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Water management practices and users conflicts of the village pond aquaculture

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Abstract
India is the world's third-largest fish producer, with vast inland fisheries resources. Gujarat, known for marine fish production, lags behind in freshwater aquaculture. A study in Anand District focused on water management practices in village pond aquaculture. Data from 80 fish farmers revealed that ponds were used for both fishery and domestic purposes, with farmers residing on-site and employing security personnel. Various water sources, including canal water, sewer water, groundwater, and rainwater, were utilized, with groundwater and canal water being primary. Conflicts arose due to waste disposal, water quality, poaching, and disputes over water usage. These challenges, along with production losses and insufficient financial support, led to many farmers abandoning fish farming. The involvement of the Gram Panchayat and Fishery Department was crucial for conflict resolution and addressing the issues faced by fish farmers.

Keywords: Fish farmer, village pond, ground water, aquaculture, conflict

1. Introduction
Humans rely on freshwater for drinking, irrigation, industry, fish production, transport, recreation, and waste disposal. Aquaculture has grown rapidly but faces challenges like diseases and water quality management. (Dwivedi *et al*. 2018) [6], Inland aquaculture relied on nearby aquatic systems like streams, lakes, and groundwater as water sources, particularly during the dry season. In order to effectively manage water resources, it is essential to maintain an appropriate water depth in the pond. By implementing effective water resource management and promoting water reuse mitigate competition among different sectors reliant on freshwater. (Zaibel *et al.*, 2022) [11]
Global fish production reached a volume of 184.6 million metric tons in 2022. Asia takes the lead in aquacultural production, accounting for 87.9% of the total in 2018 (FAO 2020). Among the top fish-producing nations worldwide, China stands as the largest producer, followed by Indonesia and India. However, India is the second-largest in terms of aquaculture. India possesses vast and diverse untapped or underutilized resources, including 191,024 km of rivers and canals, 1.2 million hectares of floodplain lakes, 2.36 million hectares of ponds and tanks, 3.54 million hectares of reservoirs, and 1.24 million hectares of brackish water resources. These resources present significant opportunities for increased production and livelihood development. Among the states in India, Andhra Pradesh and West Bengal emerged as the leading producers of freshwater fish through aquaculture. (Biswas *et al.* 2018) [3]
Fishery resources in Gujarat are categorized into three main types: marine, inland, and brackish water resources. While Gujarat holds the top position as the leading marine fish producer in India, its freshwater aquaculture production lags behind and ranks 15th in the country. The inland resources of Gujarat encompass various bodies of water, including rivers, canals, reservoirs, tanks, ponds, estuaries, and brackish water areas. In terms of freshwater aquaculture, Gujarat primarily focuses on utilizing village ponds that are leased to farmers. The state has a total of 6,860 village ponds, covering an area of 0.22 lakh hectares, which contribute approximately 9% to the overall inland fish production in Gujarat. (Handbook of fisheries statistics-2022) [8].

2. Methodology
The research conducted in selected villages of the Anand district and entitled “Water management practices in village pond aquaculture of Anand District” was carried out within the line of objectives and analyzing their responses with the help of Analytical tools. Primary data for the study were collected through face-to-face interviews with fish farmers using a

combination of open-ended and close-ended questions. Secondary data were gathered from research journals, articles, government databases, publications, books, and relevant websites.

The research conducted an exploratory research design with a non-probability sampling method, specifically employing a purposive sampling technique. The sample consisted of 80 fish farmers, and data was collected through key informant interviews, focus group discussions, and case studies. Analytical tools such as tabular analysis, percentage analysis, and graphical presentation were used to analyze the data within a 90-day timeframe.

The study was conducted with the objectives: (i) To identify multiple practices followed by the fish farmers in village ponds (ii) To know alternative water sources used to maintain water levels in village ponds (iii) To identify and study cases of user conflict involving fish farmers and other users

Field interviews were conducted with fish farmers and visited ponds to identify multiple practices followed by fish farmers in village ponds. Apart from fishery observed domestic activities like bathing livestock, drinking, cleaning & leveling, cloth washing, landscaping, irrigation purpose, and utilizing pond land for livelihood. Recognized alternative sources of water used to maintain the water level and key observations to be addressed in the analysis of alternative water sources are as follows:

- Is there any sewer connection with the pond?
- Is there any availability of a canal or groundwater source near the pond?
- Any source of water other than rain, canal, sewer, and groundwater?
- Does the pond overflow in Monsoon?
- Does the pond dry up during summer?
- At what frequency are ponds being filled in a year

After Analyzing the issue of a conflict arising regarding the use of ponds between fish farmers and other pond users of the village.

