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## Development of Bihar through Irrigation management

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### Abstract:-

Bihar state in India is witnessing a slow but a steady progress in participatory irrigation management. Its silent efforts with more depth, if continues with stronger spirits with new regime in place, will herald a new era of irrigation management in India. The emerging picture, though out from the publicity, is quite different from other states of India. Some of the key features are: a) water users associations collect water fee and retains 70%, b) elections are held on time, c) irrigation services are improved, and essentially, e) water users organizations have taken over the distributories (in other states minors) without putting much pressure on the government for system rehabilitation as prior condition.

**Keywords:** Water Management, Irrigation, Power, Drainage, Silt Management , Climatic Risk

### 1. Introduction

Bihar irrigation schemes are generally classified into three classes: a) Major and medium schemes - surface schemes irrigating over 2,000 hectares; b) Minor surface schemes – diversion or reservoir schemes irrigating less than 2,000 hectares; c) Life schemes – tubewell or small river liftirrigation schemes. There are now 27 major and 163 medium completed irrigation schemes, and another 19 major and 31 medium schemes under construction in the state. There are also about 40,000 minor surface irrigation works, of which 747 are formally recognized as schemes and the remainder are ahars<sup>2</sup> (small tanks). There are 2,074 river lift-irrigation schemes, 5,791 deep tubewells, about 600,000 shallow tubewells and about 400,000 dug wells used for irrigation. Bihar's gross sown irrigated area of around 50% is relatively low as compared to 95% in Punjab, 67% in Uttara Pradesh, and 60% for India as a whole. The average groundwater exploitation is 39%, indicating a large unexploited potential (World Bank, 2005). The visionary programme of Water Resources Department (WRD) of Bihar (GoB, 2006) indicates that the ultimate irrigation potential of the state is 10.7 million ha, out of which 5.3 million ha can be through major and medium irrigation projects. However, till the year 2005 created potential is 2.61 million and actual utilization is only 1.6 million ha. Thereby, half of the potential fields are still rainfed. Unfortunately, 76% of North Bihar population and 73% of geographical area is under constant threat of floods. According to the visionary programme of WRD (GoB, 2006), an estimated Rs1500 crores worth of property and hundreds of lives are lost every year owing to floods; the programme planned to achieve, among several things, a) water to all potentially irrigable fields by 2025, b) complete flood free zone by 2025, c) reclamation of water logged area by 2025.

## 2. Water Resources and Climatic Risk

The river Ganga divides the State into two parts. The land on the Northern Bank of the river, North Bihar lies at the foothills of Himalaya and has border with Nepal. The rivers namely Kosi, Gandak, Bagmati & Kamala originate in Nepal and flow through North Bihar before draining into river Ganga which acts as a master drain for these tributaries. During monsoons when the drainage capacity of Ganga is reduced due to its being in spate, North Bihar faces severe natural disaster in the form of floods, water logging & erosion. As a result the state's economy is thrown out of gear.

Water Resources and Climatic Risk Bihar is divided into three agro-climatic zones namely, northwest alluvial, northeast alluvial and south Bihar alluvial plains. The soil type in the northwest region is mainly loam and sandy loam; the northeast region has loam and clay loam and the south zone has sandy loam, loam, clay and clay loam (Department of Agriculture, Bihar). The state lies in the tropical and sub-tropical region and its average rainfall is around 1,028 mm during the monsoon season. Around 85 per cent of the total rainfall (normal 1,198 mm) in the state is received between June and September.

The topography of Bihar is described as fertile alluvial plain lying wholly in the Gangetic Valley. The state is richly endowed with water resources, both ground and surface water. Besides rainfall, rivers that flow within the state are an important source of water. The main defining feature of the state is that the River Ganges flows through it and divides it broadly into water abundant north and south Bihar. The whole of North Bihar benefits from the Himalayan Rivers while South Bihar has rivers flowing from central India. Most of the rivers in North Bihar, Saryu (Ghaghra), Gandak, Burhi Gandak, Bagmati, Kamla-Balan, Koshi and Mahananda (Adhwara group of rivers) are of Himalayan origin and have a considerable portion of their catchment in the glacial region falling in Nepal and Tibet. They are positioned to receive copious amount of rainfall during the monsoons. The southern part of Bihar, on the other hand, is drained by rivers that are largely rain fed having their origin either in the Vindhya hills or in the hills of Chhotanagpur and Rajmahal. These rivers are either dry or have scanty discharge in non-monsoon months. Karmanasa, Sone, Punpun, Kiul, Badua, Chandan are important rivers of this region.

