

An Analysis of “Other-Sources” of Irrigation in India: A Case Study of Karnataka

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ABSTRACT

The distribution of irrigated area under ‘other-sources’ of irrigation across Indian states reveals significant regional disparities in the reliance on alternative irrigation systems beyond canals, tanks, and wells. The irrigation from other-sources involve various lift irrigation methods, water diversion methods, traditional methods, non-conventional water resources etc., At All-India level, irrigation from other-sources accounts for 58 lakh hectares, representing about 10 percent of the total Net Irrigated Area (NIA) of 602 lakh hectares during the last five years 2020-2024 and during the same period it accounts for 14% of total NIA in Karnataka. This indicates that while conventional irrigation sources dominate, other-sources still play an important supplementary role in irrigated agriculture. This study investigates how other sources of irrigation are distributed across India, with a detailed district-wise analysis for Karnataka.

Keywords: Other-sources of irrigation (OS), Lift Irrigation Schemes (LIS), Check Dams, Springs, Pickups, Seepage Water, *Naals* (Open Drainage Channels), Ponds, *Kuntas* (Traditional water-harvesting pits), Drain-Water, Small Streams, Dykes, Bridge-Cum-Barrages, Percolation tanks, Salt Water Exclusion Dams (SWED), Vented Dams, *Bandharas* (Weirs), Bamboo Drip Irrigation, *Zabo*, *Dong Bandh*, Wet Rice Irrigation, *Pukhris* (ponds), *Tuikhur* (Stream irrigation), Artificial irrigation, Intensity of Irrigation.

INTRODUCTION

Irrigation plays a crucial role in sustaining agricultural productivity in India, where a significant proportion of cultivation still depends on monsoon rainfall. Over time, several irrigation sources have evolved, including canals, tanks, wells, and traditionally there are many indigenous systems still prevalent across India. While canals, tanks, and wells constitute the major sources of irrigation in the country, a considerable portion of agricultural land is irrigated through what are broadly categorized as “other sources”. These sources include lift irrigation systems, springs, streams, diversion channels, small

check dams, traditional water harvesting structures, and other localized indigenous irrigation mechanisms that do not fall within the conventional irrigation classifications.

This paper analyses the distribution of irrigation under other-sources across various states and Union Territories(UTs) of India, highlighting regional variations and identifying states with significant dependence on these sources. In few states where disaggregated data is available on the other-sources of irrigation there a detailed analysis is done. In addition, the study includes a detailed district-wise analysis of other-sources of irrigation in Karnataka.

LITERATURE REVIEW

In the absence of disaggregated data and limited literature on other-sources of irrigation it makes difficult to determine the relative contribution of their individual components. However, the study relies on selected literature, expert discussions, and state-wise data available on the national website of the Directorate of Economics and Statistics under the Department of Agriculture and Farmers Welfare, Government of India for further analysis. The following are a few studies that have detailed the other sources of irrigation in different parts of India.

1. Sen, P, Devi, N. L., & Singha, D. (2015), researched on the topic, “Understanding indigenous irrigation systems in North East India”, the authors have analysed various methods of traditional irrigation practices adopted by the hilly regions of the NE India.
2. N. Beithou (2015), in an important study “*Non-Conventional Water Resources: Review and Developments*” provided a comprehensive review of water resources used for irrigation, categorizing them as conventional and non-conventional sources. Incorporating water-saving devices.
3. Singh, H. K., Kumar, M., Kumar, A., Gulati, A., & Jyoti (2024), in the review paper titled “*A review of irrigation systems in India utilizing both conventional and non-conventional water sources*” have analysed the non-conventional use of water resources.
4. Marlene Tomaszekiewicz, Majdi Abou Najm, Daniel Beysens (2015), researched on the topic, “Dew as a Sustainable Non-Conventional Water Resource: A Critical Review” and explored the concept of dew harvesting as a water conservation technique that can be utilized for irrigation purposes.

