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Research Article

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Groundwater use and perception of local farmers under arsenic risk in An Giang, Mekong Delta: a socio-hydrogeological assessment

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ABSTRACT

Groundwater contamination by elevated arsenic concentrations has been reported in An Giang Province since the 2000s. This study aimed to assess the current status of groundwater use in this As-risk area through an integrated socio-hydrogeological approach that examined groundwater use patterns, user perceptions, and hydrochemical conditions. Household surveys and well investigations were conducted in April 2025, covering 85 households and 80 wells. Structured interviews were combined with field measurements of pH, redox potential, and electrical conductivity to identify the main drivers of groundwater use and evaluate associated water quality risks. The results showed that aquaculture was the dominant groundwater-consuming activity, accounting for nearly 88% of total abstraction, with most water extracted from medium-depth wells (30–60 m). Although groundwater was used only marginally for drinking purposes (0.4% of total use), around 27% of households still depended on it for domestic activities. Respondents most frequently identified iron and salinity as water quality concerns, whereas awareness of arsenic risk remained very limited, despite earlier evidence of As contamination in the region. Measured redox pH, and Electrical conductivity values suggest groundwater conditions may be favorable for As mobilization, especially in shallow wells used for irrigation. Infrastructure limitations, affordability, and perceived reliability were identified as key drivers of continued groundwater use, even among households with access to piped water. However, 88.6% of respondents expressed a preference for piped water supply, indicating a strong willingness to shift away from groundwater use if reliable alternatives are available. These findings underscore the need for targeted infrastructure investment, strengthened groundwater quality monitoring, and community engagement to reduce exposure risks and promote sustainable groundwater management in As-affected areas.

Key words: Groundwater use, Arsenic contamination, Mekong Delta, Socio-hydrogeology, Farmer perception, Water quality risk

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INTRODUCTION

Groundwater plays a vital role in sustaining livelihoods across deltaic and coastal regions, particularly in areas where surface water resources are constrained by seasonal variability, pollution, or saline intrusion [1,2]. In Mekong Delta, groundwater serves as a critical source for domestic consumption, irrigated agriculture, and aquaculture [3]. However, rapid population growth, climate change, and unregulated groundwater abstraction have raised concerns about the sustainability and quality of this essential resource [4,5].

The Vietnamese Mekong Delta region exemplifies these challenges. Although freshwater is abundant during the rainy season, increasing upstream dam construction, intensive agricultural practices, and sea-level rise have led to significant deterioration of surface water quality [6]. In response, groundwater has increasingly become a strategic alternative source of various supply demands for socio-economic activities. Yet, this shift has not been accompanied by adequate regulation or monitoring, resulting in widespread proliferation of private wells estimated at over 800,000 across the Delta region [3].

An Giang Province, located in the upper delta, has access to both surface and groundwater resources [7]. Despite this, the province faces mounting challenges in water quality, including contamination from iron, salinity, and most critically, geogenic arsenic. Arsenic mobilization in groundwater has been reported since the early 2000s, particularly in shallow Holocene aquifers [8,9]. In addition to arsenic, elevated concentrations of manganese (Mn) and iron (Fe) are also commonly reported [10–12], with Mn and Fe concentrations reaching up to 25 and 1700 mg/L, respectively, thereby further compromising groundwater quality [12]. While several mitigation strategies have been

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implemented such as expanding piped water systems and promoting treated surface water use groundwater continues to be used extensively, especially in rural and peri-urban areas. Although numerous studies have characterized the hydrochemical conditions and arsenic distribution in the Mekong Delta, fewer have examined the interplay between groundwater use, user perception, and socio-economic drivers of reliance on potentially contaminated water sources. Understanding this human-environment dynamic is essential for formulating guidance on risk communication, infrastructure investment, and policy design.

This study addresses this gap by combining household surveys, field parameters measurement of groundwater quality, and well inventory data to assess the current state of groundwater use in An Giang. Specifically, the study aims to understand why local communities continue to rely on groundwater despite long standing documentation of arsenic contamination in the region, and how users perceive groundwater quality and associated risks. By linking physical and social data, this research offers insights to support integrated groundwater management in An Giang and similar areas across the Mekong Delta region.

