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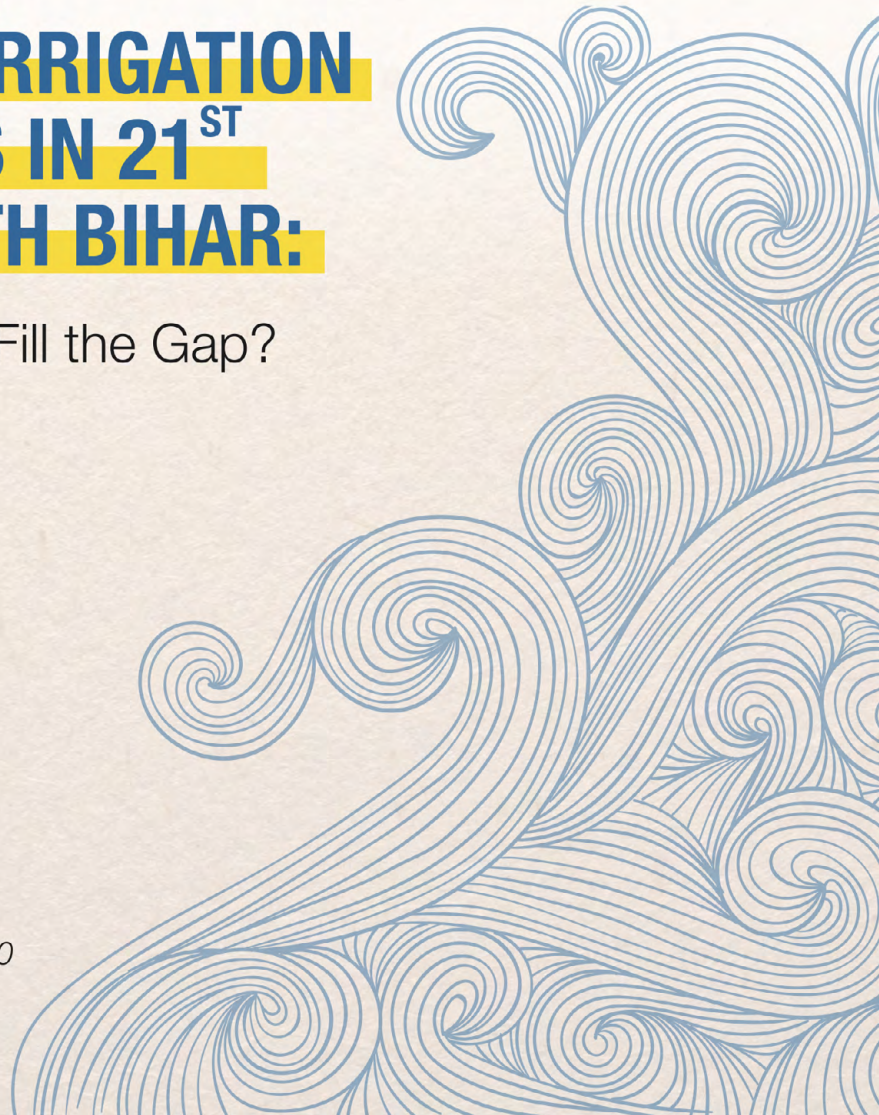
How can Ahar-Pynes Fill the Gap?

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Potential of Traditional Irrigation Technologies in 21st Century South Bihar:

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Illustrations by *Srishti Singh and Anubha Garg*

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INTRODUCTION

Sixty percent of South Bihar is vulnerable to droughts (Government of Bihar n.d.). This statistic is not surprising if we were to look at the physiography with scanty rainfall and lack of perennial rivers. However, in stark contrast, the same region was classified as immune to famines in the Colonial era, even as water abundant regions faced famines (Sengupta 1980). To the surprise of the colonial officers, functional indigenous irrigation technology such as Ahar-Pynes helped South Bihar evade famines.

