholarly depths and others discuss agendas that are not relevant for your preparation. Added to this is the difficulty of going through a large volume of information, facts and analysis to finally extract their essence that may be useful for the exam.

We are not discouraging from reading the magazine itself. So, do not take this as a document which you take read, remember and reproduce in the examination. Its only purpose is to equip you with the right understanding. But, if you do not have enough time to go through the magazines, you can rely on the content provided here for it sums up the most essential points from all the articles.

You need not put hours and hours in reading and making its notes in pages. We believe, a smart study, rather than hard study, can improve your preparation levels.

Think, learn, practice and keep improving!

You know that's your success mantra ☺

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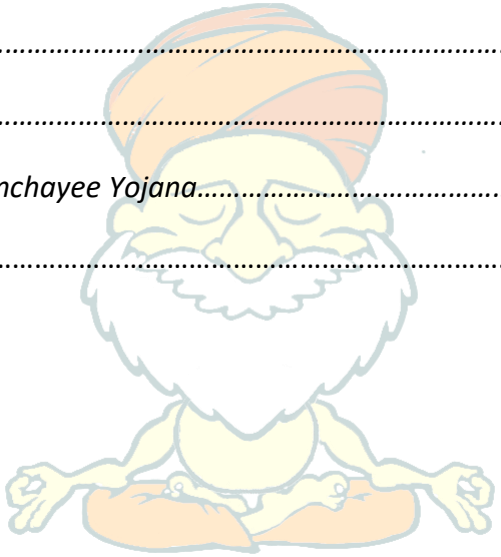


TECHNOLOGY

A. Atmanirbhar Bharat

What does it mean?

- Freeing Indian entrepreneurship and innovation from bureaucratic hurdles
- This is about decentralised localism that takes pride in local brands, emphasises resilience and flexibility, and encourages local capacity-building and indigenisation.
- The idea of self-reliance is about resilience, leveraging internal strengths, personal responsibility, and a sense of national mission (or "Man Making" to use the late 19th century expression of Swami Vivekananda).
- Product and factor markets are made flexible in order to allow the Indian economy to adapt to the problems and opportunities of an emerging post-COVID world.
- Commitment to privatisation of non-strategic public sector entities, opening up of new sectors like space to private investment, decriminalisation of most aspects of corporate law, greater flexibility in labour laws, and so on.

Five Pillars of Self-Reliant India

1. **Economy** - Bringing in quantum jump and not incremental jump
2. **Infrastructure** - To become the identity of India
3. **System** - Based on 21st century technology driven arrangements
4. **Vibrant Demography** - Our source of energy for a self-reliant India
5. **Demand** - The strength of our demand and supply chain should be utilised to full capacity

The Five phases of Atmanirbhar Bharat are:

Phase-I: Businesses including MSMEs ('be vocal for the local')

- To raise the domestic competitiveness of our industries' pricing factors that make them uncompetitive with respect to the foreign players should be identified and corrected.
- Exports: Maximize its export capacity, aggressively boost export-driven industries and levy a border adjustment tax (BAT) on imports to offset the impact of these internal taxes on domestic producers. Use foreign capital generated from these exports for upskilling, technological upgradation and capacity building in sectors covered under its ISI policy
- The production of intermediate and finished goods in heavy industries should be prioritised
- Only a limited and targeted import-substitution policy combined with aggressive export promotion can make Atmanirbhar Bharat a $5-trillion economy
- Review the LDR and consider removing it from our anti-dumping law.
- Develop a robust research and development-backed industrial ecosystem, with technical institutions, MSMEs and the capital goods sector forming its lead players, and powered by quick decision-making as well as government policies that are appropriate to manage such global disaster.
- Technical institutions can develop exhaustive online marketplace applications, which can facilitate the establishing of connections between demand and supply points, provide information updates regarding the finances available, government and banking notices, market situation, and latest technologies, thus creating an economic model.
- For sectors where domestic capability is limited or cannot be scaled up, we should endeavor to forge strategic alliances with countries in the form of comprehensive bilateral free trade agreements (FTAs) keeping in mind complementarity of trade flows.

Phase-II: Poor, including migrants and farmers

- Calls for the creation of safety nets
- Functional role to be assigned to social security. When an unexpected shock hits an economic agent, (s)he falls back on social security. Such security is meant to ease and cushion against unexpected frictions created in the normal course of events.
- Labour reforms should emphasise flexibility on the one hand but on the other hand also pitch for more stringent norms for safety and working conditions.
- Technical institutions can study the skill sets of the returning migrant labourers and propose solutions to state governments for creating employment avenues, and the mapping of skills of migrant workers along with their skill development training requirements.
- States that have suffered a poor industrial growth for long and hence have had a high outflow of migrants can now look at return of migrants as a reclaimed human capital - by planting the seeds of their on-the- job skills learnt in the urban sector into their home states. There is a possibility of building clusters of new MSMEs or units based on co-operatives using the skill and experience of the return-migrants. Besides creating gainful employment, States may have to work on improving infrastructure, building industrial estates, for setting up new MSMEs, etc.

