IASBABA'S YK GIST

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Preface

This is our 32nd edition of Yojana Gist and 23rd edition of Kurukshetra Gist, released for the month of November, 2017. 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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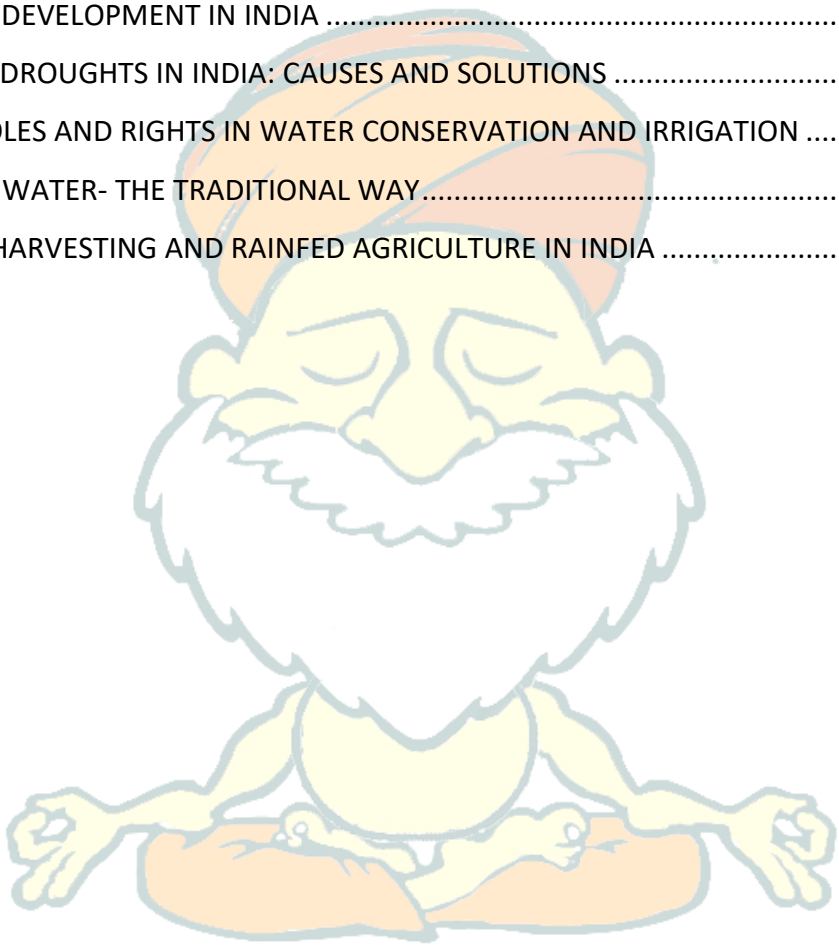


The new wave of India Micro, Small and Medium Enterprises

India is expected to emerge as one of the leading economies in the world over the next decade and the Micro, Small & Medium Enterprises (MSME) segment is expected to play a significant role. The development of this segment is extremely critical to meet the national imperatives of financial inclusion and generation of significant levels of employment across urban, rurban and rural areas across the country. Further, it can nurture and support development of new age entrepreneurs who have the potential to create globally competitive businesses from India.

MSME can be the backbone for the existing and future high growth businesses, with both domestic and foreign companies investing in the 'Make in India' initiative and making significant impact in the area of indigenisation. MSME should enable the development of a business ecosystem that enables and continuously support business that are gearing to deliver the right product, the right quality, the right solution and the right service at a competitive price, both in domestic and international markets.

It is equally important that the MSME segment develops in all areas of agriculture, manufacturing and services sectors because each of these sectors will continue to be very relevant to the overall GDP growth as well as employment generation. A catalyst for socio-economic transformation of the country, the sector is critical in meeting the national objectives of generating employment and discouraging rural-urban migration.

Of the many challenges impeding the growth and development of MSMEs, limited access to financial resources, lack of infrastructure support and inadequate linkages to domestic and global markets, etc. are few of the bottlenecks that make these enterprises vulnerable, particularly in the period of economic downturn.

	Investment in Plant and Machinery/ Equipment (excluding land and Building	
	Manufacturing Enterprises	Services Enterprises
Micro	Up to Rs. 25 lakh	Up to Rs. 10 lakh
Small	More than Rs.25 lakhs and up to Rs. 5 crore	More than Rs. 10 lakhs and up to Rs. 2 crore
Medium	More than Rs.5 crore and upto Rs. 10 crore.	More than Rs.2 crore and up to Rs. 5 crore

MSME Amendment Bill, 2015

In 2016, there were more than 36 million such units providing employment to over 80 million persons, whilst contributing about 8 per cent to GDP, 45 per cent to the total manufacturing output, and 40 per cent to the exports from the country.

The Bill aims to

1. Enhance the existing limit for investment in plant and machinery considering changes in price index and cost of inputs consistent with the emerging role of the MSMEs in various Global Value Chains
2. Include medium enterprises apart from small enterprises in section 7(9) to enable the aforesaid category of enterprises to avail the benefits and become competitive
3. Empower the Central Government to revise the existing limit for investment, by notification, considering the inflation and dynamic market situation

The investment limit prescribed for Micro, Small and Medium Enterprises (MSMEs) in the country, is proposed as under:

Manufacturing enterprises:

- Micro enterprise Investment in plant and machinery: Not exceed fifty lakh rupees
- Small enterprise Investment in plant and machinery: More than fifty lakh rupees but does not exceed ten crore rupee
- Medium enterprise Investment in plant and machinery: More than ten crore rupees but does not exceed thirty crore rupees

Service enterprises:

- Micro enterprise Investment in equipments: Not exceed twenty lakh rupees.
- Small enterprise Investment in equipments: More than twenty lakh rupees but does not exceed five crore rupees
- Medium enterprise Investment in equipments: More than five crore rupees but does not exceed fifteen crore rupees

Benefits:

- Enhance the existing limit for investment in plant and machinery considering changes in price index and cost of inputs consistent with the emerging role of the MSMEs in various Global Value Chains,
- Include medium enterprises apart from small enterprises in section to enable the aforesaid category of enterprises to avail the benefits and become competitive,
- Empower the Central Government to revise the existing limit for investment, by notification, considering the inflation and dynamic market situation

Creation of a dedicated bank for refinancing microfinance institutions (MFI)

Would lay down guidelines for

1. **Micro and small enterprise financing;**
2. **Business, registration, regulation and accreditation of MFI entities;**
3. **Promoting right technology solutions**
4. **Formulating a credit guarantee scheme for loans given out to micro enterprises.**

The government has also announced that loans to SMEs by public sector banks are to be brought under priority sector lending.

Should India relook into its definition of MSME?

MSMEs in India are defined on the basis of the investments made in plant and machinery, according to the MSME Development Act of 2006.

At the present juncture, when the need to create jobs is the most important task of governance, there is a need to *radically redefine the norms for categorisation of the MSME sector*, by only taking the number of employees into account.

The German way

Germany, one of the few growth engines of the world today, is a shining example of the difference

that such a great thrust for MSMEs can make. The German Federal Ministry for Economic Affairs and Energy has stated that it has accepted the definition of SMEs as businesses with an annual turnover of less than €50 million and with fewer than 500 employees.

In Europe, an SME has been defined by the European Commission as being a company with fewer than 250 employees and an annual turnover of less than €50 million (or total assets of less than €43 million).

Sentiment index for MSME sector

The sentiment index, named as CriSidEx, is expected to provide crucial insights into employment, business environment and foreign trade in the MSME sector.

- Provide crucial insights into employment, business environment and foreign trade
- Provide intelligence and insights for regulators, trade bodies, lenders as well as economic & financial analysts.
- Help in forecasting the business environment because it will capture sentiment on various business parameters such as the business situation, capacity utilisation, order book and margins. It will flag potential headwinds and changes in production cycles and thus help improving market efficiencies.

Concerted efforts required to utilize the potential of Demographic Dividend in India's lap

Small enterprises are known to support the vitality of markets by complementing large-scale industries, providing a large number of low-cost jobs (especially for low- or medium-skilled workers), creating wealth by contributing appropriately to the GDP, and going on to become large enterprises in the future. Therefore, it is imperative for the government to build competitiveness in this sector.

Thrust in policy reforms:

- Ease of starting and exiting business
- Single window system for approval
- Relaxation of Foreign investment norms
- Need to simplify Legal Governance
- Sick enterprises should be given one time settlement (OTS) facility by the banks before enforcing measures under the Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI) Act.
- There is need to abolish licensing of all kinds including municipal/local authorities licences for businesses that employ, say, five in rural and semi-urban centres and 10 in urban centres, totally.