STUDY AREA

An Giang Province is located in the upper part of the Vietnamese Mekong Delta, bordering Cambodia to the northwest (Figure 1). The province spans approximately 3,536 km^2 and supports a population of over 1.9 million people. It is traversed by the Tien and Hau Rivers the two main branches of the Mekong River in Vietnam which supply abundant freshwater with an average annual discharge of about 13,500 m^3/s (~ 24,000 m^3/s in the flood/wet season and 5,020 m^3/s in the dry season) and feed a dense network of natural and artificial canals. These waterways play a critical role in irrigation, aquaculture, drainage, and flood control. The climate of An Giang is characterized by a tropical monsoon regime, with two distinct seasons: a wet season from May to November, and a dry season from December to April. According to the data of climate monitoring station in Chau Doc, An Giang, annual rainfall during 2015-2024 ranges between 920 and 1500 mm, of which approximately 88% occurs during the wet season.

Seasonal variations in upstream Mekong discharge, combined with tidal backflow from the East Sea, cause pronounced fluctuations in surface water levels. The province's low-lying topography (87% of total area is lower than 3 m above mean sea level) renders it highly susceptible to flooding, especially from September to November. To manage flood risk and support triple rice cropping, An Giang has invested heavily in dike infrastructure since the late 1990s [13,14]. High dikes, particularly in districts such as An Phu, Chau Phu, Phu Tan, and Tan Chau, have disrupted the natural flood pulse and transformed the region's hydrological regime [13,15]. While these structures have enabled agricultural intensification, they have also reduced sediment deposition and groundwater recharge, and contributed to ecological shifts [15].

Groundwater in An Giang is extracted from multiple aquifer systems, including shallow Holocene deposits (<30 m) and deeper Pleistocene formations (up to 120 m) [3]. Groundwater abstraction is concentrated in rural districts such as An Phu, Tri Ton, and Tinh Bien, where access to clean surface water or piped supply remains limited. Current estimates suggest that approximately 45,000 m^3/day of groundwater is extracted for domestic, agricultural, and aquaculture use [16].

Despite surface water abundance, water quality in recently show high COD (~32 mg/L), BOD (~21 mg/L), TSS (~75 mg/L), NH4-N (0.8 mg/L) and coliform (17000 MPN/100 ml) concentrations due to increasing impact from agriculture, aquaculture, and urban activities [17]. Water in the area also faced with low pH and contamination by high Al due to acid sulfate soil oxidation [7]. During early rainy season months (June–July), surface water quality is particularly poor due to low river flows, limited dilution, and accumulation of agricultural contaminants.

Groundwater quality is also a growing concern. Arsenic contamination (> 10 μg/L) has been widely reported in shallow aquifers, especially in districts such as An Phu, Tan Chau, Phu Tan, and Chau Phu [9,10,18,19]. The occurrence of Arsenic in groundwater is primarily of natural origin, released under reducing conditions in the alluvial sediments typical of the Holocene formations [19–21]. Elevated levels of iron and manganese are also common, often linked to reducing conditions and low pH [9,12,19]. The province has initiated efforts to expand piped water supply infrastructure and encouraged water supply companies to exploit surface water sources [14].

METHODS

Household survey and well inventory

Field surveys were conducted from March to April 2025 across multiple districts in An Giang Province, including An Phu, Tan Chau, Chau Phu, Chau Thanh, Phu Tan, Tinh Bien, Tri Ton, and Long Xuyen districts. A total of 85 groundwater-using households were selected through purposive sampling to capture

