

Surface Water Resources in Ajmer District (A Geographical Perspective)

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ABSTRACT: The Ajmer district is located centrally in the Rajasthan state between 25038' to 26056' north latitudes and 73054' to 75022' east longitude with an area of 8481 sq.km. The average height from sea level of the district ranges from 280-370 mt. and the length and width of the district is 185 km and 110 km, respectively. It is bounded in north by Nagaur district, south by Bhilwara district, east by Tonk and Jaipur and West by Pali district. Ajmer falls in agro-climatic zone III 'A' semi-arid-eastern plain zone encompasses Ajmer, Jaipur, Dausa & Tonk districts. Ajmer district has 9 Tehsils, 8 Panchayat Samitis and 1130 villages. Geographically, Ajmer district could be divided into 4 parts.

- The sandy area of west and north
- Hilly area
- Central plain
- Eastern low lying area
- The district is divided into 3 agro ecosystems.
- Hilly undulated poor fertility soils or "Magra" area consisting of Jawaja & Masuda Panchayat Samitis
- Heavy to medium soil or plain "Mall" area consisting Bhinay, Arain and Kekri Panchayat Samitis
- Light soil eastern plains with low run-off consisting of Pisangan, Silora and Srinagar Panchayat Samitis

KEYWORDS: Ajmer, surface water, climate, resources, district

I. INTRODUCTION

Climate and Soil

Ajmer has semi-arid climate and has extremes of climatic conditions. The district has a hot-dry summer and cold-bracing winter. The ambient temperature rises up to 46°C in the peak summer and falls up to 4°C in extreme winter. The average rainfall of Ajmer district is 525 mm with an average 25-30 rainy days in a year. About 90% of the annual rainfall is received during the period of June to September.

Ajmer district has coarse to medium textured loamy soils. The soil has medium water holding capacity. It is low in Nitrogen, moderate in Phosphorus and moderate to rich in Potash.

Land Utilization

Total geographical area of Ajmer district is 8,42,345 ha. out of which, forest occupies 5.56%, land under non-agricultural use is 10.59%, barren land is 3.0%, other waste land is 9.66%, cultivable waste is 9.18%, fellow land 13.94% and land under net sown area is 44.77% (3,77,144 ha).[1,2,3]

Irrigation

The total irrigated area is 1.56 lac ha. in Ajmer district. The principal source of irrigation is open dug well contributing 83% of total irrigation. The subsoil water is limited and quality of water varies from normal to brackish. The Ajmer district is reckoned to be under the dark zone and water table depends on the rainfall.

Cropping pattern and Crop production

The agricultural activity mostly depends on the monsoon hence the cropping pattern has remained more or less unchanged over the years. The kharif crop occupies 60.7% of total area whereas the Rabi crop shares 39.1% only. The principal crop grown in the area are Pearl Millet, Maize, Jowar, Til, Groundnut, Moong, Cowpea and Cotton during the kharif season and in Rabi season Wheat, Barley, Gram and Mustard are grown. The Ajmer district is popular for vegetable production i.e. early cauliflower, Kharif Onion, tomato and Chillies. The common sequences followed by the cultivators are: Cotton-Methi/Carrot Tomato-fellow/Wheat, Onion-Wheat/Barley, Moong-fellow, Ground nut-fellow, Bajra-fellow, Maize-Wheat/Barley.



Area, Production and Productivity of major crops cultivated in the district (Reference year 2014-15)

S.N.	Crop	Area (ha)	Production (MT.)	Productivity (Qt./ha)
1	Pearlmillet	69443	89041	12.82
2	Greengram	86527	34846	4.02
3	Sorghum	137356	77222	5.62
4	Black gram	19511	7685	3.93
5	Cluster bean	29270	17382	5.93
6	Cotton	17286	61759	18.22
7	Maize	27334	26231	9.59
8	Wheat	62442	1319.8	21.13
9	Mustard	45859	32730	7.13
10	Chick pea	82743	38463	4.64
11	Barley	24530	48291	19.68
12	Cumin	8468	946	1.11
13	Taramira	2529	1198	4.73