The greater ambition for a self-reliant economy is to transform the farmer into an agripreneur. India's farmers are bound by the shackles of low productivity, low incomes, lack of access to institutional credit, indebtedness etc. They are reeling under the burden of a fragmented agricultural marketing ecosystem and climatic uncertainties and vagaries of nature. A self-reliant farmer is fundamental to the vision of a self-reliant India.

Phase-III: Agriculture

- Not by levying high import duties
- By creating a competitive advantage through augmenting productivity
- Increasing the recovery ratio of oil from oilseeds and in case of palm oil, from fresh fruit bunches, as this is the only plant that can give about four tonnes of oil on a per hectare basis
- Following the principle of "comparative advantage", which means exporting more where we have a competitive edge, and importing where we lack competitiveness.
- Reforms that can ensure access of farmers to technology that can reduce natural or climatic vagaries that will determine their crop producing capacity. Loans can then be aligned to the repayment capacity of the farmer based on the estimation of crop production. Such measures will reduce the probability of debt, making loan waivers irrelevant.

Phase-IV: New Horizons of Growth

- **Online Learning:** Due to COVID-19, millions of students have been driven out of university campuses and the faculty is confined to their homes. This has forced the teaching community to look for alternatives to maintain the continuity in the teaching learning process. Online platforms provide such alternative.
    - Best teachers cannot always reach grassroots, digital content can. Online education can help reduce inequality in the "Quality" of faculty and education. By removing the nuisance of unnecessary overheads and administration and by bringing the best faculty in direct contact with the students through online learning can do wonders for motivation of both, the faculty and student.
    - Access to online classes and digital media will provide room to students to develop self-motivation and become independent
    - With a multi-channel approach to combat these issues, now TV channels can run educational content for classes 1 to 12. This will be supplemented by radio and

podcasts. With this, the grassroots network of government schools should be viewed more as 'learning zones' rather than 'training institutions'. Edtech companies can chip in by customising the content to the local context.

- Access to the best digital content for all, as well as the room for creativity and innovation will help our future citizens to think, analyze and get clarity about what is right and wrong for themselves, for society as well as future of our nation. Faculty will get more time to do research, as administrative work will get reduced.

- **Birth of Social Enterprises:** Social entrepreneurs are focused on the delivery of public goods using business approaches. They combine their driving passion for improvement with the practical, innovative and opportunistic traits of the entrepreneur.
  - Akshay Patra is the world's largest NGO-run school meal program–it reaches 10 million children across five States of India, six-days a week. And they serve freshly cooked meals at Rs. 1.50 per meal. This was achieved through a 'technological Innovation: to prepare meals on large scale in a short time' and a 'logistics innovation-to reach the meals to the schools'.
  - Atal Innovation Mission (AIM) was set up to promote a culture of innovation and entrepreneurship in the country.
    - Atal Tinkering Labs - at School Level, to create problem-solving mindset across schools,
    - Atal Incubators at Universities, Institutions, Industry Level to promote creation of a supporting ecosystem for start-ups and entrepreneurs,
    - Atal Community Innovation Centres to promote the benefits of technology led innovation to the unserved/underserved regions of India
    - Atal New India Challenges - Product and Service Innovations with National Impact - to create product and service innovations having national socio-economic impact
    - Applied Research and Innovation for Small Enterprises (ARISE) - To promote innovation in a phased manner in the MSME/Start-up sector

This momentum should be built to the point so as to make India the **Innovation Capital** of the world.

- **Social Media: The Force Multiplier:** Social media has become a game changer in the way federal, regional, and local government agencies are engaging, interacting, and communicating with citizens. Especially for amplifying social media's reach and impact even in the rural hinterlands of the country.
  - Crisis / Disaster Management: To reach out to citizens during such crisis. Two recent examples bear out this trend – Cyclone alert from the NDMA on India's eastern coasts (in the state of Odisha) and an advisory from PIB to citizens for the lockdown imposed due to COVID-19.
  - Citizen Engagement - MyGov platform
  - Citizen Grievances & Support - It acts as a real-time channel for citizen grievances and support
  - Law & Order - Police can use social media to alert citizens about circulating rumours and maintaining law & order
  - Hiring & Recruitment - Some government agencies are using social media hiring channels for attracting best-in-class talent for their job vacancies
  - Foreign Relations - Governments are using social media channels effectively to engage with their foreign counterparts.
  - Business & Industry Relations - Businesses play a key role in driving social media's impact by contributing significantly to the internet economy via advertising, paid services etc. Many monetisation models on the internet rely on enterprises, B2B and large

corporations with large advertising and marketing budgets, which contributes to the nation's economy.
    - Live Traffic Updates - Real time traffic updates and advisories get regularly shared in the metropolitan cities via the local Traffic Police social media accounts
    - Crowdsourcing Ideas & Innovation – Through crowdsourcing, one gets to tap into the collective "wisdom of the crowds"