E-Governance: Different procedures and lack of mutual trust leads to hidden costs and slow paralysis

- Strengthen the communication between stakeholders
- Establish a proper procedure pan-India
- Improve efficiencies in service delivery
- Public Participation to be enhanced via the integration of Social Media
- Building up of a database to measure the levels of productivity of the products
- Identification of products in need of research and development

Massive need for providing adequate infrastructure:

- Deficiencies in basic infrastructural facilities like water, power supply, road/rail and telephone connectivity, etc. should be addressed on priority basis.
- Use of solar or renewable energy as an alternative source should be encouraged in rural areas on subsidized basis.
- A cluster-centric or cluster development approach should be adopted for a number of enterprises working in closer proximity.

Continued supply of credit: Currently despite the best efforts, 40 percent still rely on the informal sources for funds. There needs to be a concerted effort to provide funds for these sources.

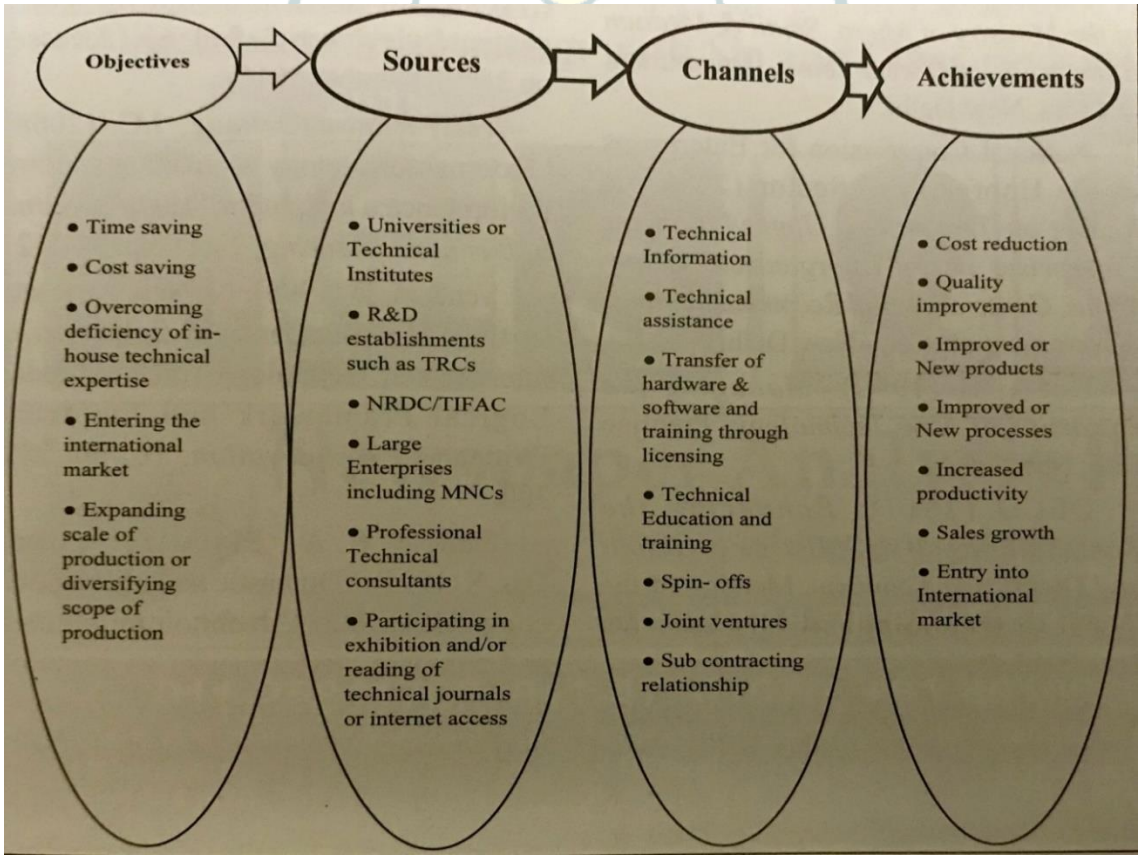
- Financial Education of the borrowers for empowerment
- Statutory guidelines to stipulate penalties or interest for big corporations which delay payments to SMEs
- Skill development for bankers :
    - Standardising simple format for accounting purposes for MSMEs,
    - Competent development of human resources,
    - Cultivating business ethics and standards, and
    - Imparting training to MSMEs
- PMJDY needs to be utilized so that financial resources can be directed towards targeted MSMEs.

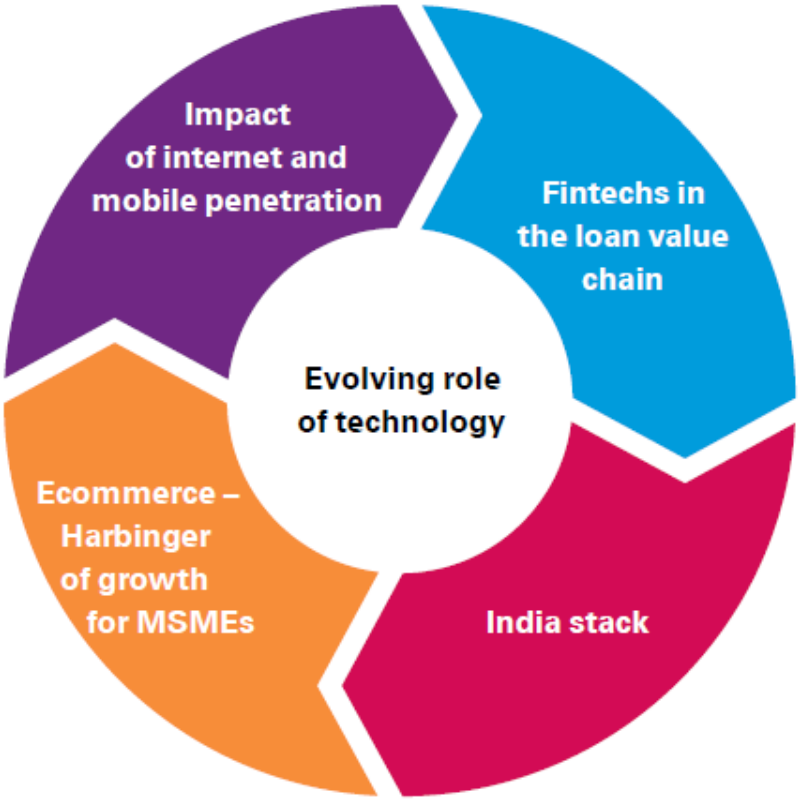
Adopt a programme like the Small Business Innovation and Research (SBIR): Under SBIR, governments disburse funds on a competitive basis to small enterprises and help them build their R&D capabilities. Improving R&D will boost innovation and make enterprises more competitive. As a result, they will generate higher employment and will be more productive with improved products and services. In fact, SBIR in the US has helped small businesses secure over 67,000 patents since its inception. Apple, Chiron, Compaq and Intel have been the early beneficiaries of SBIR.

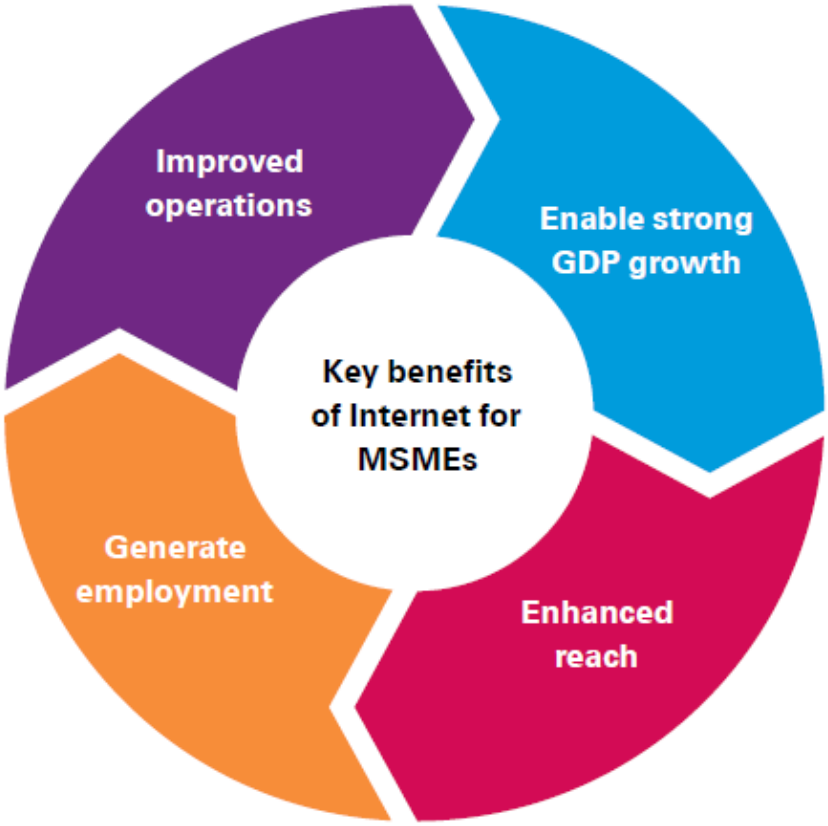
Employment Generation & Skill Development: MSMEs are labour-intensive and have the capability to create more jobs to cater to a young demographic country like India, where the climatic vagaries render many unemployed in the agricultural sector.

