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Analysis of the Water Quality of the Batang Hari River as a Source of Rice Field Irrigation in Sikabau Village, Pulau Punjung District, Dharmasraya Regency

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ABSTRACT: Research This aim analyze Water quality of the Batang Hari River based on relevant physical and chemical parameters for irrigation of rice fields and describe results rice production by farmers who use water as source irrigation in Nagari Sikabau, Pulau Punjung District, Regency Dharmasraya. Research use method mixed methods, with testing laboratory as quantitative and qualitative data sources (interviews, observations, and documentation). Water samples were taken using the grab sampling method at three points, namely upstream / irrigation (07/c), the middle of the rice field area (08/c), and downstream / flow end of the rice field (09/c). Parameters tested included pH, temperature, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). The results show that pH ranges from 7.10–7.42; temperature ranges from 24.0–25.0°C; TSS ranges from 25.9–171 mg/L; TDS ranges from 92.5–106 mg/L; DO ranges from 7.41–8.66 mg/L; BOD ranges from 0.48–3.60 mg/L; and COD ranges from 10.3–23.0 mg/L. All parameters tested fulfil standard Class IV water quality based on Regulation Government Number 22 of 2021. Interviews with the village secretary and a farmer show that the water of the Batang Hari River is still the main source of irrigation. Rice production is still ongoing, but the results fluctuate based on the availability and clarity of water, weather, variety of seeds, fertilisation, pests, and smoothness of channel irrigation. Research conclude that river water still can utilized for irrigation based on the parameters tested, however monitoring periodic and repair management irrigation still required. This research does not prove a direct cause-and-effect connection between water quality and rice production.

KEYWORDS: River water quality, irrigation, rice fields.

INTRODUCTION

Rice is a commodities food main thing that has role important in resilience Indonesian food. Success paddy cultivation is determined by the interaction of various factors, including conditions land, varieties, fertilization, control organism nuisance plants, weather, and water availability In rice field system, water is not only needed for fulfil need physiological plants, but also helps guard condition humidity land and support management land in various stage growth. Therefore that, sustainability related rice production close with adequate water availability as well as management proper water source. The quantity of water is not the only aspect that requires attention. The quality of irrigation water is also important Because characteristics physics and chemistry of water can influence land, channels irrigation, as well as growth plants. Solids high suspension can related with turbidity and sedimentation, whereas content substance dissolved, level acidity, and indicators material organic can give description about condition waters. Effendi (2003) explains that water quality is determined by the characteristics that need to be assessed in accordance with its intended use. Thus, the water that is assessed for need irrigation need analyzed based on relevant parameters with function said. The Batang Hari River is an important water source for the community in Dharmasraya Regency, including Rice farmers in Sikabau Village, Pulau Punjung District. River water utilized For irrigate land and support activity agriculture society. However, the river conditions can change following discharge, rainfall, material carried by the flow, as well as human activities along the river. Research previously cited in the thesis shows attention to turbidity, suspended solids, and possibly input pollutants in some Batang Hari River sections. Conditions the become reason the need measurement water quality at the location specific utilization.

Regency rice production data for Dharmasraya in 2019–2023 also shows interannual change. Production recorded 32,927 tonnes in 2019, an increase become 37,068 tonnes in 2020, down become 25,538 tonnes in 2021, up to 47,555 tons in 2022, then become 44,033 tons in 2023. Changes the walk together change wide harvest and productivity, so that number regency No can used for conclude that change production caused by the quality of water in one location certain. The data more appropriate become context general about importance management agriculture and

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irrigation. Based on condition said, research This focus on two questions: (1) how Batang Hari River water quality based on relevant physical and chemical parameters for irrigation of rice fields in Nagari Sikabau; and (2) how results rice production achieved farmer when using river water the as source irrigation. The study combines laboratory results with information from farmers so that water conditions can be understood together with context use and irrigation management in the field.

