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Needs of Effective Water Conservation

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Abstract: ***The earth's supply of fresh water is fixed. Its distribution is skewed spatially and temporarily. The maximum usage of water withdrawals is by agricultural sector for irrigation. It is socially, economically and culturally entwined with the lives of people. In the course of irrigation development many irrigation projects have been evolved across India. There are various irrigation techniques followed in different parts of India. The continued growth of population, industrialization, urbanization, climate change, emission of greenhouse gases and deforestation build up pressure on available water resources and arable land for food production. It is further worsened with crop production loss, deterioration of water sheds, disappearance of wetlands and reoccurrence of erratic monsoon. The fall of ground water table, deterioration of quality water, salinization, soil degradation, water logging and irrational use of water emphasized the need for conservation of irrigation water sources. While we have adopted many conservation measures like artificial recharge scheme, percolation ponds, check dams, irrigated agriculture modernization and rehabilitation works on the one side, the problem of irrigation water scarcity and shortage in the availability of quality water still persists. Hence, an attempt has been made to study the need s and effective management on conservation of irrigation water resources.***

Keywords : water scarcity, pressure on water resources, shortage in the availability of quality water, conservation of irrigation water,

I. INTRODUCTION

The Rig-Veda emphasized the irrigation of water in the earlier days. The British introduced the definite irrigation policy. After Independence, the irrigation infrastructure has been developed in India. In 1970's realized that there was a managerial problem in the operation, maintenance and distribution of irrigation infrastructure. The concept of participatory irrigation management was raised in the first National Water Policy in 1987. The pressure was built up on the available fresh water resources due to the reasons like population growth, urbanization, climate change and erratic monsoon. In addition to this arrival of modern irrigation practices and changed life style along with cropping pattern, increased the number of deep bore wells, policy measures like subsidy to inputs and use of rice transplanting machines during peak irrigation period and so on. The concept of water conservation was included in all the policies, strategies and activities to sustainably manage the natural resource of fresh water, to protect the hydrosphere and to the meet the current and future human demand. There is a need for the adoption of many water conservation measures like adoption of micro irrigation practices like drip/sprinkler, construction of rain water harvesting structures, adoption of water efficient irrigation technologies etc. The problems of high cost investment in advanced irrigational practices, rain water runoff, seepage and percolation loss, lack of economic irrigation technologies and lack of awareness prevails in many areas. In recent times there were an increased in number of floods and droughts. The issue of water scarcity in correspondence with irrigation still persists. All these ascertained the need for an effective management on conservation of irrigation water.

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II. METHODOLOGY

A. Objectives

1. To identify the nature and the importance of irrigation water resources.
2. To show the limitations of available water resources in the existing irrigation practices.
3. To identify the issues and challenges in water conservation.
4. To emphasis the importance of effective management on conservation of irrigation water for sustainable development.

B. Methodology

The present paper is conceptual in nature and it is purely based on secondary data. The ideas were collected and used for this study from various articles.. Apart from that, various research papers published in related journals, magazines and related theses listed in Shodhganga have been used..

III. REVIEW CRITERIA

Resty Naiga (2018) in his study analysed a broad variety of water infrastructure facilities, technologies, and water source functionality rates between two districts. Governance arrangements and managerial effectiveness are analysed in terms of operation maintenance, monitoring and the use of water resources. Study findings concluded that both the institutional and individual factors played a major role in determining sustainable access to safe water.

V.Basil Hans (2018) in his study analysed and concluded that the problems of property, water scarcity, food obscurity, land productivity and low water productivity were due to poor Management of Irrigation water. Findings showed that the problems are largely at institutional, structural and administrative in nature.

Problems in Indian agriculture are linked to per capital availability of water in a cost effective manner. Water problem is a triple problem from supply side, from demand side and from quality angle.

Chandam Victoria Devi (2018) in her study analysis said that there is increasing in demand of water by all major sectors while the available fresh water remains the same explained about the irrigation development and the concept of management of irrigation system. Analysed various traditional conservation methods of irrigation and disclosed constraints like lack of registered institution, lack of legal back up or policy, lack of awareness, lack of fund and lack of gender equality and finally advised technical land non-technical factors (ways) for strengthening effective irrigation management.