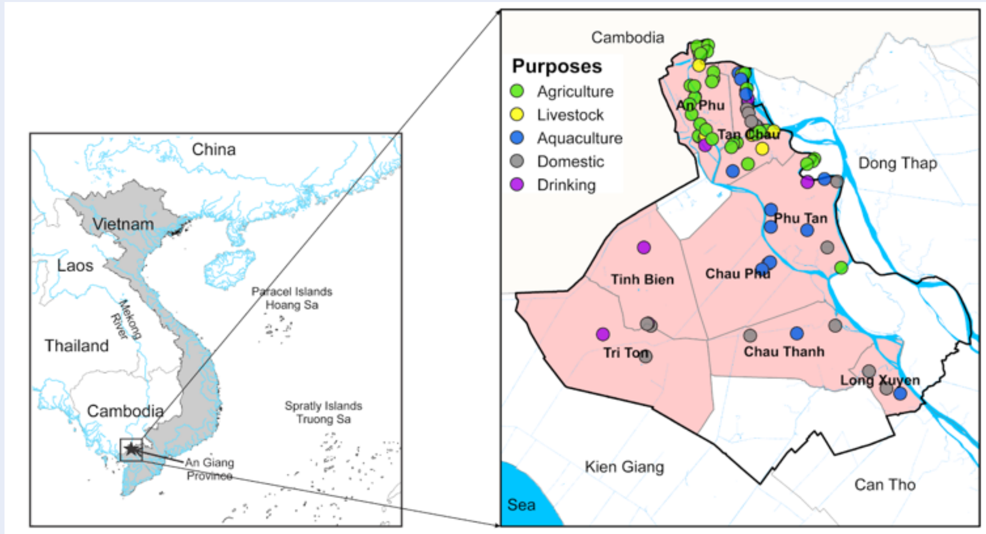

Figure 1: Location of sites for survey in An Giang province [sources: authors]

a range of water-use purposes (e.g., domestic, irrigation, aquaculture) and hydrogeological settings (Figure 1). This sampling strategy was designed to ensure functional representativeness of groundwater users directly exposed to water-quality risks, rather than population-wide statistical representativeness.

The selection of survey districts was informed by groundwater quality characteristics documented in previous studies [19]. Districts such as An Phu, Chau Phu, Tan Chau, and Phu Tan were included because shallow aquifers in these areas have been widely reported as arsenic-prone. In contrast, groundwater in Chau Thanh and Long Xuyen is predominantly affected by elevated iron (Fe) and manganese (Mn) concentrations. In Tri Ton district, groundwater is mainly abstracted from shallow aquifers and is commonly impacted by anthropogenic contamination, particularly associated with agricultural activities.

Data collection was carried out using structured questionnaire sets and face-to-face interviews. Verbal informed consent was obtained from all participants. The questionnaire included both closed- and open-ended questions to elucidate the following issues: (1) Well characteristics: location, construction year, depth, and type of pump; (2) Groundwater usage: volumes, purposes (e.g., drinking, domestic, aquaculture, irrigation, livestock); (3) Perceived water quality: color, odor, taste, iron or salinity presence; (4) Motivations for groundwater use and preferences for alternative sources; (5) Experience with piped water systems, including access, affordability, and satisfaction. Additionally, a groundwater well inventory was compiled for all visited sites, including GPS coordinates, depth, and observed types of water use. Interviews were conducted with household members who were most knowledgeable about the history and technical details of the wells to ensure the accuracy of the information collected.

Field measurements of groundwater quality

In-situ groundwater quality parameters were measured directly at each surveyed well. Prior to sampling, wells were purged by pumping water for 10–15 minutes to remove stagnant water and ensure representative aquifer conditions. The following parameters were recorded: pH measured using a handheld pH meter ($\pm$0.01 accuracy), Redox potential (Eh) measured using a platinum electrode and reference electrode in mV, Electrical conductivity (EC used as a proxy for salinity (μS/cm). Instruments were calibrated daily using standard reference solutions, in accordance with the manufacturers' guidelines. Arsenic (As) concentrations were not measured in this study; instead, hydrochemical indicators such as Eh, EC, pH, and well depth were used to assess conditions favorable for arsenic mobilization, based on established relationships reported in previous studies in the region [9,10].