NATIONAL OVERVIEW: IRRIGATION UNDER OTHER-SOURCES

Out of 36 states/UTs other-sources of irrigation is prevalent in 31 states/UTs except Haryana, Punjab, Ladakh, Delhi and Lakshadweep. At all India 58 lakh hectares irrigated

under this category during 2025, these sources contribute approximately one-tenth of the total irrigated area in the country. In comparison, wells account for the largest share of irrigated area, followed by canals, other-sources and tanks contribute very little extent.

Nevertheless, despite the dominance of major sources, other-sources of irrigation continue to play an important role in several states. Their significance becomes particularly evident in areas where large irrigation infrastructure cannot be easily developed due to factors such as rugged terrain, dispersed settlements, or limited water storage potential and requirement of major financial investment.

Moreover, these alternative irrigation systems often represent traditional knowledge based and locally adapted practices that have evolved over centuries. Many of these systems are also modern and innovative, cost-effective and environmentally sustainable, making them particularly relevant in today’s context of climate change and water scarcity.

STATE-WISE DISTRIBUTION OF OTHER-SOURCES OF IRRIGATION

The distribution of irrigation under other-sources varies widely across states. States such as Madhya Pradesh, Uttar Pradesh, Odisha, Karnataka, Maharashtra Gujarat, Rajasthan, Kerala, Bihar, Andra Pradesh and all North Eastern states have recorded large irrigated areas under this category, while states such as Tamil Nadu, Uttarakhand, Goa, and UTs show minimal dependence on such systems. It is clear from the table that the other-sources are prevalent in almost all states, except Haryana and Punjab, out of total 28 states in India. Also, out of total 8 UTs, other-sources of irrigation are ubiquitous in 5 UTs, except Delhi, Ladakh and Lakshadweep (Table 1).

Table 1: NIA by Different Sources of Irrigation in Indian States 2020-2024 (in Hectares)

Sl. No.	State	Canal	Tank	Well	OS	Total
1	Madhya Pradesh	1625152	407078	6290624	1793790	10116645
2	Odisha	0	0	0	769963	769963
3	Uttar Pradesh	1175468	24394	6606293	726045	8532201
4	Karnataka	1159406	109607	2957599	670497	4897109
5	Maharashtra	100097	23935	828560	346551	1299143
6	Gujarat	967376	151824	2226848	262981	3609030
7	Rajasthan	2185508	47032	6886992	215869	9335402
8	Assam	107739	6224	122051	125013	361027
9	Kerala	78940	46809	175386	112821	413957
10	Bihar	989339	61126	2078007	111838	3240309

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Sl. No.	State	Canal	Tank	Well	OS	Total
11	Nagaland	0	0	0	102543	102543
12	Andhra Pradesh	1237013	285903	1275917	99356	2898188
13	Arunachal Pradesh	0	0	0	63569	63569
14	Himachal Pradesh	2993	234	22901	63215	89343
15	Jharkhand	3089	56844	61929	62306	184169
16	West Bengal	110602	180734	399943	60059	751338
17	Chhattisgarh	702470	20239	479328	43024	1245061
18	Tripura	4212	1194	5794	42707	53907
19	Telangana	1192357	225111	1392420	34879	2844767
20	Jammu and Kashmir	263494	10446	16091	22263	312294
21	Uttarakhand	64855	24	228844	18477	312200
22	Manipur	0	0	0	11400	11400
23	Goa	8179	633	3124	10135	22071
24	Tamil Nadu	527593	316597	1452072	3685	2299947
25	Sikkim	213	1829	51	3398	5490
26	D&D	322	8	540	252	1123
27	Chandigarh	0	0	0	223	223
28	Puducherry	4625	0	9619	36	14280
29	A&N Islands	1	3	11	22	37
	All India	14611723	1990637	37772385	5776918	60151663
	% to total	24.29	3.31	62.80	9.60	100.00

Source: Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, Govt. of India.

Note: A&N Islands - Andaman and Nicobar Islands, NIA-Net Irrigated Area, OS-other sources

STATES WITH LARGE AREA UNDER OTHER-SOURCES

States such as Madhya Pradesh (17.9 L ha), Odisha (7.7 L ha), Uttar Pradesh (7.26 L ha) and Karnataka (6.70 L ha) records high areas under the other-sources of irrigation. In these states, OS plays a crucial role in supplementing sources like wells and canals. The prominence of OS here is linked to large-scale adoption of lift irrigation, check dams, and farm ponds, especially in semi-arid and drought-prone regions. These sources enhance irrigation coverage where canal networks are inadequate and groundwater is stressed, making them integral to agricultural stability and regional water management.