Sarah Ann Wheeler, Rosalind Bark, Adam Loch and Jeff Conner (2018) made their study on Global water supply and demand and the irrigation methods practiced at global level. They underlined that water is essential for life and for irrigation and pointed out the problems of high cost investment, biasness and corruption prevails in water resource allocation and distribution. The study provided strategies for effective management to improve and enhance irrigation and productive efficiency.

Abhilas Kumar Pradhan (2018) in his study analysis the irrigational practices for rice crop and identified human factors, technical factors and institutional factors responsible for low technical efficiency in resource use and suggested ways for an effective management.

Pradeep Kumar Mishra (2016) in his study, analysed the irrigation projects and revealed the short comings of the projects like weak planning, lack of coordination, no consistency in policy measures and guidelines, poor efforts on community organization and capacity building. Analysis outcome underlined the attributes to be (given managed attention) for an effective execution of irrigation projects.

Susanne M.Scheirlincy and David O.Treguer(2016) in their study analysed the increasing demand on water resources as a result of demographic, socio-economic, technological and climate change. Also, They Pointed out water use in agriculture tends to have relatively low returns. So other users fend to turn to agriculture as a potential source of water. The study revitalized the management of water in order to respond to the challenges of water scarcity.

ElsLecoutere, Ben D' Exelle and Bjorn Van Campenhout (2015) in their study showed that the influence of socio - economic differentiation linked to gender and social status on the distribution of common pool resources are to be considered in the irrigation water management. Appropriation and distribution rules could be enforceable of they are recorded. Empowerment programmes for women and people in low social status should be arranged.

Zareen Pervez Bharucha, David Smith and Jules Pretty (2014) in their study on watershed development in India found out and shortfalls in it. They pointed out continuing experience of water scarcity due to lack of participatory process, inequitable distribution of cost and benefits, socio-cultural, institutional and administrative barriers.

IV. NATURE AND IMPORTANCE OF IRRIGATION WATER RESOURCES

The existence of life in the blue planet is supported by its uniqueness of having a large amount of liquid water. It is constituted about 75 percent of the earth's surface. Water is a key element of life for everyone on earth. Water sustains human health, food production, economic development and ecological balance. But only three percent of earth's water is available as fresh water out of which almost 75 percent is locked in the form of glaciers and icebergs. The planet's supply of fresh water is fixed and there is no substitute for its life giving qualities. The Ministry of water resources in India has estimated that with 2.5 percent of global landmass and home to 17.5 percent (i.e. 1.21billion) of world population, India has only four percent of the world's fresh water resources. And its distribution too is skewed spatially and temporarily. The central waster commission of India estimated that there is a large variation in the availability of fresh water resources in respect to land area. Accordingly, the Northern India has 60percent of water resources with 33 percent of the landmass, the western coastline has three percent of water resources with 11 percent of the landmass and the peninsular India has 29percent of water resources with the remaining 64 percent of the landmass. For an example, Tamilnadu is one such peninsular state forms part of the peninsular shield and composed of geologically ancient rock of diverse origins. It constitutes 130.33 lakh hectares (four percent) of India's land area and is inhabited by six percent of India's population but has only 2.5percent of India's water resources putting high stress on irrigation water availability. Agriculture sector consumes 75percent among total water users. Irrigated area of the state is 58.78percent.

Agriculture is the prime driving force for food security, rural economy and sustainable socio-economic development of farmers. India's available fresh water resources is used phenomenally by agricultural, domestic, power, industry and service sectors of these agricultural usage accounts maximum of it. India ranks first among the countries with the largest agricultural withdrawals based on Food and Agriculture Organization (FAO) 2016 report. The agricultural water withdrawals in respect to total water withdrawals in ratio of 688 billion m3 amounts to 90percent of total water withdrawals for irrigation. The country's total agricultural area is 195 million hectare(m ha). But of which, area equipped for irrigation is 72 m ha (i.e. 37percent). Agriculture with its allied sector is the largest source of livelihood in India. It has 160 Million(Mn) of the total workforce (i.e.56.6percent) and accounted for 23percent of India's Gross Domestic Product(GDP). According to 2011 Agricultural census of India, an estimated 61.5percent of the 1210 Mn India's population is rural and dependent primarily on agriculture. The number of farming households are 159.6 Mn. It has showed the importance of agriculture and its success is based on irrigation development. The earliest mentions of irrigations are found in Rig-Veda with references to wells, tanks, canals and dams. Samritis too contain evidence of early irrigation works. In Ancient India, the marvel of irrigation works was the construction of grand ancient across river Cauvery in the second century A.D.