## 3. Vision

In order to achieve the targets set for crop production and productivity in Agriculture Road Map, harnessing of irrigation potential to hilt is important. Present irrigation intensity has to be increased from 83% to 158% by year 2017 and 209% by year 2022. In the table 1, this status has been clarified. The standards decided in this regard is quite challenging . Therefore, concerted effort will have to be made to achieve the prescribed targets for 12th five year plan period (2012-17) in the Agriculture Road Map and if there remains any short fall, it will be completed during the 13th five year plan period (2017-22).

Table-1 Crop Season Wise Irrigation Requirement (Area in Lakh Ha.)

Particulars/Year	Kharif	Rabi	Summer	Total	Irrigation/ Crop intensity (%)
Present Irrigated Area	20.20	23.11	3.3	46.61	83%
Irrigation Requirement (2017)	31.00	38.00	30.00	99.00	158.00%
Irrigation Requirement (2022)	35.00	51.00	44.90	130.90	209.00%

For achievement of targets of Agriculture Road Map (2012-22) as irrigation requirement shown in 1, the ultimate, created and achieved irrigation potential of the state is presented in 2. It is clear that proposed irrigated agriculture intensity of 209% can be achieved from net sown area of 56.19 lakh ha by taking three irrigated crops from most of the agricultural land.

-Ultimate, Created and Achieved Irrigation Potential of the State. (Area in Lakh Ha.)

Type of Irrigation Potential	Ultimate Potential	Created Potential	Utilised Potential
(a) Major-Medium Irrigation	53.53	28.86	16.36
(b) Minor Irrigation			
(i) Surface Irrigation (Including Ahars & Pynes)	15.44	5.191	2.358
(ii) Ground Water Schemes (mostly private shallow tube well)	48.57	28.99	26.75
Total	117.54	63.04	45.46

It is clear from the above table that against the up to date created potential of 63.041 lakh ha, through the major, medium and minor water resources schemes annually 45.468 lakh ha irrigation is achieved and irrigation potential of about 17.573 lakh ha area has been lost which need to be restored. In the Agriculture Road Map for the proposed agricultural production, 158% irrigation intensity by year 2017 and 209% irrigation intensity by year 2022 is required and thereby, irrigation will have to be provided in 99.00 lakh ha area by 2017 and 130.90 lakh ha by 2022. Even if, it is proposed to develop the entire ultimate irrigation potential of 117.54 lakh ha by year 2022, requirement will be to create irrigation potential for an additional about 13.36 lakh ha (approx) of land by that period. There are the following alternatives for this :-

- (i) Integrated development of the entire potential of major, medium and minor water resources.
- (ii) Conjunctive use of surface and ground water.
- (iii) Channel storage of surface water resources in rivers /pynes bed during rainy season and their use in non-monsoon months.
- (iv) Enhancement of ground water availability (especially in hilly regions of South Bihar) through rain water harvesting and ground water recharge techniques.
- (v) Increase in ultimate irrigation potential of the state by enhancing the water use efficiency by adopting participatory irrigation management and other techniques.
- (vi) Efforts to achieve irrigation in larger areas with lesser water by covering extensive area under sprinkler and drip irrigation system.
- (vii) Establishing about 8 lakh additional deep private tube wells to utilize very small fraction (about 0.30%) of the huge static ground water resources of about 2550 Billion Cubic Metre (BCM) stored in deep aquifers in north Bihar.

This deep aquifer need not be tapped during 12th five year plan period (2012-17). Very small fraction of ground water resources stored in deep aquifer will be tapped during 13th five year plan period (2017-22) by installing 8 lakh additional private tube wells in North Bihar. Otherwise, there will be shortfall of about 16 lakh ha of projected irrigation during the period.

Qualitative improvement in irrigation along with its horizontal capacity expansion. Under capacity building programme of major, medium and Minor Water Resources programme. Organizational expansion, proposals for farmers' organizations and participatory irrigation management have also been given included. Adequate provisions have been made for required monitoring, evaluation, research, documentation and technical manpower support. This provision is about 10% of the cost incurred on water resources development/irrigation components of the programmes. The capacity building provision will also cover the cost of infrastructure for quality control, third party inspection, non-government supporting individuals and organizations as well as water user's associations.