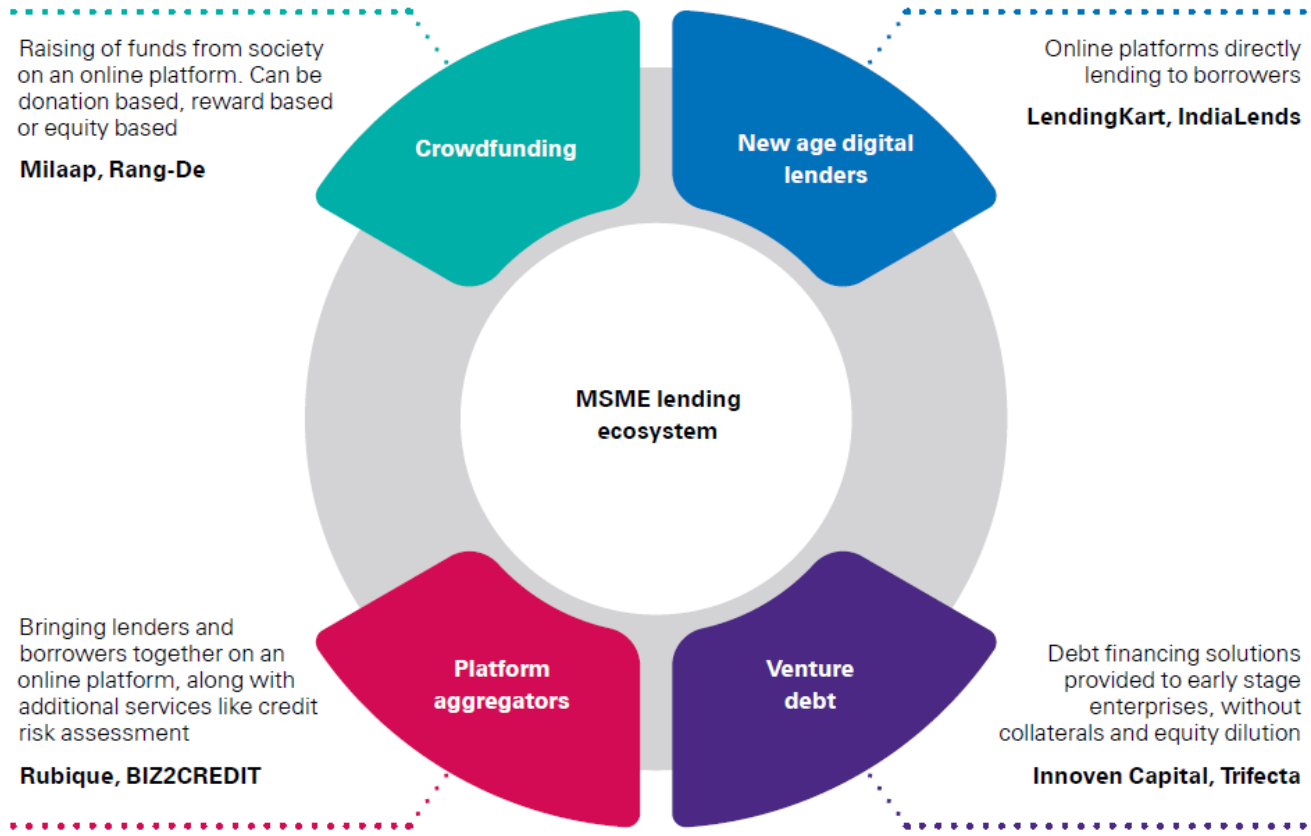
- Training of educated unemployed youth both in conventional and most advanced production and management technology/processes
- Developing Modular Courses and training of trainers
- Developing districts wise skill development needs and training providers.
- Up-scaling in collaboration with NSDC, Ministry of Skill Development, Entrepreneurship, Youth Affairs and Sports and Ministry of Labour and Employment
- Providing adequately trained and skilled manpower: With more and more sophisticated machinery usage, the industry needs have shifted to highly skilled operators and there needs to be a seamless supply in the near future. Skill programmes through the National Skill Development Agency & National Council on Vocational Training could potentially help bridge this skill gap.

Technology Development and Innovation




Impact of internet and mobile penetration
Fintechs in the loan value chain
Evolving role of technology
Ecommerce – Harbinger of growth for MSMEs
India stack


Improved operations
Enable strong GDP growth
Key benefits of Internet for MSMEs
Generate employment
Enhanced reach



Infographics: KPMG Report on MSME

Recent initiatives taken by government to encourage MSME

India Aspiration Fund (IAF):

- India Aspiration Fund (IAF) would invest in venture capital funds for meeting the equity requirement of MSME start-ups
- Life Insurance Corp. of India (LIC) will be a partner and co-investor in this fund.

SIDBI Make in India Loan for Enterprises (SMILE):

- It is a debt-fund which will carter soft term loans to MSMEs to meet debt-to-equity norms and pursue growth opportunities.
- SIDBI has set Initial corpus of Rs. 10, 000 crore under SMILE fund.

Scheme of Fund for Regeneration of Traditional Industries (SFURTI):

- To develop clusters of traditional industries in various parts of the country
- To make traditional industries more competitive with more market-driven, productive, profitable and sustained employment for traditional industry artisans and rural entrepreneurs
- To strengthen the local governance systems of industry clusters, with the active participation of the local stakeholders, so that they are enabled to undertake development initiatives by themselves

Prime Minister Employment Generation Programme (PMEGP)

- A credit linked Scheme to facilitate participation of financial institutions for higher credit flow to micro sector.
- Its objectives are to generate continuous and sustainable employment opportunities in Rural and Urban areas of the country through start-ups.

Udyog Aadhaar Memorandum (UAM): a simple one-page registration Form. This is an important step to promote ease of doing business for MSMEs in India as the UAM replaces the filing of Entrepreneurs' Memorandum with the respective States/UTs.

Framework for revival and rehabilitation of MSMEs: Provides a mechanism for revival and rehabilitation with a definite voice to the Entrepreneurs and is expected to balance the interest of debtors and creditors.

A Scheme for Promoting Innovation, Rural Industry and Entrepreneurship (ASPIRE): To promote Innovation & Rural Entrepreneurship through rural Livelihood Business Incubator (LBI), Technology Business Incubator (TBI) and Fund of Funds for start-up creation in the agro-based industry.

National Small Industries Commission (NSIC) under the Ministry of MSME is implementing the Raw Material Assistance Scheme which aims at helping MSEs by way of financing the purchase of Raw Material (both indigenous & imported).

Credit Guarantee Fund Scheme for Micro and Small Enterprises (MSEs): To facilitate easy flow of credit to Micro, Small and Medium Enterprises

Credit Guarantee Fund Trust for Micro and CGTMSE Scheme: CGTMSE was set up to strengthen credit delivery system and facilitate flow of credit to the MSE sector. It seeks to reassure the lender that, in the event of a MSE unit, which availed collateral free credit facilities, fails to discharge its liabilities to the lender; the CGMSE would make good the loss incurred by the lender up to 85 per cent of the credit facility.

Credit Linked Capital Subsidy Scheme (CLCSS) for Technology Upgradation: CLCSS aims at facilitating technology upgradation of Micro and Small Enterprises (MSEs) by providing 15% capital subsidy (limited to maximum Rs.15 lakhs) for purchase of Plant & Machinery.

Trade Receivable e-Discounting System (TReDS): TReDS is an institutional mechanism for facilitating the financing of trade receivables of MSMEs through multiple financiers. TReDS will facilitate by creating an electronic platform / Electronic Bill Factoring Exchanges,

whereby MSME bills against large companies can be accepted electronically and auctioned, to ensure prompt realisation of receivables at competitive rates.

Financial Support to MSMEs in ZED Certification Scheme: The objective of the scheme for promotion of Zero Defect and Zero Effect (ZED) manufacturing amongst micro, small and medium enterprises (MSMEs) and ZED Assessment for their certification so as to:

- Develop an Ecosystem for Zero Defect Manufacturing in MSMEs.
- Promote adaptation of Quality tools/systems and Energy Efficient manufacturing.
- Enable MSMEs for manufacturing of quality products.
- Encourage MSMEs to constantly upgrade their quality standards in products and processes.
- Drive manufacturing with adoption of Zero Defect production processes and without impacting the environment.
- Develop professionals in the area of ZED manufacturing and certification.