Instances of famines in India are enmeshed with the institutions that govern the nation and affect its agriculture systems. The downward trajectory of famines in India coincides with its transition from a colony to a functional democracy (Sen 1981). Yet, post-independence South Bihar continues to be drought-prone along with its susceptibility to vagaries of nature despite the existing pioneering Ahar-Pynes in a feudal and colonial set-up.

While there is consensus that participatory irrigation management is a must for the success of irrigation strategies, it is pertinent to understand the causes of their fragility (Pandolfelli et al., 2007). Placing the technology in the institutional framework developed by Elinor Ostrom, a Nobel Prize awardee American economist, to study Common Pool Resources, this paper seeks to understand the variables in the governance set up that engender uncertainty and impact longevity. We must correct them before nesting Ahar-Pynes in the broader irrigation strategy.



DESCRIPTION OF SOUTH BIHAR AND AHAR-PYNES

Bihar can be divided into two regions, namely North and South Bihar. The slope of South Bihar enables the building of embankments. The soil is drier in South Bihar, rainfall is more erratic, and groundwater levels are lower. Therefore, we see Ahar-Pynes primarily in the South. This system is known to help in both drought and flood management. The system is built in areas such as Gaya, Nawada, Munger (Figure 1 below), which lie in both flood-prone and drought-prone areas.



Source: Wikicommons

Fig. (Above): Map of Bihar



Ahar-Pynes can be traced to Kautilya's Arthashastra, a treatise on statecraft written in the Mauryan age. Kautilya described an irrigation system that the King should put in place, especially for rain-fed areas. The description of aharyodakat in Arthashastra roughly translates to a structure that collects water, similar to present-day Ahars (Sengupta 1980). Ahar-Pynes is mentioned in this context, thus dating the system to the Mauryan era.



*Fig. (Above):
An Ahar is a rectangular catchment area embanked on three sides which collects water as it flows down a gradient. South Bihar is bound by the Chhotanagpur plateau in the south, and slopes upwards towards the South. This slope enables building of embankments.*

Pynes are artificial channels which carry water. They are either used to carry water from rivers to fields directly or to feed an Ahar and carry water from it to a field. A pyne can be 10km long and irrigate 400 acres per km. Large pynes can even have upto 10 branches. Swollen torrents fill these channels in July and are in use till September.

Social Organisation over the Centuries

Nirmal Sengupta (1980) provides a vivid account of the system under the Zamindars in the colonial era. Since Zamindars controlled the land, its boundaries were defined as revenue units. Though the boundaries of Ahars and the lengths of Pynes were fixed, the exact amount of water or water rights were not defined. The allocation of water was managed independently by the farmers. While the Tikari estate in Gaya maintained detailed records in the Lal Bahi (Red Book), the records in every estate were not as meticulously written or even recorded in the first place (Sengupta 1998). As the Zamindars were paid in agricultural output, they also had a stake in the maintenance of the irrigation systems.



Fig. (Above): Niranjan Pant states that the monitoring agents in some areas were from a particular community of Dusadhs (Dalits) (Pant 1998). They would travel from one village to another armed with lathis to report breakdown of pynes or irregularities in water use by farmers. In the 21st century the cell phone has replaced the lantern.



Fig. (Above): Zamindars used to charge Gilandazi for irrigation works and enforce the Gomam, a collective physical action for upkeep —albeit with force— was given at the sound of drums. Zamindars were also responsible for solving any disputes about the distribution of water. In the 21st century, the onus of resolving conflicts now rests on the local administration or Courts.

For an extensive decentralised irrigation system to be sustainable, it needs a functional monitoring mechanism and a participatory system for upkeep.