#### 4. Water and land management

The Water and Land Management Institute (WALMI), based in Patna, is a full pledged campus based institute. It was started in 1987 with the support from USAID, under the Indo-US Water Resources, Management and Training Project. As part of this project, WALMI took the lead in initiating the action research project in Paliganj area of Sone command area. In Bihar, this was the first step towards participatory irrigation management in major canal irrigation systems. This action research was started in 1988 and Paliganj distributory was one among the four irrigation systems included. The committed team of engineers and sociologists (hired by WALMI), and organizational behaviour specialists from AN Sinha Institute of Social Sciences, Patna, collaborated in this activity for nearly four years. Even after the closure of the USAID funded project, WALMI continued (though on lower scale) to strengthen the Paliganj WUA.

#### 5. Strategy of Water Management & Irrigation:-

Conservation of surplus monsoon water for utilization during lean flow period is most imperative need of the irrigated agriculture sector. Due to non-availability of suitable dam sites within the state, the storage, conservation and development of water resources is constrained. However, this constraint may be overcome to some extent by adopting the traditional indigenous technology / methodology of diverting water in Pynes by constructing barriers like barrages / weirs / sluice gates on streams and storing them in Ahars. This methodology is ideally suitable and time tested for all districts of South Bihar.

**Drainage:** About 9.41 lakh ha. of land has drainage congestion and water logging problem in the State. Till date above 1.80 lakh ha. has been made free from drainage congestion. Out of balance 7.61 lakh ha., 2.50 lakh ha. cannot be economically drained out. Aqua-culture & pisciculture should be encouraged in this area.

**Long term solution of Flood Problem:** Bihar faces the severe damages due to flood caused by the rivers originating from Nepal and Tibet every year. Therefore, the entire cost incurred on flood protection schemes of trans-border districts of Bihar must be borne by GoI under River Management Activities & Works related to Border Area (RMAWBA). Re-identification of Flood Prone 30 Districts should be carried out at earliest on the basis of Highest Flood Level (HFL) and actual inundated area. For permanent solution of flood problem in Bihar under long term measures the construction of Sapta Kosi High Dam-Sun Kosi Diversion scheme on Kosi river, the Multi Purpose High Dam at Noonthore on Bagmati river and at Chisapani on Kamla river is necessary. For this purpose the preparation of DPR of these three projects should be completed at the earliest and concerning Joint Project Office(JPO) at Viratnagar, Nepal should be strengthened.

**Silt Management and Linking of Rivers :** The construction of barrages on Ganga river for the purpose of National Water Way seems not to be better option but the deepening and dredging of Ganga river for the development of National Water Way would be a better option. Rivers originating from Nepal and Tibet bring huge quantity of silt with its water flow. Siltation of river bed causes havoc during flood and so scientific and technical management of silt is crying need of present time. Therefore, it is needed that an effective Silt Management Policy should be framed by Government of India. Linking of river basins projects should be declared as National Projects.

Almost every year Bihar faces vagaries of flood. About 68.80 lakh ha land is flood prone in the state. The recurring floods cause heavy loss to standing crops, lives and properties. Managing flood is imperative for intensive irrigated agriculture. As a short term measure, the state has constructed 3745.65 KM length of embankment to protect 36.46 lakh ha area from flood upto 2014-15. There is a programme to protect another 3.36 lakh ha of additional land from flood by constructing 344.74 KM of embankment in a time frame of 2015-17 and the remaining 28.98 lakh ha will be made flood free by constructing 2969 KM of Embankment during 2017-22.

## 6. Conclusion

In short, Bihar has successfully adopted an irrigation management transfer policy for the surface irrigation systems. These policies are clearly being driven by the state's financial conditions, neither by the state's long history of farmer developed and managed irrigation systems, the examples of farmer management being provided by the NGO programmes, nor by other factors, although the other factors are being used to justify the transfer policies. The Paliganj experiment carried out by the Water and Land Management Institute is the current model for irrigation management transfer in large surface systems. Several government orders have been issued in recent years to facilitate formation and function of WUAs in Bihar state. Some of the leading differences of WUAs in Bihar compare to other states in India are: a) WUA formation at distributory level, b) water fee collection by WUAs and retention of 70% and payment of the rest (30%) to the government, c) license to procure paddy and wheat at WUA level on behalf of the FCI, d) lead role being played by WALMI in providing training to planned WUAs in their region, e) setting up of PIM cell in WRD office, f) keen interest of field staff and senior staff of WRD to transfer the irrigation systems to WUAs, and g) the experienced WUAs at distributory level are willing to shoulder the responsibility of the system management, for which they would like to have capacity building help from WALMI and other organizations.

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