Niryat Bandhu Scheme: To reach out to the new and potential exporters including exporters from Micro, Small & Medium Enterprises (MSMEs) and mentor them through orientation programmes, counselling sessions, individual facilitation, etc., on various aspects of foreign trade to enable them to get into international trade and boost exports from India.

Additionally, the Insolvency and Bankruptcy code (IBC) has been enacted and Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest Act (SARFAESI) and The Recovery of Debts due to Banks and Financial Institutions (RDDBFI) Act have been amended to improve resolution/recovery of bank loans. Six new Debt Recovery Tribunals (DRTs) have been established for improving recovery.

It is time to connect the dots

1. Can virtual clusters launched by the Ministry of Micro, Small and Medium Enterprises supplement the existing physical clusters? Critically examine.
2. Write a short note on MUDRA Bank.
3. Amid all the noises surrounding the issue of GI, the hoarse history of neglecting our traditional artisans and workers, fail to ring bells. Is it possible to establish synchronization between the empowerment of our craftsperson and MSME? Suggest a way forward.
4. Can inclusive growth of small enterprises be considered as means to generate jobs and elevate people out of poverty? Comment.
5. What is a micro, small and medium enterprise all about? Mention the recent initiatives taken by the government to encourage small enterprises and also throw light on how can these small enterprises add value in a big way to India's growth story?
6. A big challenge faced by the MSME sector in India is regarding the definition of what constitutes micro, medium and small units both in manufacturing and services. Discuss briefly what the issue is about and how it hampers the growth of the sector.
7. "In every progressive economy, there has been a steady shift of employment and investment from the essential primary activities to secondary activities of all kinds and to a still greater extent into tertiary production". In the light of the current initiatives taken for the revival of MSME's, comment on the statement with your opinion on the burgeoning signs of distress and the disequilibrium of employment present amongst the three sectors.

MORE CROP PER DROP: EFFICIENT IRRIGATION WATER USE

Globally, 0.4% of total water on earth is at our disposal for meeting our needs. 14% of world populations shares 53% of total water resources while 86% of world population including china and India shares 47% of global water resources. India's share of world water resources is only 4% although it contributes 17% of world population.

Water resources are essential inter alia, for life, livelihood and ecology. They are vital for economic development and are also crucial for food security national security and energy security.

There are spatial and temporal variations of water availability. For example, 75% of rainfall in India occurs in 4 months with highest precipitation in north east region and lowest in rajasthan. The per capita availability of water resources is declining over the years, it is estimated to touch the water scarcity zone by 2050.

Even today, India's per capita water availability is low compared to countries such as Brazil, Australia, USA, UK, Bangladesh and china.

Agriculture sector although consuming about 80% of India's water resources, suffers from low water use efficiency (about 38%). It is especially important because India being an agrarian economy, is largely dependent on farm cultivation for fulfilling its basic needs in fact, irrigation is a major input cost agriculture amounting to about 70% of total input cost. Increasing water use efficiency means water saving leading to lower input cost.

The irrigated area in gross terms is about 80 million hectares, the largest amount of irrigated agriculture in the world.

In **irrigation conveyance system**, there is significant water loss by the time water reaches the tail end due to inefficiencies in conveyance system. The conventional irrigation water use such as through canal and flood irrigation has efficiency varying from 55-66% while the improved micro irrigation systems using drop and micro irrigation technology has efficacy above 90%. A huge amount of water loss in canal and flood irrigation occurs due to evaporation, percolation and seepage. In contrast, the closed pipe network reduces this loss significantly.

Various types of irrigation efficiency are used

- **Water conveyance efficiency** talks into account the conveyance and transit loss and is determined as a traction of water delivered to farm or irrigated plot where the water supplied or diverts from river or reservoir.
- **Water application efficiency** focus on the attention of suitability of the method of application of water to the crops. In a well-designed surface irrigation system, the water application efficacy is at least 60% while in sprinkler irrigation is about 75%.
- **Low water application efficiency** is due to inter alia, irregular land surface etc.

- **Water use efficiency** is the ratio of water consumptively used to the quantity of water delivered.
- **Water storage efficiency** gives an insight to how completely the required water has been stored in the root zone during irrigation. It is the ratio of water stored in the root zone during irrigation and the water needed in the root zone prior to irrigation.
- The **water distribution efficiency** evaluates the degree to which the water is uniformly distributed throughout the root zone. The more uniformly the water is distributed, the better will be the crop response.

Steps for water conservation

The demand of water in all sectors including irrigation is increasing. However, there is a limited supply of water resources. In addition, there is a threat from climate change effects which will be further reduce availability of water resources.

To meet the increasing demand, there is a need for water conservation and reducing water contamination in all sectors. There is and for increasing water use efficiency in all sectors

- Proper and timely system maintenance
- Rehabilitation and restoration of damaged and silted canal system
- Conjunctive use of surface and ground water
- Adopting 'drip and sprinkler' systems for crop irrigation
- Revision of cropping pattern in event of water change availability
- Constitution of water user association
- Promoting multiple use of water
- Introducing night irrigation to minimize evaporation losses.
- Assuring timely and optimum irrigation for minimizing water loss and water logging.
- Worldwide initiatives
- World water council 2000 envisions 50% of the increased agricultural demand by 2025 should be met by increasing productivity of water
- UN world water assessment programme calls for enhancement of crop water productivity to reduce demand for new supply sources or increasing water allocation to agriculture.
- National water mission of GoI has set target of increasing water use efficiency by 20% a a part of National Action Plan on climate change.
- Launch of PMKVY to improve farm water use efficiency to reduce wastage of water, enhance the adoption of precision irrigation, enhance recharge of ground water aquifers and sustainable water conservation practices.

Conclusion

Efficient water use in agricultural sector is a challenging task in Indian context as stakeholders are too many. The participation of such stakeholders in this effort would

require collaboration with governments, civil societies, corporate bodies, financial institutions and others.

There is a need for change of minds of the stakeholders as well. There is also a need of to have an integrated solution for irrigation systems such as introducing micro irrigation systems – drip and sprinklers', application of IT, use of sensor based water conveyance and application to fields, introducing solar pumping techniques and adopting water conservation methods such as ground water recharge.

Zero tillage technology preserves moisture in the soil and use of laser leveling technology and has the potential to save irrigation water. These are good practices in India on the subject, but these should be scaled up.

KRISHI SINCHAYEE YOJANA- DOUBLING FARMERS' INCOME

- NSSO data for 2011-12 reveals that more than one-fifth if rural households with employment in agriculture as their principal occupation were having income less than the poverty line and in some states like Jharkhand an, 45.3% of farm households were under poverty.
- The past green revolution technologies are input intensive and have not helped the entire agriscape of India.
- Additionally, average size of the operational holding is declining.
- With 67% as marginal farmers, there is a growing disparity between agricultural and non-agricultural income, rural youth has rising aspirations and there are inadequate institutional arrangements to mitigate risks and crop loss due to droughts, floods, heat/cold wave and other natural disasters.
- The government has noticed a persistent distress among the agrarian society and is eager to devise an effective mitigation policy.

Enhancing access to irrigation and technological advancement are the most potent instruments to raise agricultural productivity. **With the availability of irrigation it is possible to enhance cropping intensity known as 'vertical intensification'**.

- Presently, 76% of the agricultural land in the country remains unused for half of the productive period due to lack of access to meet the crop water requirement.
- Even in irrigated areas, adequate and affordable irrigation is not available throughout the year.
- Once assured irrigation is available, diversification to high value crop has the potential to raise the farmers' income.
- As per data of NITI Ayog, shifting one hectare area from staple crops to high value crops like fruits, vegetables, floriculture, commercial crops t. has the potential to increase gross returns upto Rs. 101608/ha as compared to Rs. 41169/ha for staple crops. This is an increase of 2.47times.

PM Krishi Sinchayee Yojana

Inspite of India being blessed with ample water resources at the national level, the present Indian irrigation is besieged with several problems including

A widening gap between irrigation potential created (IPC) and irrigation potential utilised (IPU)	High dependence on ground water irrigation leading to over-exploitation of groundwater resources and declining water tables in large parts	Poor development of water resources and rural electrification and seasonal flooding in the eastern region
Low water use efficiency/water productivity in agriculture and all other sectors	Weak regulation and half hearted implementation of water policies	Non-convergence of several water resources related schemes

PMKSY had two objectives

- Har Keht Ko Pani
- Per Drop-More Crop

Speedy execution of river linking project, at least one new water conservation structure per village, speedy completion of the pending irrigation systems to achieve 'more crop per drop' were advanced as the instruments to achieve the vision.

Focus of the programme is to provide end-to-end solution to irrigation supply chain through development of water resources, creation of an efficient distribution network and improve farm level management and water –use efficiency.