- **Digital Platforms setup by Government during COVID19:** During COVID-19 pandemic, Indian government used digital technology for providing timely information, direct money transfer to the poor etc.
    - **Aarogya Setu App** enables people to assess themselves the risk for their catching the coronavirus infection
    - **WhatsApp chatbot** so that the citizens can get instant and authentic answers to all of their queries related to the Coronavirus pandemic
    - **Corona Kavach** is a COVID-19 tracker application, provides users with real-time location of infected users who have activated the 'Kavach' feature.
    - **SAMPRAC** to enable tracking people under quarantine. The system enables geofencing, AI-based automated face recognition. It has the capability to display the information to the state officials on a map which can be colour coded to depict hotspots and containment zones.
    - **Direct Benefit Transfer (DBT)** has been crucial in implementing PM Garib Kalyan Yojana that was rolled out to provide relief to the poor and vulnerable amid the COVID-19 crisis.
    - **SAHYOG** is an e-platform that collects geotagged information on the nation's critical infrastructure. It works as a key tool in helping community workers carry out the government's objectives of door-to-door, surveys, contact tracing, deliveries of essentials items and to create focused public awareness campaigns.

Phase-V: Government Reforms and Enablers

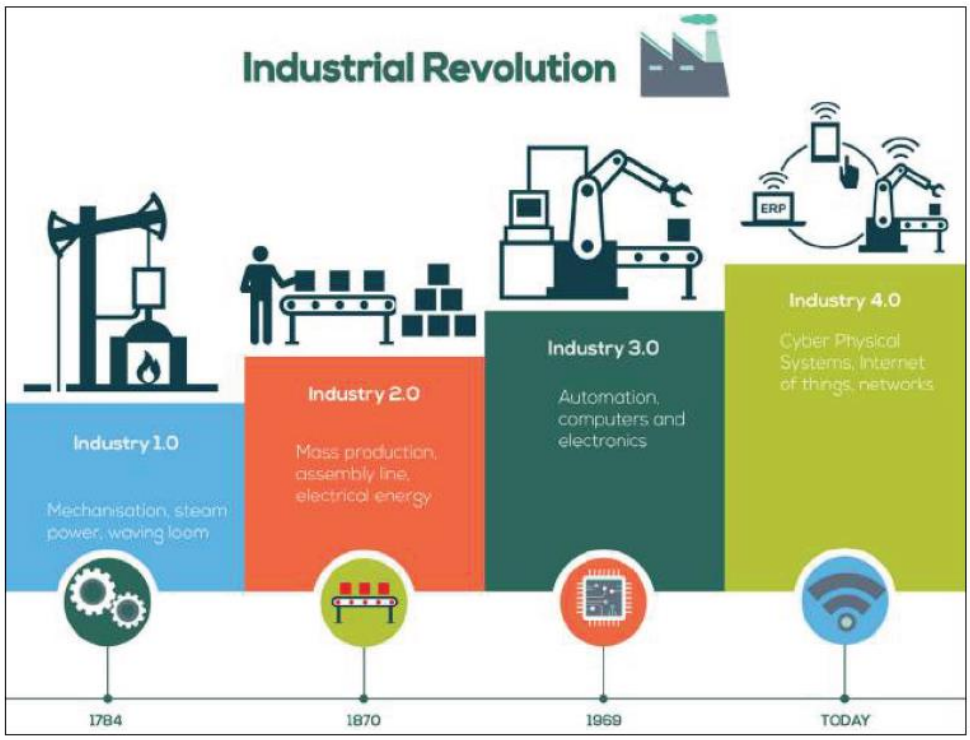
- **Legal system should become an enabler:** A decentralised system, where economic entities are expected to be self-reliant, requires a generalised system of social trust and the ability to enforce contracts. In turn, it implies a need to carry out administrative reforms and, more specifically, reform of the legal system. The inefficiencies and delays of the legal system are now the single biggest hurdle to economic development. This is not just about the judicial process but the wider ecosystem of rules, regulations, policing, and investigation and so on.
- **For Businesses:** Create an enabling policy and regulatory environment that fosters economic growth and lets companies scale up. The government must not think it needs to create winners, but that it must foster the right environment for winners to emerge from the soil of India. Once they do, you must back them to the hilt.

Criticisms

- Many economists have derided these efforts, assuming that it will take India back to the era of costly import substitution.
- The boycott call has also been criticized because it may end up causing supply disruptions in our own economy.
- Government needs to understand what creates global champs.

B. Industry 4.0

The world is facing greater disruption, an increasing innovation pace and is caught up in a revolutionary period. Technology, talent, and new innovation ecosystems are emerging; building greater complexities into our final innovation offerings. Intelligent automation and technology are fuelling this new industrial revolution. And this unprecedented, exponential pace of change is increasingly reliant on collaborative platforms to realise the result which is more radical innovations. Also known as the Fourth Industrial Revolution, Industry 4.0 encompasses three technological trends driving this transformation: connectivity, intelligence and flexible automation.



Industry 4.0 describes the growing trend towards automation and data exchange in technology and processes within the manufacturing industry, including:

- The Internet of Things (IoT)
- The Industrial Internet of Things (IIoT)
- Cyber-physical Systems (CPS)
- Smart Manufacturing
- Smart Factories
- Cloud Computing
- Additive Manufacturing
- Big Data
- Robotics
- Cognitive Computing
- Artificial Intelligence
- Blockchain

Changing Scenario Making Industry 4.0 Inevitable

A. Radical Pace of Innovation

Innovation is fundamentally undergoing a radical change. Companies are radically overhauling entire systems of production, management, and governance on a constant basis of change. We have unprecedented processing power, storage capacity, and access to various avenues of knowledge.