Livestock

The live stock wealth is very important in the district. The most important milch breed of cattle i.e. Gir is abundant in the district. The Sirohi breed of goat has flourished very well in the hilly track of Aravali. The cross breeding programme was implemented very successfully and there are more than 18 thousands cross bred cattle in the district. The quality cross bred animals attracted outsiders for their marketing. The number of buffaloes has also increased by 25% in last five years. As per 2012 livestock census, there are 3.92 lacs cattle, 3.36 lacs buffaloes, 5.02 lacs sheep and 7.7 lacs goats in the district. The climatic condition of Ajmer has provided a very congenial atmosphere for breeding and propagation of poultry. The hatchery, poultry feed units, marketing and other co-operative activities regarding poultry production has fetched a very high status in poultry production at national level. In Ajmer, there are 525 registered poultry farms. At present there are 32.43 lacs poultry birds and Ajmer is producing on an average 12 lacs eggs per day. M/s Kewal Ramani's hatchery produces 25 lac broiler chicks per year which goes to many places in Rajasthan and in India.[2,3,4]

II. DISCUSSION

Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) is being implemented in the state from the year 2015-16. The scheme is launched with the motto of "Har Khet Ko Pani" and "Per Drop More Crop". This needs serious consideration of all options of water security under one umbrella and to bridge the gaps. This may include optimal use of water resources (to prevent recurrence of flood and drought), water harvesting, water distribution network and enhanced water use efficiency (microirrigation). Rain water harvesting through "Jal Sanchay" and "Jal Sinchan" will improve water conservation and ground water recharge. The vision of PMKSY will be to ensure access to some means of protective irrigation to all agricultural farms in the country, to produce 'more crop per drop', thus bringing much desired rural prosperity. The major objective of PMKSY is to achieve convergence of investments in irrigation at the field level, expand cultivable area under assured irrigation, improve on-farm water use efficiency to reduce wastage of water, enhance the adoption of precision-irrigation and other water saving technologies, enhance recharge of aquifers and introduce sustainable water conservation practices by exploring the feasibility of reusing treated municipal waste water for peri-urban agriculture and attract greater private investment in precision irrigation system. PMKSY has been conceived amalgamating ongoing schemes viz. Accelerated Irrigation Benefit Programme (AIBP) of the Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR, RD&GR), Integrated Watershed Management Programme (IWMP) of Department of Land Resources (DoLR) and the [3,4,5] On Farm Water Management (OFWM) of Department of Agriculture and Cooperation (DAC). The scheme will be implemented by Ministry of Agriculture,