3. Result and Discussion

The detail analysis of the responses given by the respondents were as follows:

3.1 Uses of Ponds

Ponds serve as shared water sources for villagers and fish farmers, accommodating various activities. In particular, "Gao Talab" located near populated areas where both fishing and domestic practices were carried out. Fishing practices encompassed pond preparation, maintenance, fertilization, fish stocking, feeding, disease management, and fish harvesting, among others. Cleaning and leveling practices were implemented based on the specific condition of each pond.

Table 1: Uses of Ponds

Purposes	Frequency	Percentage
Only Fishery	31	38.75
Domestic & Fishery	49	61.25
Total	80	100

According to the data presented in Table 1, it was observed that 61.25 percent of the ponds served dual purposes, catering to domestic activities such as fish harvesting, pond maintenance, water quality management, bathing livestock, drinking, cloth washing, irrigation, and livelihood support. Additionally, 38.75 percent of the ponds were exclusively utilized for fishery practices, and the majority of these ponds were characterized by smaller sizes. This indicates that the majority of fish farmers engaged in a combination of fisheries and domestic activities in their pond management.

3.2 Pond Security

Table 2: Pond Security

Pond Security	Frequency	Percentage
Personal Security	32	40
Live at Pond Site	48	60
Total	80	100

Based on the findings presented in Table 2, it was found that 40 percent of farmers hired security guard to safeguard their ponds, while 60 percent chose to reside at the pond site themselves to personally oversee its operations. This data highlights that the majority of farmers opted to live on-site, utilizing the pond areas not only for fish farming but also as a means of sustaining their livelihoods.

3.3 Livestock Practices in the Pond Area

Table 3: Livestock Practices in the Pond Area

Livestock Practices	Frequency	Percentage
Kept Livestock	4	5
Not Kept Livestock	76	95
Total	80	100

Table 2 shows 60 percent of farmers lived at a pond site, among them 5 percent of farmers kept livestock in the pond area for additional income according to Table 3.

3.4 Water Management Practices

Water management practices hold significant importance in village pond aquaculture as they are essential for maintaining the health and productivity of fish and other aquatic organisms. These practices encompass various activities such as the application of lime, monitoring and measuring pH levels, appropriate pond construction and design, efficient filling and draining of the pond, effective waste management, as well as weed and pest control measures. By implementing these water management practices, farmers can ensure optimal conditions for the growth and well-being of their fish and aquatic species in the village ponds.

3.5 Use of Lime

Table 4: Use of Lime

Use of Lime	Frequency	Percentage
Yes	66	82.50
No	14	17.50
Total	80	100

According to the data presented in Table 4, it was observed that 82.50 percent of farmers utilized lime for enhancing water quality in the pond, while 17.50 percent of farmers did not employ lime in their pond management practices. These results indicate that the majority of farmers opted to incorporate lime as a water quality improvement measure in their ponds.

3.6 pH Measurement

Table 5: pH Measurement

Measure	Frequency	Percentage
Yes	16	20
No	64	80
Total	80	100

Based on the data provided in Table 5, it is evident that only 20 percent of farmers measured the pH level of their ponds, while the remaining 80 percent did not measure the pH level. These results highlight that the majority of farmers did not prioritize pH level monitoring in their pond management practices.

3.7 Pond Condition in Summer

Table 6: Pond Condition in Summer

Condition of Pond	Frequency	Percentage
Water Level Decreased	45	56.25
Water Level Maintained	35	43.75
Total	80	100

In the summer season, it was observed that 56.25 percent of ponds experienced a decrease in water level, while 43.75 percent of ponds managed to maintain their water level throughout this period. The findings indicate that the majority of ponds faced a reduction in water level. This can be attributed to factors such as insufficient depth or smaller size of the ponds, necessitating the utilization of nearby alternative water sources to compensate for the shortage.

3.8 Pond Condition in Monsoon

Table 7: Pond Condition in Monsoon

Pond Overflow	Frequency	Percentage
Yes	32	40
No	48	60
Total	80	100

According to the data presented in Table 7, it was found that 40 percent of farmers encountered the issue of pond overflow during the monsoon season, resulting in a decline in fish production. Conversely, 60 percent of ponds did not experience any overflow during this period. The majority of ponds that faced overflow were directly connected to sewer lines or canals, indicating the presence of inadequate drainage systems.