STATES WITH MODERATE AREA UNDER OTHER-SOURCES

This category includes states where OS contributes a moderate share, acting as a complementary source rather than a dominant one. Examples include Maharashtra (3.47 L ha), Gujarat (2.63 L ha), Rajasthan (2.16 L ha), Kerala (1.12 L ha.), Bihar (1.12 L ha), Andra Pradesh (1 L ha), Himachal Pradesh (63,215 ha.), Jharkhand (62,306 ha.), west Bengal (60,059 ha.). In these regions, irrigation is still largely driven by wells and canals, but OS plays a supportive role in improving water accessibility during seasonal shortages. The presence of watershed development programs and minor irrigation schemes have contributed to the steady growth of OS, helping diversify irrigation sources and reduce overdependence on a single system.

STATES WITH SMALL AREA UNDER OTHER-SOURCES

States and Union Territories with minimal OS contribution fall into this category, such as Chhattisgarh (43,024 ha.), Telangana (34,879 ha), Jammu and Kashmir (22,263 ha), Uttarakhand (18,477 ha.) and smaller contributors like Tamil Nadu, Goa, Puducherry, and Andaman and Nicobar Islands. In these areas, irrigation is dominated by traditional systems such as tanks or canals and wells, leaving limited scope or necessity for OS.

However, the growth of other-sources also raises concerns. Many of these systems depend on groundwater or seasonal flows, making them vulnerable to over-extraction and climate variability. The lack of regulation and monitoring in decentralized systems can lead to inefficiencies and sustainability issues. Additionally, since OS includes diverse structures, data classification inconsistencies may obscure their true contribution and effectiveness.

Overall, other-sources of irrigation have emerged as a dynamic and adaptive component of India’s irrigation landscape. While their share remains modest, their role is critical in bridging gaps left by traditional systems, particularly in regions with geographical and climatic constraints. Future policy should focus on sustainability, standardization of data, and integration with watershed and groundwater management strategies to ensure that these sources contribute effectively to long-term agricultural productivity.

STORY OF NORTH EAST INDIA REGION

North-East India, comprising Assam, Arunachal Pradesh, Mizoram, Meghalaya, Manipur, Tripura, Nagaland, and Sikkim, is rich in biodiversity and cultural heritage. Agriculture in the region largely depends on natural moisture and monsoon rainfall, resulting in unstable crop production. Although the region has abundant water resources, irrigation mainly relies on rain-fed systems, minor irrigation structures, and gravity-based irrigation from perennial hill streams managed by local communities. Table 2 presents different sources of irrigation across the eight North-Eastern states.

Table 2: NIA by Different Sources of Irrigation In Indian States 2020-2024 (in Hectares)

Sl. No.	State	Canal	Tank	Well	OS		Total NIA
					NIA	% to state total	
1	Assam	107739	6224	122051	125013	35%	361027
2	Nagaland	0	0	0	102543	100%	102543
3	Arunachal Pradesh	0	0	0	63569	100%	63569
4	Tripura	4212	1194	5794	42707	79%	53907
5	Manipur	0	0	0	11400	100%	11400
6	Sikkim	213	1829	51	3398	62%	5490
7	Mizoram	0	0	0	12000	100%	12000
8	Meghalaya	0	0	0	104448	100%	104448
	Total NE Region	112163	9247	127896	465077	65%	714384

Source: Directorate of Economics and Statistics, Dept. of Agriculture and Farmers, Govt. of India, 2025

An analysis of the “other-sources” of irrigation in the North East Region (2020 to 2024) indicates a dominant reliance on non-conventional and minor irrigation systems compared to canals, tanks, and wells. Out of the total NIA of 7.14 lakh hectares, nearly 4.65 lakh hectares (65%) are irrigated through other-sources, highlighting their crucial role in the region’s agricultural water management. Several states depend almost entirely on these sources. Out of 8 NE states 5 states namely Nagaland, Arunachal Pradesh, Manipur, Mizoram and Meghalaya record 100 percent of their irrigated area under other-sources, reflecting the absence or negligible presence of major irrigation sources due to the region’s mountainous terrain, dispersed settlements. In Tripura, other-sources account for 42,707 hectares (79%) of the irrigated area, while Sikkim records 62 percent. Even in Assam, where canals and wells exist to some extent, other-sources still contribute 1.25 lakh hectares (35%) of total irrigation.