Water Resources and Rural Development. Ministry of Rural Development is to mainly undertake rain water conservation, construction of farm pond, water harvesting structures, small check dams and contour bunding etc. MoWR, RD & GR, is to undertake various measures for creation of assured irrigation source, construction of diversion canals, field channels, water diversion/lift irrigation, including development of water distribution systems. Ministry of Agriculture will promote efficient water conveyance and precision water application devices like drips, sprinklers, pivots, rain-guns in the farm “(Jal Sinchan)”, construction of micro-irrigation structures to supplement source creation activities, extension activities for promotion of scientific moisture conservation and agronomic measures. Programme architecture of PMKSY will be to adopt a ‘decentralized State level planning and project execution’ structure that will allow States to draw up their own irrigation development plans based on District Irrigation Plan (DIP) and State Irrigation Plan (SIP). It will be operative as convergence platform for all water sector activities including drinking water & sanitation, Mahatma Gandhi NREGA, application of science & technology etc. through comprehensive plan. State Level Sanctioning Committee (SLSC) chaired by the Chief Secretary of the State with the authority to oversee its implementation and sanction of projects. The programme will be supervised and monitored by an Inter-Ministerial National Steering Committee (NSC) constituted under the Chairmanship of Prime Minister with Union Ministers from concerned Ministries.[4,5,6] A National Executive Committee (NEC) constituted under the Chairmanship of Vice Chairman, NITI Aayog to oversee programme implementation, allocation of resources, inter-ministerial coordination, monitoring & performance assessment, addressing administrative issues etc. Components and responsible Ministries/Departments - 1. Accelerated Irrigation Benefit Programme (AIBP) by Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR, RD&GR) to focus on faster completion of on-going Major and Medium Irrigation including National Projects. 2. PMKSY (Har Khet ko Pani) by MoWR, RD & GR – • Creation of new water sources through Minor Irrigation (both surface and ground water) ; • Repair, restoration and renovation of water bodies; strengthening carrying capacity of traditional water sources, construction rain water harvesting structures (Jal Sanchay) ; • Command area development, strengthening and creation of distribution network from source to the farm; • Improvement in water management and distribution system for water bodies to take advantage of the available source which is not tapped to its fullest capacity (deriving benefits from low hanging fruits). At least 10% of the command area to be covered under micro/precision irrigation; • Diversion of water from source of different location where it is plenty to nearby water scarce areas, lift irrigation from water bodies/rivers at lower elevation to supplement requirements beyond IWMP and Mahatma Gandhi NREGA irrespective of irrigation command; • Creation and rejuvenation of traditional water storage systems like Jal Mandir (Gujarat); Khatri, Kuhl (H.P.); Zabo (Nagaland); Eri, Ooranis (T.N.); Dongs (Assam); Katas, Bandhas (Odisha and M.P.) etc. at feasible locations. 3. PMKSY (Watershed) by Dept. of Land Resources, MoRD • Water harvesting structures such as check dams, nala bund, farm ponds, tanks etc. • Capacity building, entry point activities, ridge area treatment, drainage line treatment, soil and moisture conservation, nursery raising, afforestation, horticulture, pasture development, livelihood activities for the asset-less persons and production system & micro enterprises for small and marginal farmers etc. • Effective rainfall management like field bunding, contour bunding/trenching, staggered trenching, land levelling, mulching etc. 4. PMKSY (Per drop more crop) by Dept. of Agriculture & Cooperation, MoA • Programme management, preparation of State/District Irrigation Plan, approval of annual action plan, Monitoring etc. • Promoting efficient water conveyance and precision water application devices like drips, sprinklers, pivots, rain-guns in the farm (Jal Sinchan); • Topping up of input cost particularly under civil construction beyond permissible limit (40%), under Mahatma Gandhi NREGA for activities like lining inlet, outlet, silt traps, distribution system etc. • Construction of micro irrigation structures to supplement source creation activities including tube wells and dug wells (in areas where ground water is available and not under semi critical /critical /over exploited category of development) which are not supported under PMKSY (WR), PMKSY (Watershed) and Mahatma Gandhi NREGA. • Secondary storage structures at tail end of canal system to store water when available in abundance (rainy season) or from perennial sources like streams for use during dry periods through effective on-farm water management; • Water lifting devices like diesel/ electric/ solar pump sets including water carriage pipes. • Extension activities for promotion of scientific moisture conservation and agronomic measures including cropping alignment to maximise use of available water including rainfall and minimise irrigation requirement (Jal Sarankchan); • Capacity building, training for encouraging potential use water source through technological, agronomic and management practices including community irrigation. • Awareness campaign on water saving technologies, practices, programmes etc., organisation of workshops, conferences, publication of booklets, pamphlets, success stories, documentary, advertisements etc. • Improved/innovative distribution system like pipe and box outlet system[5,6,7] with controlled outlet and other activities of enhancing water use efficiency. District Irrigation Plans (DIP) District Irrigation Plan (DIP) shall be the cornerstone for planning and implementation of PMKSY. DIP will identify the gaps in irrigation infrastructure after taking into consideration the District Agriculture Plans (DAP) already prepared for Rashtriya Krishi Vikas Yojana (RKVY) vis-à-vis irrigation infrastructure currently available and resources that would be added during XII Plan from other ongoing schemes (both State and Central), like Mahatma Gandhi National Rural Employment Guarantee Scheme (Mahatma Gandhi NREGS), Rashtriya Krishi Vikash Yojana (RKVY), Rural Infrastructure Development Fund (RIDF), Member of Parliament Local Area Development (MPLAD) Scheme, Member of Legislative Assembly Local Area Development (MLALAD) Scheme, Local body funds etc. The gaps identified under