Table 1: Changes in Governance Structure using Ostrom's Institutional Analysis Framework

S. No.	Principle	Mauryan	Colonial era	Present day
1.	Clearly defined boundaries	Described in Arthashastra	As per the Zamindar's land	Physical boundary defined
2.	Congruence between appropriation and provision rules and local conditions	Depending on type of water resource	Effective till commutation	Decided by NGOs/sabhas
3.	Collective-choice arrangements: who can change the system	Prescribed	Asymmetry in power in favour of zamindar	Needs cooperation from all cultivators
4.	Monitoring	Prescribed	Appointed	Ambiguous – both Government and community
5.	Graduated sanctions: Credible Punishment strategy for violators	Prescribed	Zamindars used force to enforce cooperation	Ambiguous
6.	Conflict resolution mechanism	Prescribed	Zamindars used force to enforce cooperation	1. Courts 2. Sabhas/ Panchayat
7.	Minimal recognition of rights to organize	Not applicable	Zamindars left to control system till revenue systems introduced	Depends on area
8.	Nested enterprise	Not applicable	None	In Progress

Source: MoUD (2012)

A Flow, Interrupted

The area irrigated by Ahar-Pynes fell from 40% in 1901 to 9% in 1965 (Pant 1998). Twenty thousand such structures exist, of which three thousand are defunct (Government of Bihar 2015). This fragility can be traced to inequality in the governance structures of Ahar-Pynes over millennia.

Area under Ahar-Pynes declined as the British Administration introduced changes in the revenue collection method. The decline of Ahar Pynes coincided with the change from a producer-rent system to cash (Sengupta 1980). Sengupta (1980) posits that land and water were priced together under a producer-rent system, while under the cash system only land was priced, which eventually made way for the disuse of Ahar Pynes. Post-independence, the introduction of tube wells further led to irrigation and land being treated as separate resources. The emphasis on this distinction led to the disuse of Ahar-Pynes and tube wells occupied the spotlight under the country's Water Policy.

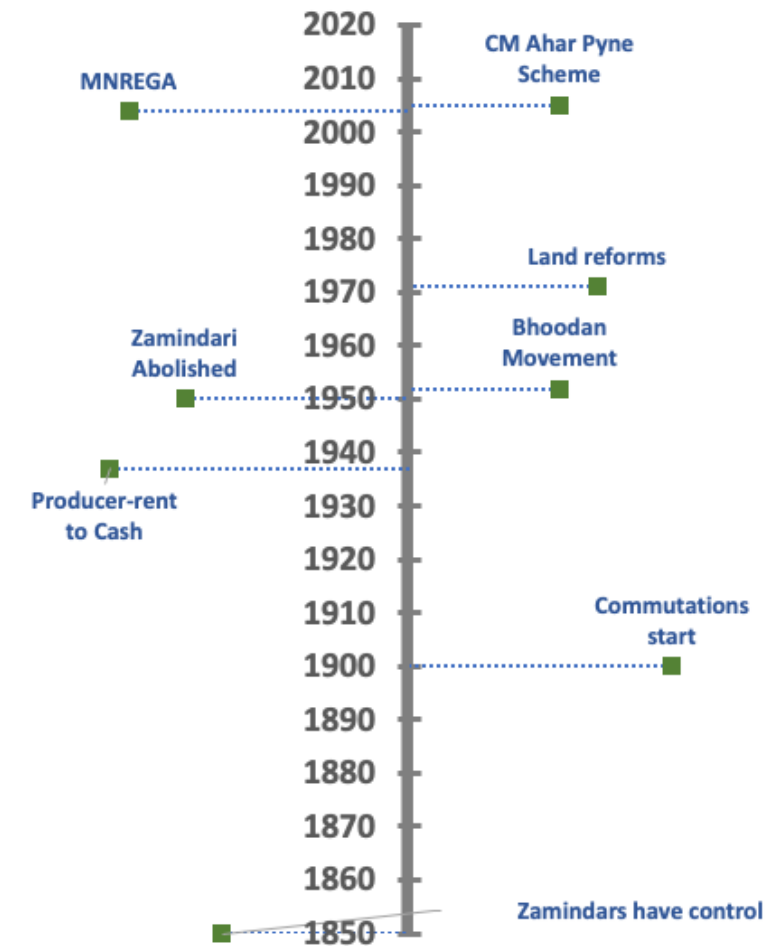


Fig. (Left): Timeline of changes in Governance Structure

Source: Author provided



Fig. (Above): The scales of justice now tilt towards Courts and State Administration, away from the diktat of Zamindars