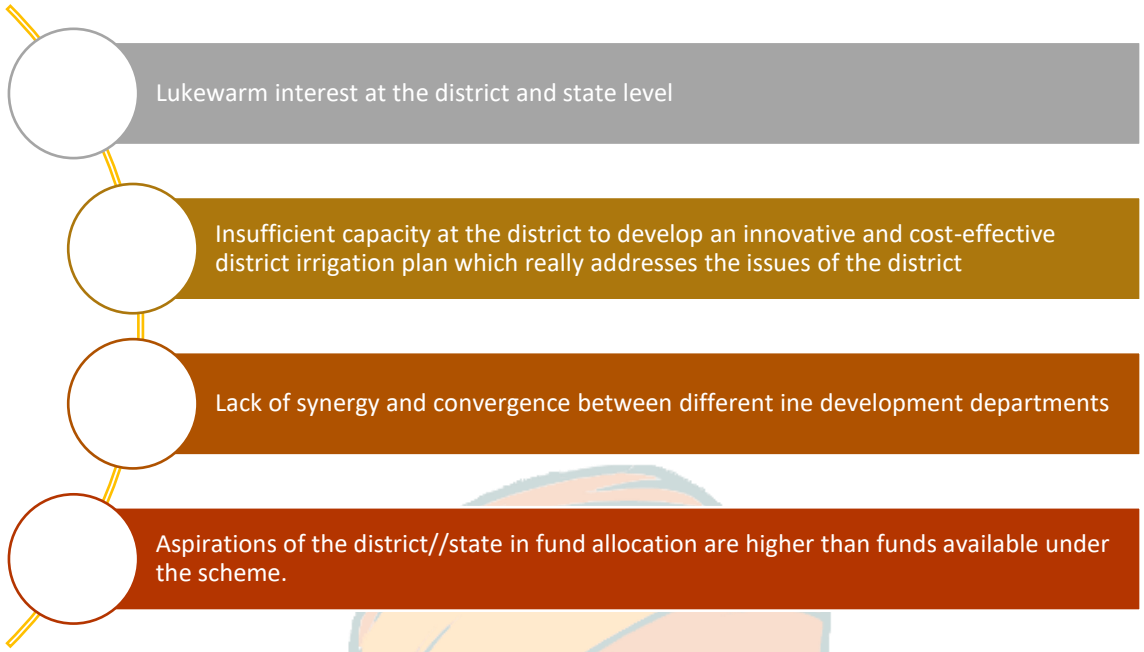
The programme is regularly reviewed by PMO and NITI Ayog.

Way forward

There is a need for **synergy between** various government departments, Krishi Vigyan Kendras and agricultural universities to work out efficient cropping patterns ad water use mechanisms in the command areas of these projects.

Why not successful?

In spite of good intentions and reasonable allocation of funds by the central government and its disbursement through NABARD, the programme has made little headway due to number of factors such as



Proposed intervention for its successful implementation are

Possible measures	Support to solar power irrigators cooperatives, especially in non-grid areas with shallow water tables
	Support to micro-irrigation to promote speedy installation of drips and sprinklers, especially in water stressed areas
	Closing gap between IPC and IPU in existing major and medium irrigation schemes.
	Encourage groundwater harvesting and recharge shafts, tubewells, infiltration wells etc.
	Encourage peri-urban wastewater irrigation for farm forestry, fodder, vegetables and floriculture cultivation.
	Ensure community participation and social inclusion in all programmes with special emphasis on women and girl child who are traditionally responsible for domestic water provisioning.

IRRIGATION SYSTEMS IN INDIA

Being an agriculture dependent country, irrigation is backbone of India. India has large water resources, great rivers systems and vast thirst tracts of land and is thus designed, so to say by nature for the development of irrigation.

Irrigation is a technique of supplying water to the dry land as a supplementation of rain water.

- It is mainly aimed for farming. There are various types of systems of irrigation practices in different parts of India.
- It is carried out through wells, canals, perennial canals and multi-purpose river valley projects.
- The irrigation engineer should be well acquainted with the type of soil moisture, quality of irrigation water, frequency of irrigation for the proper implementation of irrigation system.

In India, agriculture is mainly dependent on rainfall. The rainfall is generally unpredictable in its incidence and variable in amount. Hence, the distribution of water in India is very uneven and is concentrated only for four months.

India's irrigation is mostly groundwater well based. At 39 million hectares (mha) – 67% of total irrigation, India has the world's largest groundwater well equipped irrigation system. China with 19 mha and USA with 17 mha is second and third respectively.

Among the agricultural inputs which include seeds, fertilisers, plant protection, machinery and credit, **irrigation assumes an important place**. Irrigation means watering the fields by any means of water to the land or soil. It is the replacement or supplementation of rainwater with another source of water.

Types of irrigation system

- Tank water
- Tube wells
- Inundation
- Canals
- Multipurpose river valley projects

TANK WATER IRRIGATION SYSTEM

- It is prevalent in uneven in the uneven and relatively rocky plateau of peninsular India.
- Tanks are commonly used in Deccan plateau, Andhra Pradesh, Karnataka, TN, a Eastern MP. Chhattisgarh, Odisha and Maharashtra.
- There are about 5 lakh big and 50 lakh small tanks irrigating over 25.24 lakh hectares of agricultural land.
- Most of the tanks are small in size and built by individuals or groups of farmers by raising bunds across seasonal streams.
- Most of the tanks are natural and do not involve heavy cost or their construction
- Tanks are generally constructed n a rocky bed and have longer life span
- In many tanks, fishing is also carried on. This supplements both the food resources and income of farmers

Drawbacks

- Tanks cover large number of cultivable land
- Evaporation of water is rapid due to large expanse of shallow water of tanks
- Do not ensure perennial supply of water
- Lifting of water from tanks and carrying it to the fields is a strenuous and costly exercise which discourages the use of tanks as a source of irrigation.

WELL WATER IRRIGATION SYSTEM

- It is more widespread in plains, coasts and some regions of peninsular India. It is less costly and more flexible as water can be drawn whenever needed and 'evaporation loss' is minimized and no fear of 'over irrigation'.
- There were about 5 million wells in 1950-51 and now it has increased t about 12 million.
- Well irrigation has now rose to 332.77 lakh hectares from 59.78 lakh hectares in 1950-51

Two types of wells

- **Open wells**- they are shallow and irrigate small area because water available is limited and the level of water goes down during the arid season.
- **Tube wells**- they are deep, more suitable and have capacity o draw large volume of water. Mostly used in UP, Gujarat and Bihar.

Other irrigation systems

INUNDATION/CANAL IRRIGATION SYSTEM	•In many places during rainy season, there is flood in rivers which can be carried to the fields through canals. These canals are found in WB, Odisha etc. they supply water only when there is flood in the rivers and therefore are of no use during dry season.
PERENNIAL CANALS IRRIGATION SYSTEM	•The perennial canals get supply either from river directly or through reservoirs of the river projects. •From these reservoirs, water can be supplied the fields whenever there is demand for it. •So this system of irrigation ensures supply of water in all seasons. •Generally adopted in AP, TN, and Karnataka.
MULTIPURPOSE RIVER VALLEY PROJECTS	•In recent years, multi-purpose river valley projects are helping irrigation and growth of agriculture.

WATER SHED DEVELOPMENT IN INDIA

The rainfed areas of India are amongst the most challenging for the sustenance of the agrarian economy. They are almost entirely single cropped areas with scanty rainfall, prone to frequent droughts, soil erosion, characterised by fragile pasture lands necessitating large-scale cattle migration, depleting water tables, low employment opportunities and chronic poverty levels. It was to address these very challenging agrarian economics that the watershed development and the soil conservation programmes were formulated.

Initiatives in watershed

- In the 1990s, watershed based efforts at resource management had great appeal amongst academics, policy makers, environmentalists and had spawned considerable activity on a pan India basis.
- From WARSA guidelines in 1990-91 to NEERANCHAL in 2015 guidelines, integrated watershed management program has remained a flagship program for government in its efforts for drought moderation.
- This program has developed into huge people's movement based on pragmatism and effective regional organisations.

The best way to reclaim watersheds was through an integrated management model given the inter-linkages between the diverse dimensions- the natural resources, humans and cattle of which were inter-twined.
Lack of comprehensiveness and integrated management of watershed management activities led to severe soil erosion and environmental problems.

DPAP AND DDP

Drought Prone Areas Program (DPAP) and Desert Development Programme (DDP) had not created a substantial impact as the drought conditions in the county were increasing and ecological degradation was taking place unabated especially in drought prone areas. Later on, it was presented that **drought can be beaten with concerted efforts for development on watershed basis and active participation of local farmers willing to undergo sacrifices and share benefits.**
Greater attention should be given to people's own strategies and their own indigenous technologies including the locally preferred plans so as to incorporate in the programs to mitigate the rigors of drought. They reiterated that harmonious management development and utilisation of land, water and vegetation resources on watershed basis should be implemented with total participation of beneficiaries.