Strategic Research & Extension Plan (SREGP) are used in preparation of DIP. DIP will present holistic irrigation development perspective of the district outlining medium to long term development plans integrating three components viz. water sources, distribution network and water use applications incorporating all usage of water like drinking & domestic use, irrigation and industry. Preparation of DIP will be taken up as joint exercise of all participating departments. DIP will form the compendium of all existing and proposed water resource network system in the district. The DIPs may be prepared at two levels, the block and the district. Keeping in view the convenience of map preparation and data collection, the work would be primarily done at block level. Block wise irrigation plan is to be prepared depending on the available and potential water resources and water requirement for agriculture sector prioritising the activities based on socio-economic and location specific requirement. Use of satellite imagery, topo sheets and available database may be appropriately utilised for developing irrigation plans at least on pilot basis to begin with and subsequently extended to all projects. i. Background Hon'ble President in his address to the joint Session of the Parliament of 16th Lok Sabha indicated that "Each drop of water is precious. Government is committed to giving high priority to water security. It will complete the long pending irrigation projects on priority and launch the 'Pradhan Mantri Krishi Sinchayee Yojana' with the motto of 'Har Khet Ko Paani'. There is a need for seriously considering all options including linking of rivers, where feasible; for ensuring optimal use of our water resources to prevent the recurrence of floods and drought. By harnessing rain water through 'Jal Sanchay' and 'Jal Sinchan', we will nurture water conservation and ground water recharge.[5,6] Micro irrigation will be to ensure 'Per drop-More crop'. Out of about 141 million hectare of net area sown in the country, about 65 million hectare (or 45%) is presently covered under irrigation. Substantial dependency on rainfall makes cultivation in unirrigated areas a high risk, less productive profession. Empirical evidences suggest that assured or protective irrigation encourages farmers to invest more in farming technology and inputs leading to productivity enhancement and increased farm income. ii. Vision To use the available water resources in the district to the maximum potential in an efficient way catering to the basic needs of every living being and enhancing the livelihoods of rural population to the maximum extent thus alleviating poverty in a sustainable way without compromising the interests of future generations. iii. Objective The broad objectives of PMKSY will be:- a) Achieve convergence of investments in irrigation at the field level (preparation of district level and, if required, sub district level water use plans). b) Enhance the physical access of water on the farm and expand cultivable area under assured irrigation (Har Khet ko Pani). c) Integration of water source, distribution and its efficient use, to make best use of water through appropriate technologies and practices. d) Improve on-farm water use efficiency to reduce wastage and increase availability both in duration and in extent. e) Enhance the adoption of precision-irrigation and other water saving technologies (More crop per drop). f) Enhance recharge of aquifers and introduce sustainable water conservation practices. g) Ensure the integrated development of rainfed areas using the watershed approach towards soil and water conservation, regeneration of ground water, arresting runoff, providing livelihood options and other NRM activities. h) Farmer oriented activities like capacity building, training and exposure visits, demonstration, farmschools, skill development in efficient water and crop management practices (crop alignment) including large scale awareness on more crop per drop of water through mass media campaign, exhibition, field days, and extension activities through short animation films etc. i) Explore the feasibility of reusing treated municipal wastewater for peri-urban agriculture, and j) Attract greater private investments in irrigation. This will in turn increase agricultural production and productivity and enhance farm income.

III. RESULTS

To achieve above objectives, PMKSY will strategize by focussing on end-to-end solution in irrigation supply chain, viz. water sources, distribution network, efficient farm level applications, extension services on new technologies & information etc. Broadly, PMKSY will focus on:- (a) Creation of new water sources; repair, restoration and renovation of defunct water sources; construction of water harvesting structures, secondary & micro storage, groundwater development, enhancing potentials of traditional water bodies at village level like Jal Mandir (Gujarat); Khatri, Kuhl (H.P.); Zabo (Nagaland); Eri, Ooranis (T.N.); Dongs (Assam); Katas, Bandhas (Odisha and M.P.) etc. (b) Developing/augmenting distribution network where irrigation sources (both assured and protective) are available or created; (c) Promotion of scientific moisture conservation and run off control measures to improve ground water recharge so as to create opportunities for farmer to access recharged water through shallow tube/dug wells; (d) Promoting efficient water conveyance and field application devices within the farm viz, underground piping system, Drip & Sprinklers, pivots, rain-guns and other application devices etc. (e) Encouraging community irrigation through registered user groups/farmer producers' organisations/NGOs. (f) Farmer oriented activities like capacity building, training and exposure visits, demonstrations, farmschools, skill development in efficient water and crop management practices (crop alignment) including large scale awareness on more crop per drop of water through mass media campaign, exhibitions, field days, and extension activities through short animation films etc. (g) The aforesaid areas only outline the broad contours of PMKSY; combination of interventions may be required depending on location specific conditions and requirements, which will be identified through District and State Irrigation Plans. Methodology: The preparation of District Irrigation Plan (DIP) is an integration of geospatial technology, space application