The loss of a central authority like a Zamindar was one of the causes for the Ahar-Pynes falling into disuse. On the other hand, during the Mauryan Era, Buddhist Sanghs and villagers together used to oversee the upkeep of Pynes in a decentralised system (Amar 2009). The introduction of major water works such as canals and private tube-wells after independence saw the State take charge of irrigation and local management taking a backseat. Thus, it is pertinent to note that though Ahar-Pynes was decentralised and efficient, it was built by force. It is possible to attribute the renewed interest in Ahar-Pynes in Bihar to bottom-up demand and consensus building.

ROLE IN CURRENT WATER POLICY: POLICY IMPLICATIONS

The void left by the absence of Ahar-Pynes was filled by canals and tubewells in the 1950s. With water levels falling and insufficient surface canals to fulfil all needs, there was renewed interest in traditional irrigation technologies such as Ahar-Pynes. Today, Ahar-Pynes fall under surface irrigation schemes in the Minor Water Resources Department of Government of Bihar. Minor irrigation schemes irrigate areas under 2000 hectares using surface or groundwater. Two schemes, namely CM Ahar Pynes Scheme and Jal Jeevan Haryali mission [JJH], have shown renewed interest by the State Government in this technology. 1430 crores have been allocated under the JJH mission for Ahar-Pynes and Ponds as of 2020 (Government of Bihar [GoB] 2020a).

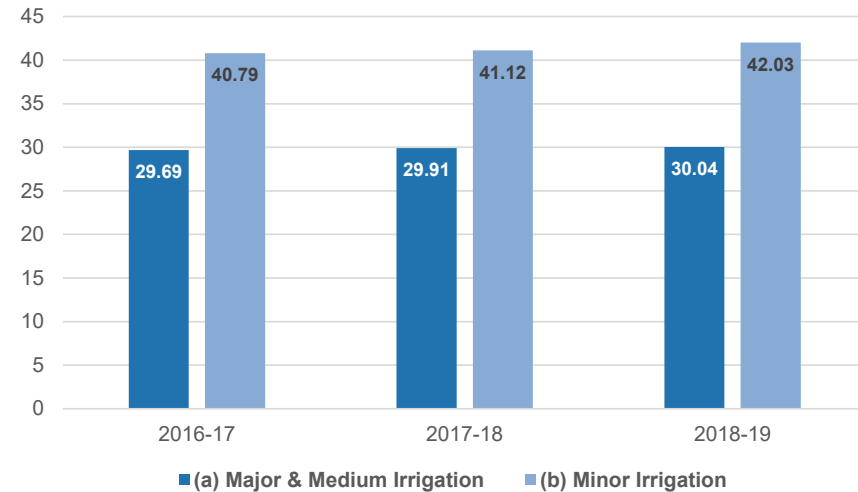
01. Comparison of Ahar Pynes with other Sources in Bihar

Area

Bihar relies on tube wells for irrigation, with 63.1% of irrigated land serviced by tubewells (GoB 2020a). It is concerning to

note that groundwater accounts for 75.9% of ultimate irrigation potential. However, tube wells irrigate more than 80% of irrigated area in North Bihar. Additionally, roughly 50% of South Bihar relies on canals (Bihar Agricultural Management and Extension Training Institute 2018) and 16% of the land is irrigated by Ahar-Pynes and tanks.