LITERATURE REVIEW

1. Water quality and testing parameters

Water quality is a description of water characteristics that determine its suitability for certain uses. Assessment water quality is necessary considering physical and chemical parameters in a way simultaneously, because one parameter only Not yet Enough describe condition waters. In this study, the parameters analyzed namely pH, temperature, TSS, TDS, DO, BOD, and COD. pH shows level acidity or alkalinity; temperature describe condition thermal water; TSS indicates amount solids suspended; TDS shows solids dissolved; DO indicates oxygen dissolved; while BOD and COD are used as indicator need related oxygen with material organic and biodegradable materials oxidized. The TSS value needs to be read with notice difference location and conditions flow. Suspended particles can originate from erosion, processing land, surface runoff, or material carried by the current. TDS provides a description of the amount of dissolved solids, which can be related to minerals and salts in the water. While that, DO, BOD, and COD help explain condition oxygen and load materials required oxygen in the process of decomposition or oxidation. Interpretation of these parameters in article This limited to strictly defined parameters tested in the laboratory; research This No test metal weight, residue pesticides, or biological parameters.

2. Irrigation water and rice cultivation

Paddy fields require sufficient water supply during different growth phases. When the water supply is not stable, activity processing soil, planting, and maintenance plant can disturbed. Water quality also needs to be maintained so that the use of term long No cause problem for land and systems irrigation. However, the harvest results are influenced by many interrelated factors. Because of that, assessment of water quality should be equipped with information about cultivation practices, planting patterns, weather conditions, fertilisation, pests, and conditions of channel irrigation.

MATERIALS AND METHODS

Study use mixed methods approach, namely combining quantitative and qualitative data for get a clearer picture intact. Quantitative data originate from testing laboratory to Batang Hari River water samples, while qualitative data collected through interviews, observations field, and documentation related utilization of water for paddy cultivation. The research location is in Nagari Sikabau, Pulau Punjung District, Dharmasraya Regency. Pickup location sample covers three dot, dot, dot upstream / irrigation (07/C), the middle of the rice field area (08/C), and point downstream in the flow end of rice field (09/C). The third point was chosen to describe water conditions in the section beginning irrigation, when passing through the rice field area and after exiting the rice field area. Samples were collected with the grab sampling method on June 1, 2026 and sent to the Laboratory UPTD Environment of the West Sumatra Provincial Environmental Service for testing.



Point 1 Upstream (Irrigation) – Nagari Sikabau (June 01, 2026)



Midpoint 2 (Rice Paddy Area), Nagari Sikabau (June 01, 2026)

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Point 3 Downstream (End of Rice Paddy Irrigation Flow), Nagari Sikabau (June 01, 2026)



Sample storage in a cool box (June 01, 2026)

Laboratory parameters include pH, temperature, TSS, TDS, DO, BOD, and COD. The test results were tabulated and compared with standard Class IV water quality as used in the thesis, based on Appendix VI of Government Regulation Number 22 of 2021. Comparison: This was used to state whether each parameter tested fulfilled the criteria in the reference research. Qualitative data obtained through interview with secretary guardian village and rice farmers . Interviews covered experience use of Batang Hari River water, water clarity and discharge conditions, patterns planting, estimates results harvest, obstacles irrigation, as well as hope farmers. Data were analysed in a descriptive way through grouping repetitive information, presenting findings, and drawing conclusions. Description results the harvest mentioned informant treated as report experience farmers, not standardised production measurement results for all villages.