technologies and spatial and non-spatial data. 1. Transformation of available thematic information (district provided Gyan data) on to the village level on Bhuvan portal and extract geo-referenced village map data. 2. Integration of thematic layers with socio-economic data for classification of area into specific composite land units on village level. 3. Preparation of appropriate action plan based on potential of composite land units and developmental needs of study area is on the basis of available data. 4. Field visit to validate the recommended measures with respect to the ground situation and requirement of the local people. 5. Finalization of development plans based on field observation. Available thematic information for preparation for water resource and land resource development plan. • Land use / land cover map • Groundwater potential map • Soil map - depth, texture, erosion and land capability • Slope map. • High resolution Satellite image through Bhuvan portal. • Lithology. • Hydro geomorphology. Area for development of water resources structure geospatial technology has been used. In this process first identify the area of crop land based on high resolution satellite data and then identify the irrigated area by different source of irrigation methods. To identify the un irrigated area an overlay method is used. District irrigation plan covers the following planning component of the district unsustainable development approach: Increase in vegetation/biomass in the district. • More number of surface water bodies in district. • Shift from annual crop to perennial. • Increase in the extent of crop area. • Improvement in the soil moisture availability • Reclamation of waste lands. • Convergence of investments in irrigation at the field level. • Enhance the physical access of water on the farm and expand cultivable area under • assured irrigation (Har Khet ko pani) • Best use of water through appropriate technologies and practices. • Improve on-farm water use efficiency. • Enhance the adoption of precision-irrigation and other water saving technologies • (More crop per drop). • Enhance recharge of aquifers and introduce sustainable water conservation practices. • Ensure the integrated development of rainfed areas. • Promote extension activities relating to water harvesting, water management and crop • alignment for farmers and grass root level field functionaries. • Explore the feasibility of reusing treated municipal waste water for peri-urban • agriculture, • Attract greater private investments in irrigation.

Status of Water Availability:- Stored Surface Water:- Surface irrigation water comprises medium irrigation reservoirs and minor irrigations tanks. Farmers of the district have also constructed farm pond with the government assistance and able to cultivate the crops with life saving irrigation. Each farm pond has the volume ranging from 1200-1500 cum. More than 5000 farm ponds are there for the last 7 years. Water resources are usually utilized during the rabi. Average annual availability of surface water is 5.61 BCM

Status of Ground Water Availability:- 0.322 BCM of ground water is available in the Ajmer district. Maximum ground water is draft for all purposes in Pisangan block followed by Kekri, Silora and Bhinay[6,7]

With the advancement of technology and awareness, the farmers are using water saving devices viz., irrigation pipeline, sprinklers, mini-sprinklers and drip irrigation system. This practices enhancing the rational use of water. Irrigation in the district is being through government canal, reservoirs/ dams, private tube wells/ open wells, private water harvesting structures

IV. CONCLUSION

Water is essential for life of living beings whether plant or animal. It is an important component for almost all developmental planning. Considerable progress has been made in respect of water resources development in India after independence through various plans and such developments have helped in almost five fold increase in creation of irrigation potential. Total created irrigation potential at pre-Plan period was about 22.6 million hectares (mha) which at present is about 108.2 mha. There has also been appreciable development in the areas of drinking water supply and other uses. However, growing population, urbanization and industrialization has led to considerable increase in demand of water for various purposes e.g., irrigation, domestic needs, industrial requirements etc. In this regard, it may be mentioned here that the water sector has very strong linkages with all other developmental activities. In view of fast changing development scenario, it is emphasized that the key priorities and identified strategies cannot remain static and firm. This needs review and improvement of plans from time to time.[7]

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