3.9 Alternative Water Sources

Table 8: Alternative Water Sources

Water Source	Frequency	Percentage
Ground Water & Canal Water	44	55.00
Sewer Line Water	34	42.50
Only Rain Water	2	2.50
Total	80	100

According to Table 8, the data reveals that 55.00 percent of farmers relied on groundwater and canal water as their primary sources to maintain the water level of ponds. Furthermore, 42.50 percent of ponds were connected to sewer lines. Only 2.50 percent of ponds relied solely on rainwater for refilling. These findings indicate that the majority of farmers opt for groundwater and canal water, which encompasses wells, borewells, and tube wells, as their primary means to replenish the ponds.

3.10 Frequency of Water Level Maintenance

Table 9: Frequency of Water Level Maintenance

Ponds Refilled (in year)	Frequency	Percentage
Frequently (>10)	18	22.50
Occasionally (5-10)	17	21.25
Rarely (1-5)	10	12.50
Not Require	35	43.75
Total	80	100

During the summer season, Table 9 shows that important to replenish the water levels of ponds to ensure their sustainability. Some ponds were naturally sustained by other water sources or have a higher depth, resulting in 43.75 percent of ponds not requiring refilling. Additionally, 12.50 percent of ponds rarely need to be refilled, 21.25 percent occasionally need refilling, and 22.50 percent of ponds require frequent refilling.

3.11 Challenges Faced by Fish Farmers

Poaching emerged as a notable concern experienced by nearly all farmers, posing a challenging issue to address. Farmers encountered this problem to varying degrees, ranging from significant to modest scales. However, it was universally acknowledged that 100 of farmers faced problems related to poaching.

Table 10: Challenges Faced by Fish Farmers

Challenges (Including Poaching)	Frequency	Percentage
Bad Water Quality	31	38.75
Scarcity of Culture Water in the Dry Season	30	37.50
Diseases & Weed	19	23.75
Total	80	100

Farmers gave priority to addressing the most significant challenges, as indicated in Table 10. Among these challenges, 38.75 percent of farmers encountered issues related to poor water quality caused by sewage water, while 37.50 percent of farmers faced difficulties in maintaining water levels during the dry season. Additionally, 23.75 percent of farmers faced challenges concerning poaching, diseases, and weeds. The findings revealed that the majority of farmers grappled with problems related to poaching and bad water quality. These challenges had a direct impact on their production, leading to a decrease in their income.

3.12 Reason for Discontinuation

Table 11: Reason for Discontinuation

Particular	Frequency	Percentage
Lack of Monetary Support	48	60
Lack of Knowledge	32	40
Total	80	100

Based on Table 11, it is evident that 60 percent of farmers believed that new farmers discontinue fishing activities in leased ponds primarily due to a lack of monetary support. In contrast, 40 percent of farmers expressed that new farmers discontinued fishing activities because of a lack of knowledge. These findings suggest that the majority of beginner farmers tend to cease fishing activities primarily due to insufficient financial resources.

3.13 The Conflict between Different User Groups of the Pond

The source of water is often common property or has open access resources, so conflicts between fishermen and different user groups of water sources are inevitable. Identified the following most important issues and user conflicts such as (i) Poaching Activities (ii) Dumping of Garbage (iii) Disposal of the Sewage (iv) Irrigation and fisheries.

Table 12: The Conflict between Different User Groups of the Pond

Sources of conflicts	Description
Poaching by Villagers	Poaching emerged as a major impediment to fisheries, affecting the majority of farmers. All farmers acknowledged facing poaching-related issues on a small scale. However, in the Piplav and Kasor villages of Anand district, farmers encountered large-scale incidents of poaching. They shared experiences of goons hunting extensively in their ponds during their absence. To address this, 40 percent of farmers employed security guard to tackle poaching problems. Farmers believed that a single security guard was inadequate to protect the pond from large-scale poaching. Suspecting the involvement of nearby villagers, farmers lodged complaints with the police station and the fisheries department seeking intervention and assistance.
Dumping of Garbage	According to Table 1, 61.25 percent of ponds were utilized for various activities including pond preparation, water quality management, disease control, feeding, cloth washing, and cattle bathing. However, excessive domestic use of the pond and the disposal of waste in close proximity have resulted in the accumulation of debris and a gradual decline in water quality. This conflict was most prominent in ponds connected to sewer lines, as indicated by 42.50 percent of ponds being linked to sewer systems. These issues adversely affect fish production and increase the costs associated with pond cleaning and maintenance. Pond lessees face challenges in dealing with the villagers in addressing these concerns.
Disposal of the Sewage	Sewage water contamination poses a significant threat to inland water bodies, resulting in a decline in water quality. Additionally, poorly maintained drainage systems contribute to overflow issues, particularly during the monsoon season, leading to a reduction in fish production. While sewage water lines mitigate water scarcity problems during the summer, they give rise to water quality concerns, causing diseases among fish and pH level fluctuations in ponds. Alarmingly, only 20 percent of farmers monitor pH values, and 42.50 percent of ponds were connected to sewer lines, exacerbating sewage disposal challenges. Due to the high population density surrounding village ponds, these problems are widespread, and fish farmers are seeking assistance from the "Gram panchayat" to manage proper drainage system.
Irrigation and Fisheries	In Malu village, Khambhat, located in Anand district, there is a "Gao talab" (village pond) that receives water directly from a canal, ensuring that the pond does not dry up during the summer. However, during fish harvesting, the farmers construct fragile walls to retain water and prevent the fish from escaping. Unfortunately, nearby paddy farmers break these walls to fulfil their water requirements, resulting in substantial losses for the fish farmer. The owner of the pond has approached assistance from fishery department and the Gram Panchayat, but their attempts have been unsuccessful in addressing this issue.