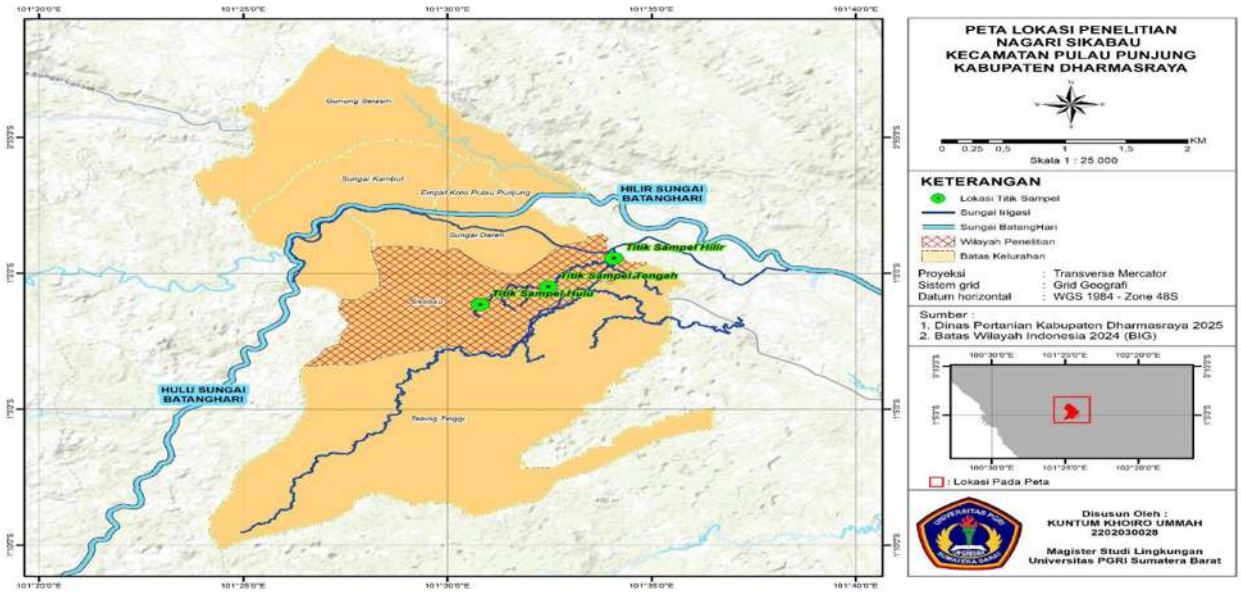

Figure 1. Location map study

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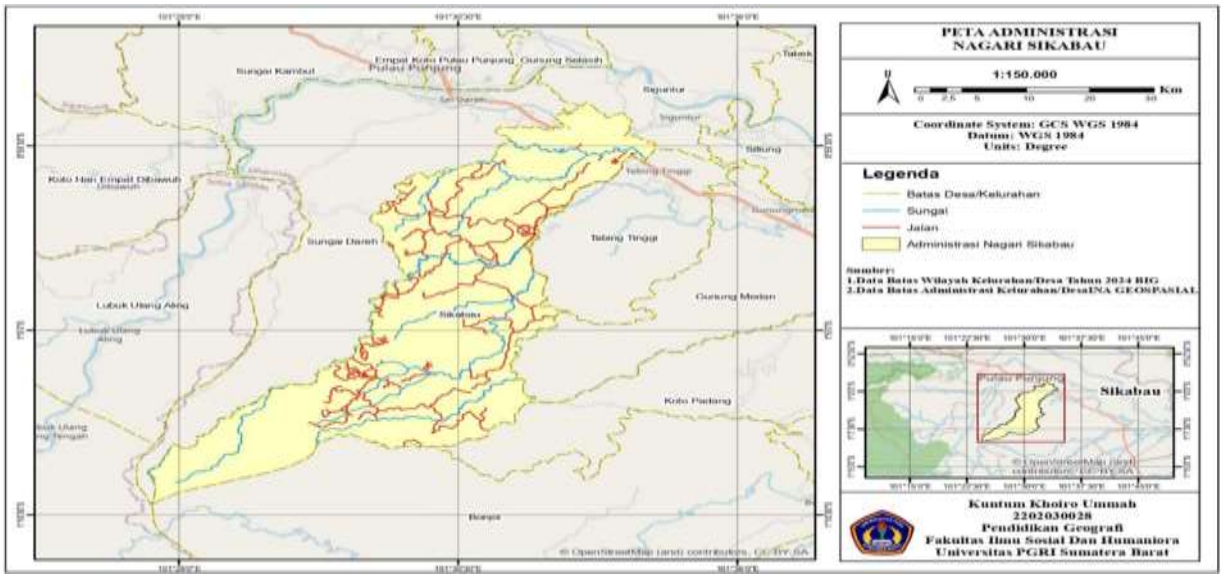

Figure 2. Administrative Map Study

RESULTS

1. Test results water quality

Test results laboratory on three point show that all parameters tested is at in range standard Class IV water quality used in research . However, the parameter values are different between points. The differences give a description of the variation in water conditions throughout the irrigation and rice field areas.