Prominent traditional irrigation methods include Zabo, Dong, Cheo-ozih, Bamboo Drip Irrigation, wet-rice irrigation, Pukhris (ponds), Kholas, Tuikhur, and other artificial irrigation systems. A brief description of these systems is provided below as researched by Sen, P., et al (2015) in their article titled, “Understanding indigenous irrigation systems in North East India”.

1. **Bamboo Drip Irrigation:** The bamboo drip irrigation system practiced in Meghalaya is an ingenious traditional method of irrigation developed by the tribal farmers of the Khasi and Jaintia hills over 200 years ago. In this system, hard bamboo pipes are used to divert perennial stream and spring water from hilltops to plantations located at lower elevations through gravity. The bamboo channels

convey water to the fields, where it is further distributed through smaller bamboo pipes and diversion units arranged in several stages.

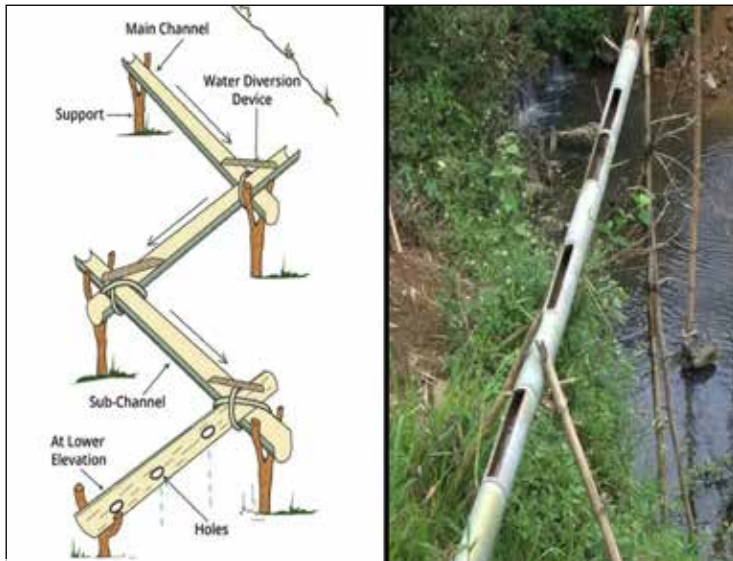


Fig. 1: Bamboo Drip irrigation, Meghalaya

2. **Zabo:** *Zabo* is pounding of water. *Zabo*, an indigenous farming system that combines forestry, agriculture, fishery and animal husbandry.
3. **Dong Bandh:** This traditional system is in practice in parts of Lower Assam by peoples participation to construct the temporary check dams called *dong bund* to the flowing water. It is being practiced by Assamese, Boros & Nepalese etc.



Fig. 2: Dong Bandh

4. **Cheo-ozih:** The River Mezii flows along the Angami village of Kwigema in Nagaland. The river water is brought down by a long channel. From this channel, many branch channels are taken off, and water is often diverted to the terraces through bamboo pipes.

5. **Wet Rice Irrigation:** Traditional irrigation system in Arunachal Pradesh-the irrigation of rice terraces with bamboo pipes, and the Apatani system of wet rice irrigation.



Fig. 3: Wet Rice Irrigation, Arunachal Pradesh

6. **Pukhris:** *Pukhris* or ponds in Manipur *Pukhris* are the most prevalent traditional water harvesting structures. It was quite common to have a small pond at the lower end of the plot in paddy fields. It was useful during the dry spells between the rains after sowing.