Fig. 4: Comparison of Irrigation Potential Created in Bihar



Source: Bihar Economic Survey 2019-20

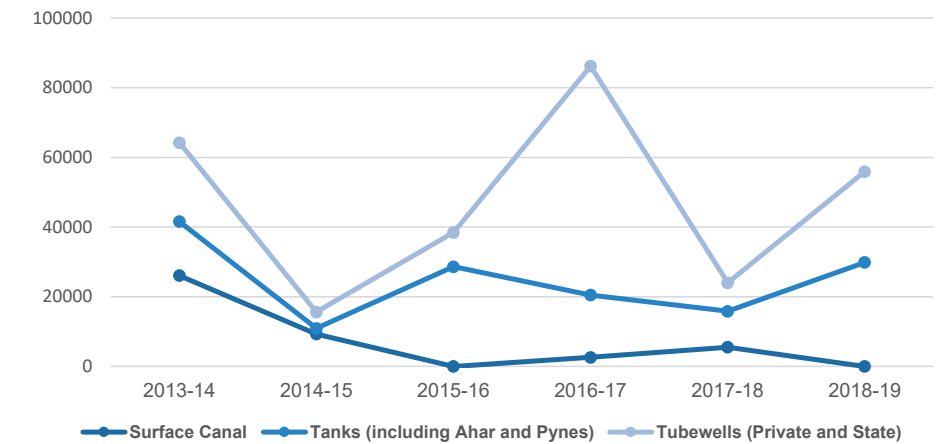
Table 2: Status of Irrigation Potential in Bihar (lakh hectares)

Type of Irrigation Potential	2016-17		2017-18		2018-19		Ultimate Potential
	Created Potential	Utilized Potential	Created Potential	Utilized Potential	Created Potential	Utilized Potential	
(a) Major & Medium Irrigation	29.69	26.72	29.91	23.8	30.04	26.56	53.53
(b) Minor Irrigation	40.79	36.71	41.12	36.99	42.03	37.82	64.01
Surface Irrigation	8.14	7.33	8.35	7.5	8.7	7.83	15.44
Groundwater	32.66	29.38	32.77	29.49	33.33	30	48.57
Total	70.48	63.43	71.03	60.79	72.07	64.38	117.54

Source: Bihar Economic Survey 2019-20

Within surface irrigation, the focus is slowly shifting from canals to other surface irrigation methods as well. The Department aims to create an additional irrigation potential of 8.25 lakh hectares through surface irrigation with 5.56 lakh hectares under Ahar-Pynes (GoB 2020b). Thus far, 32.9% of additional irrigated area was created under Ahar-Pynes as illustrated in Table 3 between 2013-14 and 2018-19.

Fig. 5: Comparison of Area brought under Irrigation



Source: Bihar Economic Survey 2019-20

Table 3: Area brought under irrigation in Bihar

Source	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Surface Canal	26086	9310	0	2600	5500	0
Tanks (including Ahar and Pynes)	41591	10934	28631	20500	15830	29876
Tubewells (Private and State)	64251	15610	38440	86200	24000	55931
Other Sources (Lift Irrigation) and Barge Lift Irrigation	9627	2564	5055	18000	10160	4950
Total	141555	38418	72126	127300	55490	90757

Source: Bihar Economic Survey 2019-20

Cost

Minor Water Resources Department officials estimate the cost of constructing Ahar-Pynes to be in the range of Rs.50,000 to 1 Lakh. However, the final cost depends on the amount of de-siltation to be done per kilometre. Additionally, restoration of Ahar-Pynes cost a third of medium and major irrigation schemes (GoB 2020b). Currently, there are no user-charges for water usage from Ahar-Pynes as they collect rainwater or flood waters. The cost of tubewell construction in comparison is approximately Rs.1.1 lakh, with additional usage charges depending on fuel use (Times News Network [TNN] 2015). Similarly, canals too have user charges, and their cost of construction rises considerably because of land acquisition and material costs. This discussion merits a lifetime cost-benefit comparison, which would depend on the specific physical geography. Additionally, we must also take into account costs related to training the community for successful participatory management of the Ahar-Pynes.