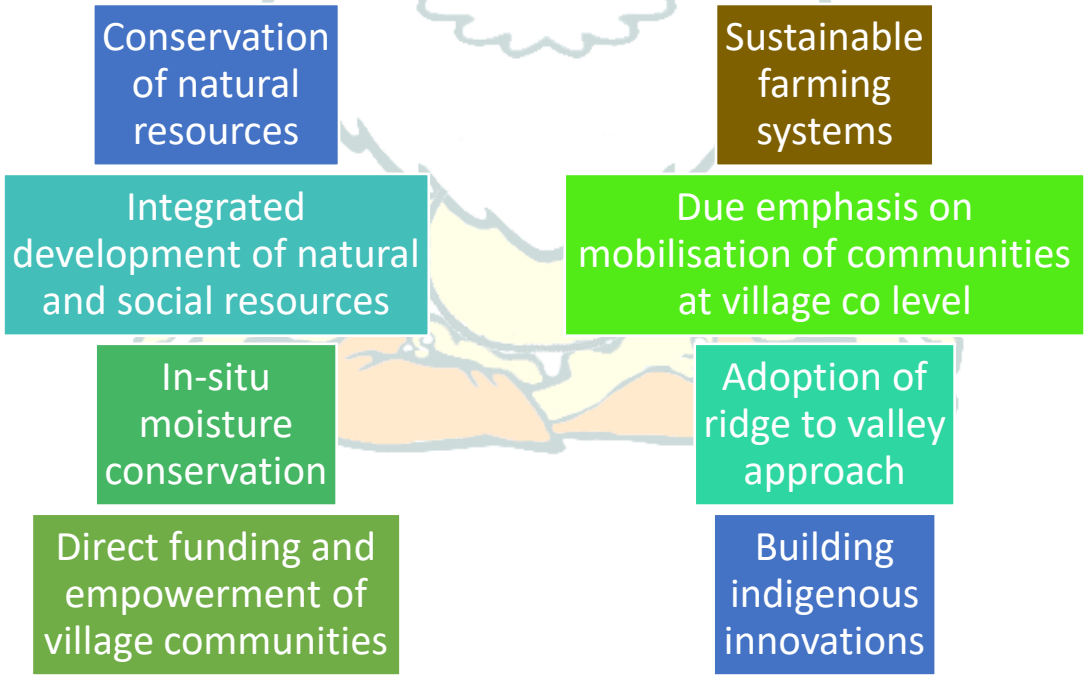
NWDPRA

The watershed movement was more than an organised effort of government. It entailed complex issues of coordination.

The **National Watershed Development Program For Rainfed Areas** recognised that **sustainability was possible only through people's participation and implementation should be strengthened through a participatory model**.

- **Capacity building** was needed for all stakeholders. Institutional development should start from the planning stage and continue to project implementation and maintenance stages.
- **Exposure visits** were necessary for increasing awareness levels and interactions.
- **Role of women** was seen as a crucial from planning to implementation. Monitoring and evaluation agency was necessary.
- Conventional watershed activities had little potential for raising incomes of the farmers. Hence **integrated management of watersheds** broadened the scope of projects to include subsidiary income generating activities, agricultural/non-agricultural activities.

The focus on guiding principles of NWDPRA



The watershed development was undertaken in a phased manner with an awareness generation, capacity building and project implementation phase followed by sustainable management phase.

IWDP

The World Bank financed Integrated Watershed Development Program (IWDP) which introduced **Improve and sustainable land management practices** in selected watersheds.
The project sought to adopt institutional arrangements to facilitate inter-agency coordination in watershed planning and implementation, and to ensure full participation of watershed land users in the development and management of common properties.

The project also sustainably improved the collective capability of government agencies to implement programmes of watershed development. It helped achieve **substantial involvement and commitment of local communities in planning, managing and maintaining improvements of communal and individual natural resources and assets**.

Key lessons learnt

- Initiatives that benefited the project implementations
    - Regular sup supervision and constructive approach
    - Flexibility to respond to the needs and priorities of beneficiaries
    - Emphasis on beneficiary participation and following cost sharing norms
    - Regular training courses
    - Maintenance of staff continuity
    - Innovative ways to facilitate inter-state exchange of experiences
- Potential improvement are
    - Need to assign sufficient time and emphasis in the beginning of projects to governmental and community joint planning- defining, location and sequencing project interventions and assigning responsibility. In watershed development
    - This is to ensure direct emphasis on women's needs, aspirations and involvement in watershed development and give more emphasis to policy and action plans concerning macro level management of natural resources.

HARIYALI

With PRIs emergence, the watershed development teams at village level was merged with Gram Panchayats. This resulted in watershed development programs at each level being administered by people who had money other responsibilities. Thus, there were coordination difficulties between transient actors pursuing departmental agendas.
Thus, the Haryali guidelines were introduced as to further simplify procedures and involve the Panchayat Raj Institutions (PRIs) more meaningfully in planning, implementation and management of economic development activities in rural areas.

The Parthsarthi committee report recommended a national authority for sustainable development of rainfed areas to be set up as quasi-independent authority to manage the watershed programs.
This national authority was responsible for bringing prosperity to the watershed regions through the sustainable development of natural resource base.

NEERANCHAL

In 2015, GoI approved World Bank assisted Neeranchal which was to bring about the institutional changes in the watershed and the rainfed agricultural management practices in India. It aimed to build systems that ensure watershed programmes and rainfed irrigation management practices are better focused and more coordinated and have quantifiable results. Further, it aims to devise strategies for the sustainability of improved watershed management practices in program areas, even after withdrawal of support.

Neeranchal supported both the conservation and production outcomes including the availability of water in the rainfed areas, catering to the needs of small and marginal farmers as well as asset-less, including women.

The challenges remained in enhanced participation of communities, building stronger capacities and systems to plan, implement, monitor and post-project sustainability of local institutions and assets.

NRAA

The National Rainfed Area Authority (NRAA) was constituted as an attached office of the Department of Agriculture And Cooperation in 2006.
It serves as an **advisory body for policy and program formulation and monitoring of scheme and programs to resolve the agrarian challenges** across the vast rainfed system of the country besides promoting sustainable practices for the steady growth of agricultural sector and farmers' welfare.

NRAA facilitates skill and knowledge development of farmers and enables openness and ability to adopt improved technologies and management practices for crop production, animal husbandry, horticulture, agro-forestry and farm resources linked enterprises.

Conclusion

India's watershed development programmes in the collaborative era have witnessed several success stores. NRAA is established for technical assistance, the program guidelines have been made highly participatory and adequate time has been given for implementation.

The government has provided adequate resources and manpower for effective implementation.

FLOODS AND DROUGHTS IN INDIA: CAUSES AND SOLUTIONS

On an average, every year, India gets 4000 billion cubic meters of water mostly through rainfall and some snowfall. However, this is the average, over a large number of years. In any given year, the rainfall, and hence the river flow, may vary from this average, on the lower side or on the higher side. Such rainfall instances, very low or very high are called hydrologic extremes.

Floods and droughts both are result of hydrologic extremes

FLOODS

The term 'flood' is commonly used to describe any inundation by water. But there are two distinct mechanisms that can cause inundation.

- A rainfall takes place somewhere in the upstream catchment, and consequent high flow in the river may spill out in to the habitation areas somewhere downstream. This is called flood.
- The other mechanism is a high rainfall may take place locally, and the rainwater may fail to drain out fast enough and accumulate in the city//village. This is called drainage congestion.

In India, 33.5 mha of area is flood prone and out of this, 7.5 mha on average is affected every year by floods.

Causes of floods

- **Heavy rainfall in the upstream catchment** causes large riverflow. The width of the river through the city downstream is not adequate to carry that flow, and the water spills over beyond the usual river banks.
- **Natural lake burst**- a landslide takes place in the river and acts like a dam. Water accumulates behind it, creating a lake. As the wat storage builds up, the landslide dam blocking the path bursts and the accumulated water flows out in a short time, causing a flood.
- **Breach of embankments**- they are constructed along both the banks of the rivers to protect human habitation. If it get breached river water enters the habitation.
- **Dam break**- this is very rare but a manmade dam may burst releasing a large quantity of water and causing flood.

Managing floods

They can't be entirely prevented/. The approach to flood management is a combination of protection from floods of less severity, reducing the damage by flood forecasting and disaster relief in case of floods of larger severity.

Flood management options are typically divided into two types

- **Structural** i.e. comprising some construction of embankments and Flood reservoirs
- **Non-structural** comprising flood forecasting, flood plain zoning and disaster relief.

What is not a solution?

This is an era of self-proclaimed experts and there is lot of misinformation doing the rounds about what causes floods and how to manage them. Three of these needs to be addressed.