These are being combined with emerging technology in fields such as artificial intelligence, robotics, 3D printing, nanotechnology, biotechnology, material science, and quantum computing. It is creating fresh challenges and opportunities within innovation. Intelligent automation and technology are fueling this new industrial revolution. Industry is focusing more on technological innovation. It is constantly looking at the changes to the existing business models to reflect these changes, and further integrating innovation systems to explore entirely new business models.

- Product innovation is continually giving way to technological innovation
- Greater realization that **customer is at the epicenter** of the economy.

B. Emerging Digital Business Models

- Digital management is enabling an organization to create new business models that will emerge from the way they can be operated, be responsive in the supply networks, with potential to increase the customer satisfaction.
- Industry 4.0 would enable us to understand changing choices of customers, predetermine the total cost of ownership, and calculate return on investment as well as manage the entire lifecycle

Industry 4.0 Post COVID – 19

The business drivers of Industry 4.0 pre-crisis were focused on competitive advantage, cost reduction, productivity, sustainability and innovation. The goal was to make smooth businesses to run better. The focus for many manufacturers now is **survival first** and foremost and beyond that, damage limitation. The immediate financial impact on manufacturers is already resulting in a huge reduction in non-essential spending and investments. Many Industry 4.0 solutions currently being considered or being deployed fall into the category of non-essential business activities.

- The goal for all manufacturers will be to get to 'Business as usual in the new post-crisis paradigm' as soon as possible at the lowest cost. They will factor-in lessons learnt from the crisis and try to build a more resilient and agile business. They need to require real time visibility across the business.
- Another key learning from the crisis will be driven by manufacturers' reliance on human capital and the impacts of social distancing. During the crisis, production plans would have been changing on a much higher frequency as a result of changing demands and availability of raw materials, key staff and assets. Manufacturing has a much higher volume and frequency of transaction than the supply chain.

Although businesses have had reason to embrace digital workflows in the past, COVID-19 has provided another strong incentive to move towards a smart factory, complete with smart manufacturing or smart printing processes.

Digital Transformation due to COVID-19

The integration of digital infrastructure to streamline public health to respond to the COVID-19 pandemic is very crucial in the context of epidemic forecasting and decision-making.

- Digital contact tracing is conferring a new form of immunity–digital immunity. The fastest scalable solution to India's COVID-19 challenge was to employ digital technology for diagnosis and for contact tracing.
- Digital platforms have demonstrated its usefulness in the **enhanced corporate ability of long-distance collaborative work**, and the ability to market online and business development.

Conclusion:

The impact of the COVID-19 pandemic has demonstrated the value of IT and digital transformation across industries and businesses and they must utilise this time to speed up the transition. The impact of the COVID-19 pandemic has demonstrated the value of IT and digital transformation

across industries and businesses and they must utilise this time to speed up the transition. Digital Industry 4.0 plays a vital role in envisioning and modelling outbreaks. Many organisations may adopt remote working agreements as strategies to reduce costs, improve productivity, and increase worker satisfaction.

Many manufacturers are increasing efforts to equip their human workers with digital connected-worker tools that incorporate safety checks into workflows, ensure collaboration with colleagues when physical contact is off the cards, and other such processes that ultimately balance business continuity and employee health. This is also the dawn of a new era where 'frontline' workers and desk workers are harmonised with tools that can support the flow of collaboration and data, where something that happens on the factory floor initiates a communication or workflow in the back office.

C. Localisation through AI

Artificial intelligence has started to change the very face of local language technologies, products, tools, services and features. As a result, developers have been able to simplify and augment user experiences and facilitate better productivity for Indian language users. Virtual assistants now understand verbal commands given in Hindi. These revolutionary developments in local language technologies are surely going to benefit the developers and the users alike but things can also be seen from the broader perspective of digital inclusion.

Language agnostic computing is one important aspect of digital inclusion which has started taking place due to the new developments in language technology space, now powered by artificial intelligence. Disability, coupled with inability to use English language, multiplies the challenges that people with disability face as most accessible technologies and tools don't understand Indian languages. Unfortunately, most people with disability come from the not-so-privileged section of society which is often deprived from quality education and hence finds it difficult to converse in English. Accessible tools such as Narrator, with their ability to narrate text in Hindi, will make an empowering impact on the lives of common local language users and not just people with disability.

Benefits:

- Increases productivity of people and empowers typical language user
- Breaks the language barrier through language translation
- Fulfils broader perspective of digital inclusion
- Empower tourists visiting a foreign country
- Empower divyangs

Efforts to Promote Localisation through AI

Microsoft has been working with Indian languages for over two decades since the launch of **Project Bhasha in 1998**, allowing users to input localised text easily using the Indian Language Input tool.