02. Role in Flood Management

Ahar-Pynes serve as a diversion during monsoons in South Bihar. Ahars collect torrential rainwater and Pynes divert them throughout the watershed. The water does not stagnate as the slope facilitates movement. The utility of the system in North Bihar, which is flatter, is unclear because of the difference in inclines and soil type.

03. Challenges in Transforming Governance for Continuity and Equity

Presently, the Department of Water resources is in the process of transferring management of irrigation systems to cooperative societies (GoB 2020b). Since inequality under the Zamindar controlled system stemmed from lack of agency of farmers, farmers were content with the State taking over the irrigation



Fig. (Above): While women pray to the Gods to bless the collective lands with rains, there is no institutional mechanism to ensure that women get fair water rights even within a decentralised set-up.

system, even if inefficient. It is important for upcoming irrigation systems to be intersectional and inclusive in nature.

A. Gender

For Ahar-Pynes to be sustainable, the involvement of women, referred to as “interactive participation – with a voice and influence” (Aggarwal 2001) is of paramount significance. This is a major challenge for the State Administration.

Using Pandolfelli et al.’s (2007) gendered approach to Institutional Analysis Framework, the following variables are important to create an equitable and sustainable governance structure. They can be considered as entry points for NGO/ Government support to promote equity:

A.1 Water Rights

Water rights linked to land ownership discriminate against women as land ownership amongst women is low (Government of India 2011). Currently, water needs are decided within the community, without government intervention. Conversations with officials from the Monitoring department highlight the importance to formalise water rights. Thus, it is pertinent that endowment be made equitable before institutions are formalised.

A.2 Monitoring and upkeep

Currently, the monitoring mechanism is in a state of flux. Through the Jal Jeevan Hariyali Mission, Minor Water Resources Department [MWRD] started monitoring the physical upkeep of Ahar-Pynes. In the colonial era, monitoring was carried by men from amongst the village. The role of women and their needs is yet to be recognised. How women

prefer punishment sanctions must also be taken into account while devising a deterrence strategy. For instance, women prefer flexibility in punishment strategy to cater to time constraints (Pandolfelli et al., 2007). As the Government outsources upkeep to cooperatives societies, it must also account for time constraints of women in labour participation in collective physical action for upkeep.

A.2 Conflict Resolution

MWRD officials state that any conflicts that occur are resolved at the Panchayat level. There are also reports of women being side-lined, and no representation in case of conflicts (Ramagundam 2009).

It is an opportune time for NGOs, community leaders and the State to correct these inequalities. Yet, the strengths of an informal system with respect to flexibility must be preserved as they help counter uncertainty by giving room for adaptation (Pandolfelli et al., 2007).

B. Encroachment

For Ahar-Pynes to be sustainable, the involvement of women, referred to as “interactive participation – with a voice and influence” (Aggarwal 2001) is of paramount significance. This is a major challenge for the State Administration.

Department officials state that encroachment is a major challenge with respect to rejuvenating Ahar-Pynes. According to GoB (2020a), 5395 of 20292 structures have been encroached upon. Land where houses are built happen to be the most difficult to reclaim.



CONCLUSION

Ahar-Pynes have weathered three types of governance structures over 2300 years. Yet, it is important to understand the inherent fragility they pose to the creation of sustainable institutions going forward. The gendered access to water in both centralised and decentralised systems of management needs to be explored closely.

Continuity and nature are central to Bihar's culture. Every year, people of Bihar celebrate Chhath by standing in water and by praying to the Shashthi and the Sun. Women fast to express gratitude for natural resources and request God to continue providing them for their offsprings. The turn of the century has seen renewed interest in Ahar-Pynes under the Mukhya Mantri Ahar Pyne Yojana and Jan Jeevan Haryali scheme. Ahar-Pynes continue to be central to agriculture systems in South Bihar and have the potential to be transformative if fairness and equity in allocation is ensured. It is an opportune time to correct inherent inequalities as the State looks to nest the system in its water policy in the near future.

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