The British started irrigation development in the nineteenth century and introduced definite irrigation policy in 1854 with the setting up of public works department. In India, after independence developed irrigation infrastructures and focused mainly on major and medium irrigation projects till 1970's. The concept of irrigation management was evolved in the later part. The First National Water Policy in 1987 emphasized participatory irrigation management. But there is a large gap exists between irrigation potential what we created and utilized.

V. ISSUES AND LIMITATIONS NECESSITATES FOR EFFECTIVE MANAGEMENT OF WATER CONSERVATION

The Central Water Commission report on irrigation projects (1975-80), the World Bank report in 1991 says there is a lack of maintenance and distribution of irrigation system and the issue of fund crunch for the operation and maintenance of irrigation infrastructures necessitated a paradigm shift from construction to management. In India, the irrigated area consists of about 37 percent of the net sown area. There are various techniques of irrigation practices in different parts of India. These methods of irrigation differ in how the water obtained from the source is distributed to the field. Different irrigation systems are suited to different soils, climate, crops and the nature of water resources. Before choosing a specific technique, the irrigation engineer must evaluate all the factors and choose method which is most suited for local condition.

VI. VARIOUS TECHNIQUES OF IRRIGATION PRACTICES IN INDIA

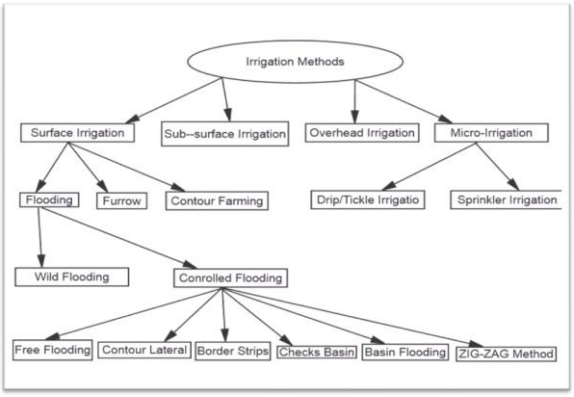
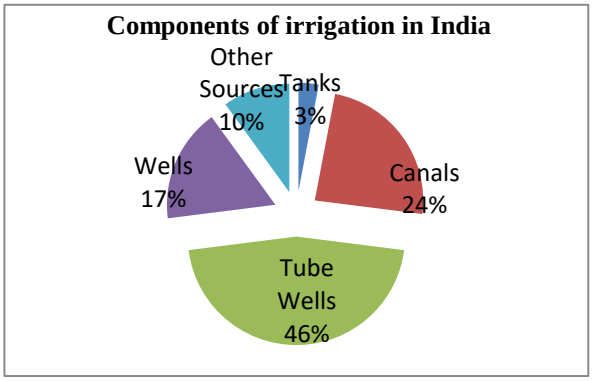
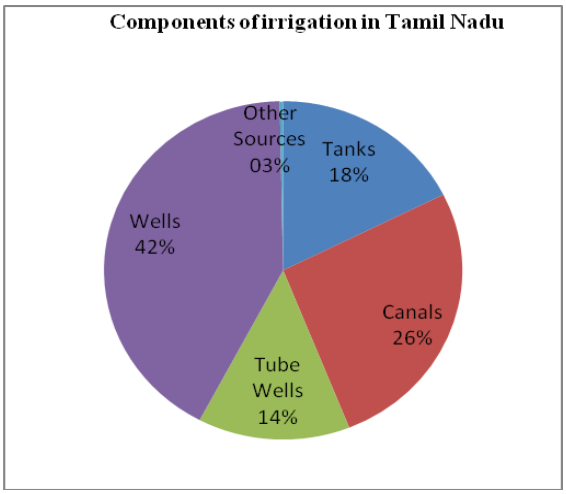


Figure.1 Irrigation Methods

Surface water irrigation involves applying water on the soil surface includes canals, Tanks, and undefined sources, Sub-surface irrigation plays a very little role. It involves applying water from beneath the soil surface either by constructing trenches or installing underground pipelines. According to a study by the National Water Resources Framework (NWRF). India
receives an annual precipitation of around 4000 billion m3(BCM). Of which only1123 BCM(i.e.28percent) is utilized out of which 61percent is being added to surface water and 39percent is being added to ground water. Unaccounted water accounts for 15 to 50percent in most part of India. Due to an absence of scientific monitoring system and lack of consciousness have resulted in large scale water wastage and theft. Surface water and ground water are the major sources of water for irrigation. Irrigation in India is done through canals, wells, tube wells, tanks, tidal irrigation, water cans and so on. The components of irrigation sources are varied across India. Tamilnadu state is taken here as an example for regional comparison.