Table 1. Laboratory Test Results

No	Parameter	Result			Unit	Method
		07/C	08/C	09/C		
1	pH	7,22	7,42	7,10	-	SNI 6989.11:2019
2	Temperature	24,0	25,0	25,0	°C	SNI 06-6989.23-2005
3	TSS	156	171	25,9	mg/L	SNI 6989.3:2019
4	TDS	92,5	96,0	106	mg/L	SNI 6989.27:2019
5	DO	8,52	8,66	7,41	mg/L	SNI 06-6989.14-2004
6	BOD	1,16	0,480	3,60	mg/L	SNI 6989.72:2009
7	COD	10,3	12,0	23,0	mg/L	SNI 6989.2:2019

Description:
07/C = Batang Hari River, irrigation, Nagari Sikabau, Dharmasraya.
08/C = Batang Hari River, middle of the rice fields, Nagari Sikabau, Dharmasraya.
09/C = Batang Hari River, outlet from the rice fields, Nagari Sikabau, Dharmasraya.

Table 2. Analysis results of the water quality of the Batang Hari River in three-point observation.

No.	Parameter	Unit	07/C Upstream/ irrigation	08/C Middle of the rice field	09/C Downstream	Quality standards Class IV	Status
1	pH	-	7.22	7.42	7.10	6–9	Fulfil
2	Temperature	°C	24.0	25.0	25.0	Deviation ≤3°C	Fulfil
3	TSS	mg/L	156	171	25.9	400	Fulfil
4	TDS	mg/L	92.5	96.0	106	2,000	Fulfil
5	DO	mg/L	8.52	8.66	7.41	≥1	Fulfil
6	BOD	mg/L	1.16	0.480	3.60	12	Fulfil
7	COD	mg/L	10.3	12.0	23.0	80	Fulfil

Source: laboratory test results in the thesis of the researcher

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2. Interpretation of parameters

The pH value ranges between 7.10 and 7.42. These values is at in range standard grade 6–9, so that based on reference used, level water acidity meets criteria. Temperature was measured between 24.0°C and 25.0°C at all three points. Temperature value This show difference small inter-location and stated fulfil criteria listed temperature in table analysis thesis. The TSS value shows the most obvious variation between observation points, namely 156 mg/L at the point upstream / irrigation, 171 mg/L at the point middle rice fields, and 25.9 mg/L at the point downstream. Highest value located at the point middle, while mark downstream more low. Difference This can describe variation of suspended material at the time sample taken, but the cause No can confirmed only from one take sample. All TSS values are still below the standard of 400 mg/L used in research. TDS value increases from 92.5 mg/L at the upstream point to 96.0 mg/L at the middle point and 106 mg/L at the downstream point. Third, mark the far-below reference mark of 2,000 mg/L. The DO value is in the range of 7.41–8.66 mg/L, with the highest at the middle and the lowest point downstream. BOD ranges from 0.480–3.60 mg/L, while COD ranges from 10.3–23.0 mg/L. All DO, BOD and COD values meet the reference limits used. By overall, results the support conclusion limited that the parameters being tested fulfil standard quality Class IV, no that all possibility polluter has checked.

3. Interview results about rice production

Interview show that the Batang Hari River is still become source main irrigation water for farmers in Nagari Sikabau. Informant state that possible alternative water sources replace function river Still limited, so that sustainability rice cultivation is closely related with water availability from river and smoothness the channel that delivers it to the rice fields. Water is channelled through small channels on the edge land, which the informant said are called bondau paembek or local channel irrigation. Farmers describe changes in water clarity according to seasons and stages of land. During the ploughing period until the rice is ready to be planted, water frequently looks more cloudy because mud and material are carried by the flow. A number of informants mention that water tends to return clearer after the plant is around one month. Description This is observation farmers and not replace measurement turbidity instrumentally, but important for understand experience water users in the field.