- **Dams do not cause floods** but moderate them/ the extent of moderation depends on how full the reservoir was when the flood started. The flood released over the dam spill away is invariably less than the flood that would have been, had there been no dams.
- **Forests are not the solution to stop floods**. Foliage of trees intercepts some rainfall, tree roots promote percolation and trees act as impediment to water flow. But the impact of all this is perceptible only for small floods.
- There is **no such thing as 'our ancestors had learnt to live with floods'**. When the population was less, and the pressure on land resources was less, it was possible to simply live away from river. Many villages are now located close to river out of compulsion.

DROUGHTS

It is also an hydrological extreme like floods. But drought neither have a clearly defined beginning nor a clearly defined end.

At times, it may not be even possible to say with certainty that a drought has set it.

- Meteorological drought is when rainfall is deficient
- Hydrological draught when there is inadequate water in the rivers/aquifers
- Agricultural drought when there is inadequate water supply to crops.

About 153 mha area of country is drought prone. As many as 11 famines are recorded between 1769 and 1901 with an estimated 20 million deaths.

However, now it is possible to transport large quantities of food grains to drought affected areas and to transport water and the famine deaths are avoided. Nevertheless, drought brings severe distress to rural people even in this age.

Solutions to mitigate drought

Groundwater can be viewed as comprising two components. One the annual recharge. Two the water that has come to be stored in deeper aquifers, over large number of years. Unfortunately, there is no control on extraction of ground water and not only the annual recharge but even the deeper aquifers are being pumped dry.

Inter basin water transfer- The geographical area from which the rainfall accumulates and drains out through a river is called its river basin. By an ingenious design of canals, and at times by pumping, it is possible to take water from a surplus basin to a deficit basin. Such waster transfer is called IBWT.

The earliest plans to construct canal to link certain rivers was in 1858 by a British engineer. Though, it was for water transport and not linking water resources
Many attempts were made to Link Rivers through canals

- In 1972, there was a proposed plan to transfer water from Ganga near Patna to Cauvery through a series of canals and pipelines. The plan was based on good engineering but the cost was high compared to the benefits and thus not taken up
- In mid 1970s, two large canals were proposed to be built in Himalayan and peninsular India and two pipelines connecting these two canals. The plan was well intentioned but engineering concept was unsound and hence question of cost or benefit did not arise.
- In 1982, GoI set up national water development agency to carry out the water surplus/deficit studies for major river basins and prepare a plan for inter-basin water transfer. In 2000, a 'National perspective Plan for IBWT was releases, popularly known as the river linking plans. In this, the water surplus and water deficit areas were identified and proposed 30 different links to transfer water from surplus area to deficit areas. This is the plan that the nation is pursuing now.

WOMEN'S ROLES AND RIGHTS IN WATER CONSERVATION AND IRRIGATION

The empowerment of women is fundamental for the progress of the country. The latest census figures list less than 35% women formally as primary workers in the agricultural sector in contrast to 81% men. However, the indisputable fact remains that India's agricultural industry, which employs 90 to 100 million women, cannot continue to exist devoid of their labour.

The women involved in agriculture help in preparing the land, selecting seeds, preparing and sowing to transplanting the seedlings, applying manure, fertilisers, pesticides and then harvesting, winnowing and threshing, they work harder and longer than the male farmers.

Maintaining the ancillary branches in agriculture sector like animal husbandry, fisheries and vegetable cultivation depends almost solely on women. However, their participation in policy making is trivial.

Despite high women participation in the agricultural workforce, the primary reason for their low involvement in decision making is because of the fact that they are usually not listed as primary earners and owners of land assets as primary earners and owners of land assets within their families.

So their role is highly confined in getting loans, participating in market panchayats, assessing and deciding the crop patterns and in liaising with the government administrators vis-s-vis their male counterparts.

The nature and extent of women's involvement in agriculture varies significantly from region to region. Even within a region, their involvement varies widely among different ecological sub-zones, farming systems, castes, classes and stages in the family cycle. Over the years, the movement of men out of agriculture has led to an increase in women's share of the agriculture workforce and an expansion of their role in the sector.

Importance

- Women have to play an important role to play in promoting a new attitude towards the use of water resources based not only on technical knowledge but also on cultural and ethical values.
- The importance of **women for water and water for women** was formally recognised in the **Dublin conference**. One of the four principles of efficient and effective water provision incorporated into Dublin declaration claimed for the full involvement of

women in the planning and implementation of all scheme and initiatives for drinking water and sanitation

The **linkage between environmental degradation and poverty, particularly related to women's life** was recognised at the conference on the environment and development **UNCED** held in 1992.

In this regard, the **Rio declaration** declared that the 'women have a crucial role to play in environmental administration and sustainable development. Their holistic involvement is essential to achieve the goal of sustainable development. '

Water Management

Women play an **important role in water management**. It becomes imperative to ensure that the gender perspective is well integrated into policy relating to all sectors of the economy and society including water conservation and irrigation facilities due to their significant involvement in collection, usage and management of water in the household.

Moreover, as farmers of irrigated and rain fed crops, women have organic linkages and inherited knowledge about water resources, including quality and reliability, limitations and suitable storage methods and are the key to the accomplishment of water resources development and irrigation policies and programmes.

Women's water rights

- In India, over the years, the water resource policies and programs have proven detrimental to women's water rights. And consequently to the sustainable management and use of water.
- Interventions such as traditional irrigation fail to take into consideration the existing imbalance between men and women's ownership rights, division of labour and incomes.
- By raising the value of land, irrigation brings about social change which usually favours men. **Gender analysis** can help irrigation planners and policy-makers to improve the performance of irrigation schemes.
- Ensuring women's rights to use and control of land and irrigation water is a primary requirement. Studies have shown a direct correlation between independent land and irrigation rights for women and a higher productivity of land and labour

Conclusion

- Gender issues refer to any aspect governing the lives of women and men as well as the relations between them. The lack of participation of women in planning, maintenance and management has negative impacts on the quality of the services and on the overall position of women and their participation in development.
- Given that women's incomes are considerably lower than men's and- that the capital requirements to invest in irrigated crops can be quite high, access to credit systems should be made available to women irrigators' access to technology.

- There is a need to improve women's skill in water resources management with their active participation.
- In order to ensure that, there should be modification and amendment to legislations and institutional set up to allow women to enhance their role in irrigated agriculture and water conservation.

Water and women are both considered to be the source of life by most civilisations throughout our shared history. Now it is the time to acknowledge the need of water for women and women for water.

CONSERVING WATER- THE TRADITIONAL WAY

History tells us that both floods and droughts were regular phenomenon in ancient India. This is the reason why perhaps every region in the country has its own traditional water harvesting techniques that reflect geographical peculiarities and cultural uniqueness of the regions. The basic concept underlying all these techniques is that rain should be harvested whenever and wherever it falls.

Archaeological evidence shows that the practice of water conservation is deep rooted in the science of ancient India. Excavations show that the cities of the Indus Valley Civilisation had excellent systems f water harvesting and drainage. The settlement of Dholavira, laid out on a slop between two storm water channels is a great example of water engineering. Chanakya's Arthshastra mentions irrigation using water harvesting systems.

Drawing upon centuries of experience, Indians continued to build structures to catch hold and store monsoon rainwater for the dry seasons to come. These traditional techniques, though less popular today, are still in use. They are efficient, easier to maintain than many modern systems and also sustainable in long run.

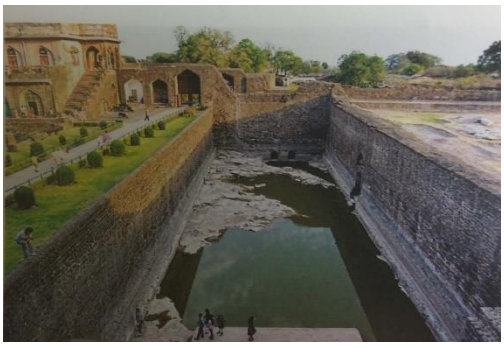
Jhalara

- rectangular shaped stepwells
- These stepwells collect subterranean seepage of an upstream reservoir or a lake
- They are built to ensure easy and regular supply of water for religious rites, royal ceremonies and community use.
- Jodhpur has many jhalaras

Talab/Bandhi

- A reservoir with an area less than 5 bighas is called talai, medium sized lake is called bandhi and bigger lakes called sagar or samand
- Talabs are reservoir that store water for household consumption and drinking purposes.
- May be natural or man-made

Bawari



- They are unique stepwells which were once part of ancient networks of water storage in the cities of Rajasthan.
- The little rain received would be diverted to man-made tanks through canals built on hilly outskirts of cities.
- Water would then percolate into the ground, raising the water table ad recharging deep and intricate network of aquifers.
- To minimise water loss through evaporation, a series of layered steps were built around the reservoirs to narrow and deepen the wells.