VII. VARIOUS SOURCES OF IRRIGATION





Source: M/o statistics and programme implementation (2014 -15)

Note: Net irrigated Area is about 67 m Ha for India and Net irrigated Area is about 28.64 lakh Ha for Tamilnadu

Central Ground Water Authority(CGWA) estimate 2011 says, India's ground water consumption not only higher in the world but also increasing the fastest. Water is being pumped principally to irrigate cropland faster than the aquifers can be replenished by natural processes.

According to the Ministry of Statistics and Programme Implementation report, 2010. Comparative statement between India and Tamilnadu

Table 1. Comparative statement between India and Tamilnadu

	India	Tamilnadu
Total irrigation Potential	139 m ha	5.5 m ha
Share of Ground water potential	45.8percent	51.2percent
Level of ground water development	53.22percent	80.79percent
Total crop area	159.6 m ha	6.5 m ha

Ground water irrigational crop area	39.43 m ha	1.61 m ha
Canal irrigational crop area	22.48 mha	1.43 m ha

Source: M/o statistics and programme implementation, 2010

The major sources of irrigation in the country are rivers, reservoirs, canals, tanks, wells, tube wells, etc.

The projects with cultural command area of more than 2000 hectares are covered under medium and major irrigation projects. It contains 40percent of the irrigated area in India which are mainly from surface irrigation source. The scheme with cultural command area of less than 2000 ha is called minor irrigation projects. it contains 60percent of the irrigated area which are mainly from tank and well irrigation source. The total irrigation potential created from these schemes has increased to159.6 m ha. In recent years there has been phenomenal growth of minor irrigation and many farmers are going for individual pump sets to ensure better and reliable supply of irrigation water to their field. There are various problems faced by the region from the timely and equitable distribution of water, transmission losses and to low level of application and utilization efficiency. The importance of irrigation water resources can be better understand on the basis of its nature, availability, distribution and in terms of its uses and users. The livelihood of farmers, agricultural development and the economic development of our country depends on it. Irrigation infrastructure like dams, tanks, ponds and wells for storing water, canals and channel for transmitting and distributing water. The development of these infrastructures and irrigation pattern are distributed differently from water scarce regions to water abundant regions. Geographical boundary, climate, topography soil types and other socio-economic and cultural factors have influences on it. The continued growth of population exerts pressure on agricultural land. Expanding urbanization and industrialization further dwindled per capital availability of arable land from 0.48 ha in 1950 to 0.08 ha by 2020. In the current growth rate of population it is estimated that the total population will reach to 1.35 billion by 2025. With the present per capita food consumption rate of 550 gm per day, it is estimated to increase food demand to 300 MT by 2020.

The International panel on climate change (IPCC) report reveals that the temperature will rise from 1.8•C to 4•C by 2100 and also says crop production loss will occur from 10 to 40percent with every rise of 1•C. Agricultural sector contributes about 28percent of Green House Gases(GHG) emissions. Influence of increasing evapo-transpiration loss, deterioration of watersheds, disappearance of wetlands, increase in number of floods and droughts, and frequent in monsoonal failure will further mounts pressure on food production with the available limited irrigation sources. In India, 75percent of total rainfall falls during south west monsoon between June and September. More surface run-off water losses occurred within the short span of time. Climatic aberrations and increasing number of dry spells caused due to Global warning resulted in low w ater and food productivity. India's agricultural water withdrawal is 688 BCM. So there is a larger scope for water harvesting. Total rainfed agricultural area is 86.0 million hectare(mha) of which 27.5 mha is classified as potential rain fed area. It generates 114 BCM of surface run-off for water harvesting. Rainfed agriculture is vulnerable to climate change and socio-economic shocks. The current yield of rainfed crops lies between 25 and 50percent. The yield and rainfed food production can be increased substantially through the supplemental irrigation managerial practices. Growing water scarcity is further complicated due to fall of ground water table. Water quality deteriorates owing to increasing pollution of shallow and deep water. Intrusion of seawater due to over withdrawal of ground water since increase in number of deep bore wells.