The Table 12 illustrates the primary sources of conflicts observed in village ponds, with the left side indicating the main issues that commonly arise. On the right side, The Table 12 describes the underlying factors and circumstances that give rise to these conflicts, providing an overview of the entire conflict phenomenon.

Conclusion

The majority of ponds, serving both fishery and domestic purposes, experienced a decrease in water levels during the summer season, affecting 56.25 percent of them. To replenish the ponds, most farmers relied on groundwater and canal water, while a mere 2.50 percent depended solely on rainfall. Village ponds were typically situated near populated areas, attracting higher numbers of users, but this led to issues such as sewage disposal and garbage dumping. Approximately 42.50 percent of ponds were connected to sewer lines, and while only 20 percent of farmers measured the pH level of the water, 82.50 percent used lime for water quality improvement. Despite these efforts, 38.75 percent of farmers still encountered problems with poor water quality, causing conflicts between pond lessees and villagers who exploited the ponds. To prevent poaching, 60 percent of farmers resided near the ponds, and 40 percent hired security guards. Unfortunately, all farmers faced poaching issues, resulting in conflicts between them and the villagers. Water use conflicts also arose between paddy farmers and fish farmers, with the latter suffering losses. These production setbacks led to a need for financial support during lease payments, ultimately resulting in the majority of farmers discontinuing fish farming due to insufficient monetary aid. Although the Gram Panchayat and fishery department addressed these conflicts, farmers were often dissatisfied with the decisions made. Despite their attempts to seek assistance from government institutions, fish farmers' efforts proved futile.

Reference

1. Ail SKS, Misra CK, Chaudhari AK, Landge A, Dube K, Nayak BB, *et al*. Comparative Analysis of Fish Culture Methods in Village Ponds of Gujarat. Fishery Technology. 2019;56:254-260.
2. Bhatt JH, Patel GG. Knowledge level of fish farmers regarding freshwater aquaculture. Young (Up to 30 years), 2018;23:23-00.
3. Biswas B, Das SK, Mondal I, Mandal A. Composite fish farming in West Bengal, India: redesigning management practices during the course of last five decades. International Journal of Aquaculture. 2018, 8(12).
4. Commissioner of Fisheries. Department of Agriculture, Farmers Welfare and Co-operation, Government of Gujarat, 2023.
5. Das A, Choudhury BU, Ramkrushna GI, Tripathi AK, Singh RK, Ngachan SV, *et al*. Multiple use of pond water for enhancing water productivity and livelihood of small and marginal farmers. Indian Journal of Hill Farming. 2013;26(1):29-36.
6. Dwivedi AC, Jha DN, Shrivastava RS, Das BK, Mayank P, Kumar M, *et al*. Status of water resources and fish

farming in Allahabad district, India. Journal of Fisheries and Livestock Production. 2018;6(2):274.
7. Department of Animal Husbandry and Dairying. Annual report. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying. Government of India, New Delhi, 2023.
8. Handbook of fisheries statistics. Department of Animal Husbandry and Dairying. Government of India, New Delhi, 2022.
9. Jana BB, Jana S. The potential and sustainability of aquaculture in India. Journal of Applied Aquaculture. 2003;13(3-4):283-316.
10. National Fisheries Development Board. Retrieved from Department of Animal Husbandry and Dairying. Government of India, New Delhi, 2014.
11. Zaibel I, Arnon S, Zilberg D. Treated municipal wastewater as a water source for sustainable aquaculture: A review. Reviews in Aquaculture. 2022;14(1):362-377.