- The company has recently made available the **Microsoft Indian language Speech Corpus**, offering speech training and test data for Telugu, Tamil and Gujarati.
- Through its **global Local Language Program** (LLP), it provides people access to technology in their native language. This includes **Language Interface Packs for Indian languages** like Hindi, Kannada, Bengali, Malayalam, amongst others.

D. Migration & Economic Growth

It is a phenomenal task to settle millions of workers and it requires effective collaboration from many interest groups. There are reports that the lockdown has helped the environment to recover from the damages, and that the pollution levels have dipped significantly. Considering, that the land and its people form inseparable components of sustainable development, this pandemic can provide a good opportunity to revive social dialogue as well.

These were the migrant workers who provide support services to every sector and across the classes. Their savings had dried out as they supported themselves without jobs. And though the government by declaring it as a national disaster had made it obligatory for the employers to pay the wages, as per the National Disaster Management Act, it is difficult to assess its implementation.

Why was it difficult?

1. The administrative machinery to ensure compliance across the nation is far from adequate.
2. Secondly, the income earned by the self-employed workers cannot be termed as wages, which means that these workers would have to go without earnings when there is no work. Then there are those engaged in piece-rated jobs, whose remuneration would differ depending on pieces made.
3. Finally, the MSMEs or tiny enterprises are financially too fragile to release the wages without production. Perhaps only the domestic workers, whose contracts involve a significant personal component making them relatively indispensable, might have received their wages during the lockdown(s)

Challenges and Opportunities

The influx: The presence of a kin or a community member in the urban sector greatly influences the decision to migrate. Availability of such a support induces migration, which is a rational personal choice, by providing at least an initial base to a new migrant. And while every migrant may dream of a secure job in formal sector, as more migrants flow in, they are compelled to settle in the unorganised or informal sector. In fact even their hosts may be earning their livelihood out of the informal sector. As bad harvest, subdivision of family land and poor employment opportunities drive more and more people to migrate to mega cities, this number swells, and it is nearly impossible to track the size of work force in the urban informal sector.

The opportunity: But as workers began returning due to the pandemic, there was an opportunity to prepare a data base of this labour market, which is significant, given the employment potential and contribution of this sector to the GDP. This opportunity was available in at the posts where they had to register themselves, and seek a medical certificate to be allowed to return to their home states.

- Mapping this huge workforce would have been possible if, for example, the registration form could include the details of demographic information, level of skill, the kind of employment, the income earned, and whether or not the worker intended to return to work after the normalcy. This information is crucial to the formation of Labour Market Information System, which could be developed by compilation of information at the Labour commissioner's office. Inadequate information may be a strong impediment in proper utilisation of funds allotted towards social protection of migrant workers, and the need for a sound data base cannot be over emphasised.
- Having data of the number of skilled and unskilled workers who moved back may be useful for both, the states they left, and those they returned to, especially if a sizeable portion of this population does not wish to return. once the lockdown is lifted, there are chances of a high labour surplus in some states and relative deficits in others. The administration can get a better picture of the need for employment generation programs in the surplus states, besides the advantage of knowing the size of pool of experienced and skilled workers now available to the home state, provided there are opportunities. In fact by further classifying

this pool skill-wise, it may be possible to bring them together through cooperative forms of organisation.

An Opportunity for Social Dialogue

It's a phenomenal task to 'settle' millions of workers and it requires effective collaboration from many interest groups. This, then, is a great opportunity to initiate social dialogue.

- Firstly, once the phase-wise return is planned, NGOs can be encouraged to participate in ensuring a safe return of migrants by collaborating with the medical personnel. Several states administered quarantine to the return-migrants once they reached their home states. This is another stage where collaboration between local self-government, and NGOs could be beneficial.
- States with a large inflow of return migrants are likely to face a downward pressure of wages. An effective social dialogue can ensure that such revisions are acceptable, and at the same time 'sweat shops' are minimised.
- A similar collaboration could bring about significant benefits if deployed in the process of initiation of new economic activities spearheaded by the return-migrants. Permission to utilise the CSR funds could go a long way in promoting entrepreneurial development (Sanghi, Sensharma 2014).

Creating opportunities of gainful employment by utilising the skills the return-migrants have acquired so far, especially through cooperatives not only follows the Prime Minister's call to be 'Atma-Nirbhar' (self-reliance), but it can also facilitate decentralisation of the process of growth.

E. Water Management: Towards Sustainable Agriculture

With the foodgrain production touching an all-time record level of 284 plus million tonnes (MT) in 2018–19, Indian agriculture has made stupendous progress in ensuring food security to its vast population. Sustainable agriculture is a way of farming according to the location-specific ecosystem and study of relationships between organisms and their environment. Simply stated, sustainable agriculture is a form of agriculture aimed at meeting the needs of the present generation without endangering the resource base of the future generations. Thus, a holistic and systematic approach is essential for achieving sustainability.

Sustainable water management in agriculture aims to match water availability and water needs in quantity and quality, in space and time, at reasonable cost and with acceptable environmental impact.