About 6.75 m ha lands are affected due to salinity and 6.41 m ha land is degraded due to water logging. Policy measures like subsidy to inputs for example, fertilizer, power supply became a reason behind irrational use and over consumption of water. Affluence of people and changing life styles with dietary preferences have an impact on cropping pattern which influence on water demand with regional variations. Landscape is made up of interconnected watersheds. It is an area of land that separates water flowing to different water bodies or and area drowns into a single river / basins/seas. It helps ecology by providing natural habitat. Watersheds are exposed to grave threats and uncertainties in the undergoing massive changes of rural landscapes. Conservation measures have been widely adopted for the sustainable utilization of irrigational water resources. Rain water harvesting, constructing and protecting the irrigation source points. Regulating the distribution of irrigation water through various policies, institutional, legislative and administrative means have been taken place.

Arrival of the advanced modern irrigation practices like deep bore well increased the number of tube well irrigations which intensified irrigational water requirements. Extensive use of rice transplanting machines reduced the spring transplantation period and subsequently increased the peak irrigation demand within the short period. Introduction of micro irrigation technologies like drip and sprinkler drastically improved the application and irrigation efficiencies. But yet the problems like seepage and percolation losses takes place in the transmission line. Heavy run-off water losses takes place during the intensive rain period. Lack of co-ordination among different stakeholder and have feeble connection with the agricultural and extension networks. Management induced water scarcity causes agricultural droughts and dry spells. Almost 60percent of the farmers are small and marginal and they cannot spare for high cost investments.

VIII. CONCLUSION

Effective management on conservation of irrigation water resources alone could ensure sustainable supply of irrigation water for social, cultural, economic and ecological development of a nation. Any effective management should be democratic, participatory, locally feasible and economically applicable in nature. Effective management solves the issues of degradation, shrinkage, depletion, falling of water at source site. Effectively deal the problems of an encroachment, agricultural land conversion, floods, illegal mining, sedimentation and salting at storage sites. It provides solution for water diversion, leakages, and untimely supply at distribution sites.

Through on effective management can settle the conflicts among different water users, to improve the rational use of irrigation water, and to establish a link between research networks and farmers. It could create a platform for coordination among all the line departments of irrigation for an effective execution of any measures for sustainable development.

REFERENCES

1. Resty Naiga (2018), "Conditions for successful community based water management: perspectives from rural Uganda", international journal of Rural management,Vol.14(2), PP.110-135.
2. V.Basil Hans (2018), "Water Management in agriculture : Issues and strategies in India", International journal of Development and sustainability, Vol.7, No.2,PP.578 - 588.
3. Chandam Victoria Devi (2018), "Participatory management of irrigation system in North - Eastern Region of India", International journal of Rural management,Vol.14(1), PP.69 - 79.
4. Sarah Ann Wheeler, Rosalind Bark, Adam Loch and Jeff Connor (2018), "Agricultural Water Management", Agricultural Water Management, PP.71 - 84.
5. Abhilas Kumar Pradhan (2018), "Measuring Technical efficiency of rice productivity using Data Envelopment analysis : A study of Odisha", International journal of Rural management, Vol.14(1), PP.1 - 21.
6. Pradeep Kumar Mishra (2016), "Managing International Development projects : case studies of implementation of large scale projects in India", International journal of Rural management, PP.4 - 22.
7. Susanne M.Scheirling and David O.Treguer (2016), "Investing in adaptation : The challenges of responding to water scarcity in irrigated agriculture". Economic Review, PP.75 - 95.
8. Els Lecoutere, Ben D'Exelle and Bjorn Van Camperhout (2015), "Sharing common resources in patriarchal and status based societies : Evidence from Tanzania", Feminist Economics, Vol.21, No.03, PP.142 - 167.
9. Zareen Pervez Bharucha, David Simith and Jules Pretty (2014), "All paths lead to rain: Explaining why watershed development in India does not alleviate the experience of water scarcity", The journal of development studies, Vol.50, No.09, PP.1209 - 1225.

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