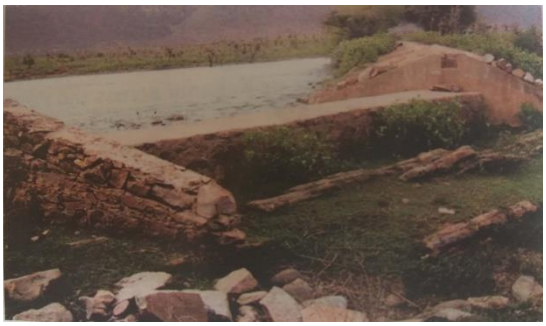
Taanka

- It is a traditional rainwater harvesting technique of Rajasthan.
- It is a cylindrical paved underground pit into which rainwater from rooftops, courtyards or artificially prepares catchment flows.
- Once completely filed, the water stored in taanka can last through the dry season.

Ahar Pynes

- It is a traditional flood water harvesting system indigenous to south Bihar.
- Ahars are reservoirs with embankments on three sides that are built at the end of diversion channels like pynes.
- Pynes are artificial rivulets led off from rivers to collect water in the ahars for irrigation in the dry months.

Johads



- One of the oldest systems to conserve and recharge ground water.
- They are small earthen check dams that capture and store rainwater.
- Constructed in an area with naturally high elevation on three sides, a storage

pit made by excavating the area and excavated soil is used to create wall on fourth side.

- Also called madakas in Karnataka and pemghara in Odisha.

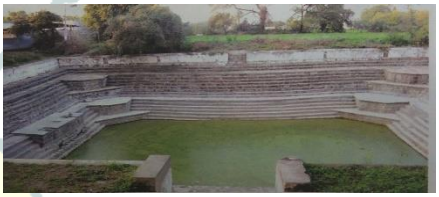
Panamkeni

- The kuruma tribe uses special kind of well to store water.
- Wooden cylinders are made by soaking the stems of toddy palms in water for long time.
- These cylinders are then immersed in groundwater located in forests and fields.

Khadin

- They are ingenious constructions designed to harvest surface runoff water for agriculture.
- There is a long earthen embankment built across the hill slopes of gravelly uplands.
- Sluices and spillways allow the excess water to drain off and the water-saturated land is then used for crop production.
- First used by paliwal brahmins of Jaisalmer.

Kund



- A saucer shaped catchment area that slopes towards central circular underground well.
- Main purpose is to harvest rainwater for drinking.
- Found mainly in Rajasthan.

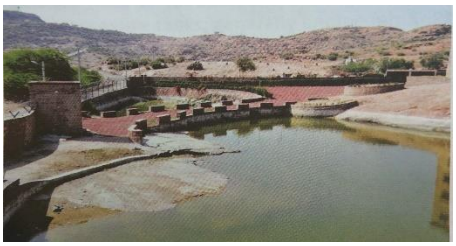
Baoli

- Built by the nobility for civic, strategic or philanthropic reasons, baolis were secular structures from which everyone could draw water.
- The locations of baolis suggest its use. If located in villages, it is for utilitarian purpose and social gatherings. On trade routes, often used as resting plac.

Nadi

- They are village ponds that store rainwater collected from adjoining catchment areas.

- The location of nadi has strong bearing on its storage capacity and hence the site of a nadi is chosen after careful deliberation of its catchment and runoff characteristics.
- Found near jodhpur. A local voluntary organisation- Mewar Krishik Vikas Samiti has been adding systems like spillways and silt traps to old nadis and promoting afforestation of their drainage basin to prevent siltation.



Bhandara Phad

- Phad, a community managed irrigation system came into existence few centuries ago.
- The system starts with bhandara (check dam) built across a river from which kalvas (canals) branch out to carry water into fields in the phad (agricultural block).
- Sandams (escape outlets) ensure that excess water is removed by distributaries an field channels.
- This system is operated on three rivers in tapi basin- panjhara, mosam and aram- in dhule and nasik districts of maharasthra.

Zing

- Found in ladakh, they are small tanks that collect melting glacier water.
- A network of guiding channels brings water from the glacier to the tank.
- The melting waters of the glacier turn into a flowing stream by the afternoon. The water collected by evening is used in fields on the following day.
- A water official called a chirpun is responsible for the equitable distribution of water in this dry region.

Kuhls

- They are surface water channels found in mountainous regions of Himachal Pradesh.
- These channels carry glacier waters from rivers and streams into the field.
- Kangra valley has around 715 major kuhls and 2500 minor kuhls.
- An important cultural tradition, the kuhls were built wither though public donations or royal rulers.

- A kohli would be designated as the master of the kuhl ad would be responsible for the maintenance of kuhl.

Zabo

- The system combines water conservation with forestry, agriculture and animal care.
- Practices in Nagaland.
- Rainwater that falls on forested hilltops is collected by channels that deposit the run-off water in pond-like structures created on the terraced hillsides.
- The channels also pass through cattle yards, collecting the dung and urine of animals before ultimately meandering into paddy fields.
- Ponds created in paddy fields are used to rear fish and foster the growth.

Bamboo drip irrigation

- It is an ingenious system of efficient water management.
- The tribal farmers developed a system where water from perennial springs is diverted to the terrace fields using varying sizes and shapes of bamboo pipes.
- Best suited for crops requiring less water, the system ensures that small drops of water are delivered directly to the roots of the plants.
- This is used by farmers of khasi and jaintia hills to drip-irrigate their black pepper cultivation.

Jackwells

- The shompen tribe of greater Nicobar Islands use the system.
- The pits are encircled by bunds made from logs of hard wood.
- The bamboo are placed under trees to collect runoff water from leaves.

Ramtek model

- The model named after town of ramtek in Maharashtra.
- An intricate network of groundwater and surface water bodies, this system was constructed and

maintained mostly by malguzars (landowners) of the region.

- Here, the tanks are connected by underground and surface canals form a chain that extends from the foothills to the plains.
- Once tanks located in hills are filled to capacity, the water flows down to sill successive tanks.
- This system conserves about 60-70% of the total runoff in the region.

Pat system

- Seen in Madhya Pradesh. The peculiarities of the terrain are used to divert water from hill streams into irrigation channels.
- Diversion bunds are made across stream near the village by pilling up stones and then lining them with teak leaves and mud to make it leak proof.

Eri

- It is the tank system of Tamil Nadu and is one of the oldest water management systems in India.
- It acts as a flood-control systems, prevents soil erosion and wastage of runoff during periods of heavy rainfall and recharge groundwater.
- The tanks are inter-connected in order to enable access to the farthest village and to balance the water level in case of excess water supply.

These ecologically safe traditional systems are viable and cost-effective alternatives to rejuvenate India's depleted water resources.

Productively combining these modern structure s as percolation tanks, injection wells, and subsurface barriers could be answer to India's perennial water woes.

RAINWATER HARVESTING AND RAINFED AGRICULTURE IN INDIA

In situ rainwater conservation/harvesting- Highest priority is to preserve the rainwater whenever it falls to recharge soil profile, groundwater and surface storage.
It also improves surface and sub-surface flows perennially.
Surface runoff harvesting and storage structures, rooftop rainfall collection into cistern or ground water recharging, dugout ponds, tanks, khadins, check dams etc. are several water harvesting structures known by different regional names.

In situ rainwater conservation is achieved by land shaping, contour bunding, cultivation, sowing, and vegetative barriers.
It also cuts down erosion of soil, seeds, vegetative propagules and siltation of water bodies.
Over exploitation of groundwater and its maladies can be remedied by ground water recharging only.

How it helps agriculture?

- Regenerates and enhances biomass production of grasses, shrubs, trees and other forages
- Enhanced productivity of grains and crops residues as fodder.
- Reduces socially undesirable seasonal migration of herders
- Irrigation with surface and underground stored rainwater leads to economically better crop diversification, higher inputs due to reduced risks and improved profitability.

Government policies

- NRAA has devised watershed development guidelines.
- Convergence and coordination with MGNREGA, rural livelihoods and other schemes supplemented and complimented inputs.
- Rainwater harvesting and recycling has always been an evolving process and shall continue to do so.

Conclusion

- Global warming has increased frequency and intensity of droughts, floods, cold/heat waves and extreme events in India.
- Rainwater harvesting can ensure climate smart agriculture and resilience in agriculture.
- Simultaneous occurring of floods and droughts in other parts calls upon interlinking of rivers.
- Minimizing water storage and conveyance losses, most efficient micro-irrigation system and protected cultivation can ensure optimum use of water resources.
- Insurance of crops, livestock, agro-forestry and product portfolio, establishment of banks of fodder, water, seeds can minimise risks and farmer distress.

- Special credit and debt services and other safety nets keeping in view the vulnerability to periodic crop failures is called upon.
- Cogeneration of renewable and cheaper non-grid wind and solar energy have tremendous potential for promoting micro-irrigation, protected crop cultivation and other power needs of arid and semi-arid regions especially all along the west coast.
- Robust and climate smart farming systems, integration of on farm and non-farm activities and convergence with MGNREGA can minimise seasonal migration.

Best Wishes!

IASbaba