Fig. 4: Pukaris of Manipur

7. **Kholas:** In Sikkim, local people have evolved efficient water harvesting systems together with land management systems called *Kholas* or small tanks. The common sources of drinking water are streams and *kholas*.

8. **Tuikhur:** In Mizoram people used to harvest the water from small hilly streams for irrigation and domestic purposes by constructing small tanks or Tuikhur at the foot hills.



Fig. 5: Tuikhur or Tanks of Mizoram

9. In the Brahmaputra and Barak valleys of Assam, there had been a long tradition of artificial irrigation, by the means of artificial channels in the sub-mountainous tracts (Sen, P., Devi, N. L., & Singha, D., 2015).

Overall, the above information suggests traditionally adapted irrigation practices **remain the backbone of irrigation** in the North Eastern states of India.

KARNATAKA IN THE NATIONAL CONTEXT

Karnataka occupies an important position in the national irrigation landscape. With 6.70 lakh hectares of irrigated area under other-sources, the state accounts for 13.7 percent of its total irrigated area, which is higher than the national average of 10 percent.

The relatively significant role of other-sources in Karnataka reflects the diverse nature of irrigation practices in the state. While tanks and wells constitute other important major irrigation sources, several regions depend on alternative irrigation systems such as lift irrigation schemes, small streams, and localized diversion structures. It is important to note that the Minor Irrigation Department is the main department responsible for these other sources of irrigation, for which the government allocates about ₹3,500 crores annually since 2020.

In addition, government’s initiatives mainly aimed at strengthening minor irrigation infrastructure that have contributed to the expansion of irrigation through these alternative systems.

Table 4: Sources of Irrigation in Karnataka 2020-2024 (Hectares)

S. No.	District	Canal	Tank	Well	OS	% of OS to NIA	NIA	NAS	II
1	2	3	4	5	6	7	8	9	10
1	Belagavi	62069	529	335244	243692	38%	641535	213845	67%
2	Bagalkot	34975	378	227806	103536	28%	366694	122231	75%
3	Raichur	296593	3562	17057	54834	15%	372045	124015	58%
4	Yadgir	140028	5199	25062	46252	21%	216542	72181	56%
5	Kalaburagi	15172	5119	79393	39991	29%	139675	46558	16%
6	Ballari	108240	1573	61324	35547	17%	206684	68895	57%
7	Chikkamagaluru	5984	8331	64184	31202	28%	109702	36567	35%
8	Haveri	842	1036	146287	20633	12%	168797	56266	45%
9	Dakshin Kannad	0	0	143082	17421	11%	160503	53501	89%
10	Vijayapura	58357	3393	330982	15979	4%	408711	136237	45%
11	Shivamogga	41531	32957	80504	12452	7%	167444	55815	69%
12	Uttar Kannad	122	2766	48461	10571	17%	61920	20640	52%
13	Gadag	35331	1625	36248	9361	11%	82564	27521	23%
14	Davangere	68081	1441	120581	8891	4%	198994	66331	63%
15	Hassan	41682	11965	71148	4684	4%	129479	43160	31%
16	Vijayanagar	12485	773	102185	4148	3%	119592	39864	48%
17	Dharwad	7437	99	36335	3251	7%	47121	15707	15%
18	Koppal	45767	5253	120726	2693	2%	174440	58147	42%
19	Mandya	107722	14674	69100	2678	1%	194173	64724	68%
20	Udupi	0	634	42340	2351	5%	45325	15108	45%
21	Bidar	345	279	53597	880	2%	55101	18367	14%
22	Mysuru	70263	6910	87755	388	0%	165316	55105	45%
23	Chikkaballapura	1	18	53392	371	1%	53781	17927	30%
24	Kodagu	1414	37	51	185	1%	1687	562	1%
25	Ramanagara	1858	476	36785	128	0%	39248	13083	24%
26	Chamarajanagar	7848	325	83934	13	0%	92120	30707	59%
27	Chitradurga	251	43	153730	12	0%	154037	51346	35%
28	Kolar	0	3	51673	11	0%	51687	17229	29%
29	Bengaluru Urban	0	6	12259	1	0%	12265	4088	33%
30	Bengaluru Rural	0	0	27493	0	0%	27493	9164	24%
31	Tumakuru	0	512	279757	0	0%	280269	93423	49%
Total of Karnataka		1159406	109607	2957599	670497	14%	4897109	1632370	44%
% to Total NIA		23.7	2.2	60.4	13.7	-	100	-	-