Efficient Water Management Practices

Efficient and sustainable water management practices in agriculture aims to match water availability and water needs in quantity and quality, in space and time, at reasonable cost and with acceptable environmental impact. Under water demand management most attention has been given to irrigation scheduling (when to irrigate and how much water to apply) giving minor role to irrigation methods (how to apply the water in the field). Many parameters like crop growth stage and its sensitivity to water stress, climatic conditions and water availability in the soil determine when to irrigate or the so-called irrigation frequency. However, this frequency depends upon the irrigation method and therefore, both irrigation scheduling and the irrigation method are interrelated.

Discuss the technologies and practices focusing on enhancing water use efficiency at all levels

a. Laser Land Levelling: Proper land levelling is one of the management options which is generally ignored by most farmers. It increases the water application efficiency which leads to higher yields as well as rise in water use efficiency. It also has a direct impact on the nutrient use efficiency.

b. Irrigation Scheduling: Irrigation scheduling is the decision-making process for determining when to irrigate the crops and how much water to apply. The goal of an effective irrigation scheduling programme is to supply the plants with sufficient water while minimising loss to deep percolation or runoff. With appropriate irrigation scheduling deep percolation and transportation of fertilisers and agro-chemicals out of the root-zone is controlled, water-logging is avoided, less water is used (saving water and energy), optimum soil water conditions are created for plant growth, higher yields and better quality are obtained and rising of saline water table is avoided.

c. Methods of Irrigation: Once the water requirement of crops is quantitatively and temporally determined then methods of irrigation make water available to crop plants. Water use efficiency mainly depends on the way water is applied in the field. Efficient irrigation method is always aimed at reducing the various losses of water during application. It is very important to employ the correct method of water application to minimise the adverse effects of irrigation. Eg: Check Basin and Border Strip Irrigation, Furrow Irrigation, Surge Flow Irrigation, Micro-irrigation, Sprinkler Irrigation, Drip Irrigation, Fertigation, Subsurface Drip Irrigation, Deficit Irrigation Practices, Regulated Deficit Irrigation, Partial Root Drying.

d. Agronomic Practices: Agronomic practices, such as soil management, fertiliser application, and disease and pest control are related to sustainable water management in agriculture and the protection of the environment. These practices are very important for increasing crop productivity as well as WUE. Eg: Contour Tillage, Broad Bed Planting, Conservation Tillage (CT), Mulch, Addition of Organic Manures, Addition of Clay or Hydrophilic Compound, Control of Acidity, Weed Control Measure and Integrated Pests Management (IPM).

F. Smart Agriculture

India has demonstrated a big transformation in the agriculture sector in the second half of the 20th century with the 'Green Revolution' but now we need to go for a 'technology revolution' to accelerate the growth in the agriculture sector. Smart agriculture has all the technological inputs that can steer us away from the problems of present-day agriculture. Smart agriculture has the potential to double the food production in 40 years with lesser impact on climate change. Further, it can reduce the losses and wastage by 50 percent.

Enumerate the transformative discoveries for Smart Agriculture

a. Internet of Things (IoT): IoT is described as a network of physical objects. These can be "things" that can be embedded with technologies, software or sensors which further helps in connecting or the exchange of data with other devices or systems via the internet or vice versa.

b. Artificial Intelligence (AI): It is the science of instilling intelligence in machines so that they are capable of doing tasks that traditionally required the human mind. The term AI is commonly used when a machine mimics cognitive functions such as planning, learning, reasoning, problem solving, knowledge representation, perception, motion, manipulation, social intelligence, and creativity. AI combines automation, robotics, and computer vision. Integration of AI and IoT devices further improves the growing and selling processes via predictive analytics. These programmes will help determine which crops to grow and anticipate potential threats by combining historical information about weather patterns and crop performance with real-time data.

c. Blockchain: It is a recent technological advancement with potential for addressing the challenge of creating a more transparent, authentic, and trustworthy digital record of the journey that food and other physical products take across the supply chain. Blockchain works by mapping data and providing it to users along the value chain simply by scanning a barcode. These barcodes are applied and linked throughout the value chain automatically by grading and sorting. This information not only provides with transparency, but also reduces risks for producers at the same time making available a cost-effective supply chain analysis to optimise profits. When blockchain is integrated

with IoT, it creates an immutable supply chain, ensuring that buyers are getting an authentic product that has not been damaged along the way. These technologies can also verify whether a product that contains hazardous materials has been disposed of correctly and safely.

d. Robotics: Powered with advanced AI technology, robots will soon play a defining role in agriculture. Advanced computer vision is also transforming the way drones operate. Drones with AI-enabled vision processing capabilities are being used to assess the real situation on the condition of crops on ground. Autonomous drones and the data they provide can help in crop monitoring, soil assessment, plant emergence and population, fertility, crop protection, crop insurance reporting in real time, irrigation and drainage planning and harvest planning.

e. Autonomous Swarms: Autonomous swarms combine the technology of swarm robotics with a blockchain-based backend. Swarm robotics involves multiple copies of the same robot, working independently in parallel to achieve a goal too large for any one robot to accomplish. By leveraging the benefits of both swarm robotics and Blockchain, pesticide and fertilizer can be applied more sparingly and planting and harvesting can be done with individual attention to each plant, an impossible task with large-scale machinery. The new approach produces greater yields at reduced cost, while raising the quality of the crop.

f. Artificial Intelligence of Things (AIoT): Individually, the Internet of Things (IoT) and Artificial Intelligence (AI) are powerful technologies. AIoT is a combination of AI and IoT. AI can complete a set of tasks or learn from data in a way that seems intelligent. Devices empowered with the combination of AI and IoT can analyse data and make decisions and act on that data without involvement by humans.

g. Big Data: It is a combination of technology and analytics that can collect and compile novel data and process it in a more useful and timely way to assist decision making. Data mining is the computing process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning statistics and database system. Big Data and analytics have the potential to add value across each step and can streamline food processing value chains such as selection of right agri-inputs, monitoring soil moisture, tracking prices of market, controlling irrigations, finding the right selling point and getting the right price.