Wawancara bersama Bapak FW Sekretaris Wali Nagari Sikabau



Wawancara bersama Ibu DR selaku petani sawah di Nagari Sikabau



Wawancara bersama Ibuk AS selaku petani padi sawah di Nagari Sikabau

Rice production was reported Enough Good when water is available, the flow irrigation smooth, fertilization adequate, and weather support. One of the informant mention results about 16 sacks grain per quarter hectares, which in information thesis equivalent with approximately 64 sacks per hectare under normal conditions certain. This number is reported estimates informants and not can equalized with size heavy grain without information size sacks and water content. Farmers also conveyed that intensity plant varies according to age varieties; varieties aged about 75 days allows opportunity plant more often compared to varieties 100–120 days old, if water is available. The main obstacles mentioned farmer

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is the water discharge which decreases during the season drought, drying or disturbance channel irrigation, blocked flow, cloudy water at the stage certain conditions, changing weather, as well attack pests. In condition water shortage, results harvest can decreased and some farmer can postpone planting or consider other plants. Farmers rely on cooperation to clean channels and set water distribution when supply decreases. They hope quality river still awake, channel maintained, as well as potential activities bother water quality is controlled.

DISCUSSION

Laboratory results show that pH, temperature, TSS, TDS, DO, BOD, and COD at three observation points fulfil the standard quality Class IV as used in research. The pH range of 7.10–7.42 indicates condition approach neutral, while relative TDS value low indicates that amount solids dissolved at the time taking sample No approaching the reference limit. DO is in the range of 7.41–8.66 mg/L, accompanied by BOD and COD which are still be under mark reference, giving description that indicator oxygen and needs oxygen tested Still fulfil criteria research. TSS is a parameter that needs to be noticed in monitoring next because its value varies interpoint and more height at point irrigation as well as middle of the rice field compared with point downstream. Variations do not necessarily show pollution or impact on production, but underline the importance of monitoring repeatedly in different seasons and discharge conditions. The taking of sample only on one time No can describe all over change seasonality of the Batang Hari River. Findings interview complete laboratory data with show that experience farmer about water suitability is also related with water quantity and reliability infrastructure. Although the parameters tested fulfil standard quality, farmers still face supply problems during the season of drought and channel disturbances. Thus, the water quality meets criteria No automatic ensure production stable if the water is not available in sufficient quantity or No distributed in a way evenly.

Informants link the ups and downs of harvest with water clarity, discharge, weather, seeds, fertiliser, pests, and management channels. Relationship This need understood as the perception and experience farmers, not proof cause and effect based on design experiments. Production data fluctuating districts in 2019–2023 also show importance consider wide harvest and productivity. Because water testing is carried out at the location certain in Nagari Sikabau, the number production regency No can in a way direct associated with results laboratory study this. Limitations study is testing only covers seven parameters, three point observation, and one period taking sample. Metal weight, residue pesticides, microbiology, salinity or Power deliver electricity No including in tests reported in the table results main. Because of that, recommendations in the article are limited to the parameters tested and the standards used for comparison. Monitoring advanced cross-season, as well as measuring discharge and productivity with standardised units, will strengthen evaluation of irrigation.

CONCLUSION

Test results at point upstream/irrigation, middle rice fields, and downstream show that pH (7.10–7.42), temperature (24.0–25.0°C), TSS (25.9–171 mg/L), TDS (92.5–106 mg/L), DO (7.41–8.66 mg/L), BOD (0.480–3.60 mg/L), and COD (10.3–23.0 mg/L) meet the requirements standard Class IV water quality based on PP Number 22 of 2021 which is used in research. With parameter and time limitations taking sample Accordingly, Batang Hari River water can be obtained utilized as source irrigation of rice fields on site research. Batang Hari River remains the main irrigation source for Sikabau Village farmers. Reported harvest results farmer tend more Good when sufficient water supply, more water clear, weather support, fertilization good, and channel fluent; on the contrary, lack of discharge, interference irrigation, weather, and pest can cause decline results. Findings: This shows that managing rice production not only requires monitoring water quality, but also maintaining channels and setting water distribution. Research furthermore recommended doing testing in different seasons, adding parameters such as metal weight and pesticides, as well as measuring production by farmers with uniform units.

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