Source: Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, Govt. of India

Note: II-Irrigation Intensity, NSA-Net Sown Area

In Karnataka, the irrigation from “other-sources” include irrigation from Lift Irrigation Schemes (LIS), Check Dams, Springs, Pickups, Seepage Water, *Naals* (Open drainage channels), Ponds, *Kuntas* (Traditional water-harvesting pits), Drain-Water, Small Streams, Farm-ponds, Dykes, Bridge-Cum-Barrages, Percolation tanks, Salt Water Exclusion Dams (SWED), Vented Dams, *Bandharas* (Weirs), minor irrigation schemes, and other decentralized water harvesting structures that are not formally categorized under canals, tanks, or wells.

The distribution of irrigation through other-sources across districts reveals significant regional variation. Districts such as Belagavi, Bagalkot, Raichur, Yadgir, Kalaburagi, Ballari, Chikkamagaluru and Haveri show relatively high reliance on other-sources. These districts are largely located in the northern and central parts of Karnataka.

DISTRICTS WITH HIGH CONTRIBUTION OF OTHER-SOURCES (BETWEEN 20,000 AND 2 LAKH HECTARES)

Among the 31 districts, Belagavi records the highest area irrigated through other-sources, with 2.44 lakh hectares (38%), followed by Bagalkot with 1.04 lakh hectares (28%). These OS districts are largely located in the drought-prone northern region of Karnataka, where rainfall variability is high and limited canal irrigation that have increased reliance on alternative irrigation sources. In contrast, Chikkamagaluru (31,202 hectares; 28%) and Haveri (20,633 hectares; 12%) also report notable irrigation through other-sources despite being situated in transitional agro-climatic zones characterized by normal to relatively higher rainfall.

MODERATE DEPENDENCE DISTRICTS (LESS THAN 20000 HECTARES)

Six districts display moderate dependence on other irrigation sources, that is less than 20,000 hectares. For instance, Dakshin Kannada (17,421 hectares, 11%), and Vijayapura (15,979 hectares, 4%) show varying levels of dependence. In coastal districts such as Dakshin Kannada, the presence of rivers, streams, and local water harvesting systems contributes to irrigation under the “other-sources” category.

Shivamogga and Uttar Kannada, both located in the Western Ghats region, also rely moderately on other irrigation sources. Shivamogga records 12,452 hectares (7%), while Uttar Kannada irrigates 10,571 hectares (17%), Gadag (9,361 hectares, 11%), Davangere (8,891 hectares, 4%), through such sources. The presence of perennial streams and small-scale water diversion systems, lift irrigation schemes and farm-ponds contribute to irrigation in these districts.

DISTRICTS WITH LOW CONTRIBUTION (LESS THAN 5000 HECTARES)

Six districts record relatively low contributions from other irrigation sources, that is less than 5,000 hectares. Hassan (4,684 hectares, 4%) show limited dependence on these systems. In these areas, irrigation is primarily supported by wells and canal networks. Vijayanagar (4,148 hectares, 3%), Dharwad (3,251 hectares, 7%), Koppal (2,693 hectares, 2%), and Mandya (2,678 hectares, 1%) record smaller contributions from other-sources. Mandya in particular is heavily dependent on canal irrigation from the Cauvery basin, which explains the minimal share of alternative irrigation sources. Coastal district such as Udupi (2,351 hectares, 5%) also show relatively low dependence, although small water structures and streams still play a minor role.

DISTRICTS WITH NEGLIGIBLE/ZERO CONTRIBUTION

As many as 11 districts report negligible or zero irrigation from other-sources. These include Bidar, Mysuru, Chikkaballapura, Kodagu, Ramanagara, Chamarajanagar, Chitradurga, Kolar, Bengaluru Urban and Bengaluru Rural and Tumakuru.