G. Jal Jeevan Mission

Government of India has restructured and subsumed the ongoing National Rural Drinking Water Programme (NRDWP) into Jal Jeevan Mission (JJM) to provide **Functional Household Tap Connection (FHTC) to every rural household** i.e., *Har Ghar Nal Se Jal* (HGNSJ) by **2024**.

Proposed Jal Jeevan Mission will be a decentralised, community-managed and sustainable water management scheme –

- Out of 17.87 crore rural households in the country about 14.6 crore which accounts for 81.67 percent are yet to have household tap connections for water.
- JJM envisages a structural change in the provision of drinking water supply services. The service provision should change to 'utility based approach' centered on 'service delivery'
- The government had also integrated different ministries and departments dealing with water into one ministry — the Ministry of Jal Shakti.

Work to be taken up under JJM:

- In-village water supply (PWS) infrastructure for tap water connection to every household
- Reliable drinking water source development/ augmentation of existing sources
- Transfer of water (multi-village scheme; where quantity & quality issues are there in the local water sources)
- Technological intervention for treatment to make water potable (where water quality is an issue, but quantity is sufficient)

- Retrofitting of completed and ongoing piped water supply schemes to provide FHTC and raise the service level
- Grey water management
- Capacity building of various stakeholders and support activities to facilitate the implementation

73rd Amendment of Constitution of India: Gram Panchayats or its sub-committees will play a crucial role in planning, designing, execution, operations and maintenance of the in-village infrastructure under the Jal Jeevan Mission – Every village is to prepare a village action plan (VAP) which will be essentially having three components namely;

1. Water source & its maintenance
2. Water supply and
3. Grey water management.

What is the exact issue:

In 1951, per-capita water availability in India was just over 5,000 cu m per year. In 2011, it was 1,545 cu m. The figure has almost certainly come down since. Should it drop below 1,000 cu m per year, India will formally become a water-scarce country for the first time in its 5,000-year history. If water availability is a problem, inequality in access is even more so.

India has 180 million rural households. About 33 million have access to piped water; a little over 145 million don't. This mission means 4.5 times more houses have to be linked to piped water in the coming five years than has been done in the past 72 years-

- Augmenting water availability will be the sum of several efforts:
- Conservation and revival
- Recycle and reuse of water (including grey water)
- Rainwater harvesting
- Judicious use of water for farming (an expansion of 'per drop, more crop')
- Efficient use of water in industry
- In situ treatment of waste rather than transporting it long distances using copious quantities of water
- Labelling products, or pushing industry to benchmark optimal use of water

The Way Forward

- Need to relook at water-guzzling sugarcane —with a value chain that sucks is terrible in terms of subsidies at various stages
- Need to reimagine the public health engineering department (PHED) as not just a technical body but also as a public utility that oversees water entitlements as well as pricing of such entitlements is a goal. Digital sensors could facilitate remote monitoring of household water supply and quality, and eliminate tedious meter readings.
- This devolution can be incentivised by GoI, linked to milestones state governments and gram panchayats must reach, and hand-held by NGOs. For instance, JJM could tie up with the skill development ministry to train village women to measure turbidity and quality.
- On the lines of the Swachh Bharat Mission, extensive information, education and communication will be needed to create a jan andolan for water management. The ongoing Jal Shakti Abhiyan will help in creating awareness about the importance of integrating source sustainability and water reuse with the provision of household water supply.

Note:

SDG-6: Ensuring universal access to safe and affordable drinking water for all by 2030

Water-stressed districts: Districts with critical or over-exploited groundwater levels as per the Central Ground Water Board (CGWB) 2017. For states without critical and over-exploited groundwater levels, districts with the least availability of groundwater in comparison to the rest of the districts in the state have been selected.

H. Pradhan Mantri Krishi Sinchayee Yojana

Government of India is committed to accord high priority to water conservation and its management. To this effect Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been formulated with the vision of extending the coverage of irrigation 'Har Khet ko pani' and improving water use efficiency 'More crop per drop' in a focused manner with end to end solution on source creation, distribution, management, field application and extension activities.

PMKSY has been formulated amalgamating ongoing schemes viz. Accelerated Irrigation Benefit Programme (AIBP) of the Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR,RD&GR), Integrated Watershed Management Programme (IWMP) of Department of Land Resources (DoLR) and the On Farm Water Management (OFWM) of Department of Agriculture and Cooperation (DAC).

What are the major objective of PMKSY?

- Achieve convergence of investments in irrigation at the field level,
- Expand cultivable area under assured irrigation,
- Improve on-farm water use efficiency to reduce wastage of water,
- Enhance the adoption of precision-irrigation and other water saving technologies (More crop per drop),
- Enhance recharge of aquifers and
- Introduce sustainable water conservation practices

Various Provisions of PMKSY

Provision has been made under PMKSY during 2015-16 for carrying out extension activities in the field with special focus on water harvesting, water management and crop alignment for farmers and grass root level field functionaries. Main component are as under:

- Accelerated Irrigation Benefit Programme (AIBP) & Command Area Development & Water Management (CADWM): To focus on faster completion of ongoing Major and Medium Irrigation, including National Projects.
- PMKSY (Har Khet ko Pani): Source augmentation, distribution, ground water development, lift irrigation, diversion of water from water plenty to water scarce areas, supplementing rain water harvesting beyond IWMP & MGNREGA, repair, restoration, renovation of traditional water bodies
- PMKSY(Per Drop More Crop): Micro level storage structures, efficient water conveyance & application, precision irrigation systems, topping up of input cost beyond MGNREGA permissible limits, secondary storage , water lifting devices, extension activities, coordination & management.
- PMKSY (Watershed): Ridge area treatment, drainage line treatment, soil and moisture conservation, water harvesting structure, livelihood support activities and other watershed works.

What are the Challenges:

- Per Drop More Crop" requires higher investment to introduce costly sprinklers and drip irrigation which small landowning farmers cannot afford.
- Using treated waste water for peri urban and rural agricultural area is not feasible due to lack of adequate waste water treatment plants.
- The PMKSY contradicts the National Water Policy-2012, formulated by the government itself. While NWP-2012 aims at management of water from the perspective of hydrological unit, that is, river basin or sub-basin or watershed, PMKSY envisages water management at the level of the district — a lower order political boundary of governance.
- Wherever the watershed is divided by several districts, there could be several plans within a single watershed tearing up the watershed in different directions. So, even before the start

of the programme, the contradiction of hydrological unit versus district as a unit will torpedo the envisioned objectives of PMKSY.

- The requirement of agencies to possess land first before funding is not in the scheme of PMKSY. Therefore, two of its sub-components, namely AIBP and ' Har Khet Ko Pani' could be adversely affected and can fall short of the target.
- It's a bureaucratic mess. While specialists are the pillars of innovation and manufacturing in advanced countries, the PMKSY is loaded with generalists in the bureaucracy. The engineering component has been emasculated.
- There is also no reference to accountability when there is a failure to meet targets or to formulate any district plans.

Conclusion

The government can implement a project through its agencies or through an NGO, but once they finish, who remains to sustain it? If local Panchayati Raj leadership and watershed user associations are not strengthened and empowered, any benefits will be cyclical and short-term only.

PRELIMS ORIENTED NEWS

1. Indian National Satellite (INSAT)

- Launched in 1977
- The major objectives of INSAT were to produce and transmit varied programmes designed to inform, educate, entertain and enrich all sections of the people.

2. EDUSAT

- The dedicated satellite for education in India launched by ISRO
- It is the first Indian satellite exclusively built for the use of education sector.

3. e-NAM: Platform for Marketing

- To create a unified national market for agricultural commodities with the vision to promote uniformity in agriculture marketing by streamlining of procedures across the integrated markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply.
- The NAM portal provides a single window service for all APMC related information and services which includes commodity arrivals, quality & prices, provision to respond to trade offers and electronic payment settlement directly into farmers' accounts and helping them for better market access.
- To strengthen agriculture marketing and facilitate farmers to sell their harvested produce through the online portal, 177 new mandis have been linked with the National Agriculture Market (eNAM).
- To de-congest mandis during COVID-19 lockdown situation, FPO trade module, Logistics module and eNWR based Warehouse module were also initiated.

4. India's Report: R&D Expenditure & Scientific Publications

The country's gross expenditure in R&D has tripled between 2008 & 2018 driven mainly by Government sector and scientific publications have risen placing the country internationally among the top few. This is as per the R&D Statistics and Indicators 2019-20 based on the

national S&T survey 2018 brought out by the National Science and Technology Management Information System (NSTMIS), Department of Science and Technology (DST).

- India is placed 3rd among countries in scientific publication as per NSF database
- India is ranked at 9th position in terms of Resident Patent Filing activity in the world
- The number of researchers per mn populations has doubled since 2000

5. 'GOAL' Programme for Tribal Youth

- The GOAL (Going Online As Leaders) programme of the **Ministry of Tribal Affairs** (MoTA) has been launched in partnership with **Facebook**. The programme is designed to provide mentorship to **tribal youth** through digital mode.
- The digitally-enabled program envisages to act as a catalyst to explore hidden talents of the tribal youth, which will help in their personal development as well as contribute to all-round upliftment of their society.
- The programme intends to upskill and empower 5,000 tribal youths in the current phase to harness the full potential of digital platforms and tools to learn new ways of doing business, explore and connect with domestic and international markets

All the best ☺
Team IASbaba