The low figures in these districts can be attributed to the dominance of groundwater irrigation through wells and borewells. Urbanized districts such as Bengaluru Urban and Bengaluru Rural, Chikkaballapura, Ramnagara, agricultural land itself is limited, further reducing the relevance of alternative irrigation systems. Further, the districts namely Mysuru, Kodagu, Chamrajnagar fall under the Cauvery basin area.

REGIONAL TRENDS-KARNATAKA

From a regional perspective, the northern districts of Karnataka exhibit the highest reliance on other-sources of irrigation. This is primarily due to semi-arid climatic conditions, uneven canal distribution, and the need for supplementary irrigation systems. The coastal and Western Ghats districts show moderate levels of dependence because of the availability of natural streams and high rainfall, which support small-scale water diversion systems. In contrast, southern districts such as Hassan, Kodagu, Mandya, Mysuru, and Chamarajanagar rely largely on Cauvery canal irrigation and groundwater, leaving very little scope for other-sources.

CORRELATION BETWEEN NIA AND IRRIGATION INTENSITY

Irrigation intensity refers to the percentage of area irrigated to the to Net Sown Area in a year in terms of season hectares. The contribution of other-sources of irrigation and irrigation intensity shows a partial relationship across districts of Karnataka, as these supplementary sources help expand irrigated cultivation where canal and tank irrigation are limited. Districts such as Belagavi (38% of NIA under other-sources) and

Bagalkot (28%) record relatively high irrigation intensities of 67% and 75% respectively, indicating that other-sources support multiple cropping and improved water availability. However, the relationship is not uniform across all districts because irrigation intensity is also influenced by rainfall, groundwater use, and cropping patterns. For example, Dakshin Kannada has only 11% of NIA under other-sources but records the highest irrigation intensity (89%), while Kalaburagi shows a higher share of other-sources (29%) but relatively low irrigation intensity (16%). This indicates that although other-sources contribute to irrigation expansion, their influence on cropping intensity depends on the overall irrigation structure and agro-climatic conditions.

MAJOR FACTORS INFLUENCING THE USE OF OS OF IRRIGATION

The variation in the use of other-sources of irrigation across states can be attributed to several factors.

1. **Topography:** In mountainous and hilly regions, the construction of large canal systems is often impractical. As a result, farmers rely on small irrigation systems that utilize springs, streams, and other locally available water sources.
2. **Rainfall Patterns:** Regions with high rainfall often develop localized irrigation systems to capture and utilize excess water during the monsoon season.
3. **Availability of Groundwater:** In areas where groundwater resources are limited or difficult to access, farmers may depend more heavily on alternative irrigation systems.
4. **Historical and Traditional Practices:** Many other irrigation systems represent traditional water management practices that have been passed down through generations.

POLICY IMPLICATIONS

The analysis highlights the importance of strengthening alternative irrigation systems as part of a comprehensive water management strategy. Government policies should focus on:

- Promoting minor irrigation schemes
- Encouraging community-based water management
- Rehabilitating traditional water harvesting structures
- Integrating modern technology with traditional irrigation practices

Such measures can help enhance irrigation coverage while ensuring sustainable water use.

CONCLUSION

The analysis of irrigation under other-sources in India reveals that although these systems account for 10 percent of the total irrigated area at the national level, they play a crucial

role in several states. In regions characterized by difficult terrain, limited infrastructure, or unique environmental conditions, other sources of irrigation serve as the primary means of supporting agricultural activities. The states such as Madhya Pradesh, Uttar Pradesh, Karnataka, and Maharashtra record significant areas under other sources of irrigation, indicating major public expenditure on minor irrigation schemes and continued relevance of these systems in the agricultural economy. More reliable and timely data on these other sources of irrigation across different states would help in understanding their effectiveness and innovativeness, and may facilitate the wider dissemination and adoption of these methods across India.

Furthermore, several smaller states and union territories rely almost entirely on these alternative irrigation systems due to geographical constraints. This underscores the need to recognize and strengthen these localized traditional irrigation practices as an integral component of India's irrigation strategy.

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