RESULTS

Groundwater use patterns

Feedback from respondents and wells' owners indicate that groundwater is used for a variety of purposes, with a predominance of non-domestic uses in An Giang province (Figure 2). Of the 85 surveyed wells, 44.7% were used for irrigation, followed by aquaculture (20.0%), domestic use (18.8%), drinking purpose (8.0%), and livestock (8.0%) (Figure 2a). However, the use of water in aquaculture practices emerged as the dominant consumer in terms of volume, which accounts for 87.7% of total estimated extraction rate (Figure 2c). Irrigation represented 9.4% of volume, while domestic use, livestock, and drinking purpose accounted for 1.6%, 0.9%, and 0.4%, respectively. Most groundwater was extracted from medium to depth wells (30–60 m), which contributed 92.4% of the total daily volume (~3,125 m^3/day). Shallow wells (<30 m) accounted for 6.2% of total extraction, while deeper wells (>60 m) represented less than 1.5%.

Geographical variation of water use was notable (Figure 2b). In An Phu district, groundwater was overwhelmingly used for irrigation. The use of groundwater for aquaculture practices is dominant in Chau Phu district, while water use in Long Xuyen town and Chau Thanh district indicated a mixture of domestic and aquaculture uses. In contrast, the exploitation of groundwater for domestic and drinking purposes is dominant in Tinh Bien and Tri Ton.

Perception of groundwater quality

Among respondents, 51% considered the water to be of good quality, whereas 28% reported iron contamination, 1% identified both iron and arsenic, and 13% associated groundwater with iron and unpleasant odor. Additionally, 7% of households reported salinity problems (Figure 3a).

Importantly, perceptions of groundwater quality vary geographically among local residents and farmers. In An Phu, Chau Phu, Tan Chau, and Tinh Bien district, iron contamination was identified as the most pressing issue (Figure 3b). In Long Xuyen, where more than two-thirds of surveyed wells were drilled deeper than 80 m, users generally reported good water quality. In Tri Ton, groundwater extracted from fractured rock aquifers was also perceived as cleaner. By contrast, in districts such as Chau Thanh, Phu Tan, and parts of Chau Phu districts, respondents reported both iron and salinity problems, often linked to intermediate well depths (30–100 m). The saline groundwater in these areas is considered paleo, having been trapped in the aquifer system for more than 4,000 years during periods of sea-level transgression and regression [12].

Field-based groundwater quality measurement

In-situ measurements revealed clear variations in hydrochemical parameters across different water-use categories (Figure 4). Groundwater for irrigation and domestic uses are extracted from shallow depth 20-40 m (Figure 4a). Meanwhile, groundwater for aquaculture mainly from 40-60 m. The groundwater for drinking and livestock are in wider depth range (up to 100 m). pH levels across all types of water use ranged between 6.5 and 7.5 (Figure 4a). Electrical conductivity (EC) values were highest in wells for aquaculture cultivation, with several measurements exceed 10,000 μS/cm, indicating an influence from brackish to saline water (Figure 4c). Irrigation and domestic wells exhibited moderate EC values, though some exceeded the WHO guideline of 1,500 μS/cm. Wells for drinking purpose generally had lower EC values, reflecting a better status of quality. Redox potential (Eh) varied by wells with different types of water use, with irrigation wells exhibiting the most reducing conditions (median Eh < –100 mV), consistent with shallow, organic-rich aquifers (Figure 4d). Drinking and domestic wells showed more oxidizing conditions (median Eh ~100 mV).

These findings align with user's perception, particularly regarding the content of iron and salinity, and indicate that groundwater quality is highly variable depending on depth and type of water use. The presence of reducing conditions in many wells suggests elevated risk of arsenic mobilization. The As mobilization mechanism are well known in the area with As concentration is up to 1400 ug/L in the An Phu and Tan Chau districts [18–21].

Motivation for groundwater use and piped water preference

When asked about their motivation for using groundwater, 32% of respondents cited its cheap as the primary reason, followed by difficulty in extracting surface water (25%), good quality (13%), convenience (11%), lack of piped water access (8%), and backup use (11%). A small proportion indicated using groundwater during specific events, such as surface water pollution (2%) or periods without water supply (2%) (Figure 5).

Notably, the relative importance of these motivations differed geographically: for example, in Chau Phu district, groundwater use was almost exclusively attributed to its good quality for aquaculture, while in Tinh Bien district, the absence of piped water was

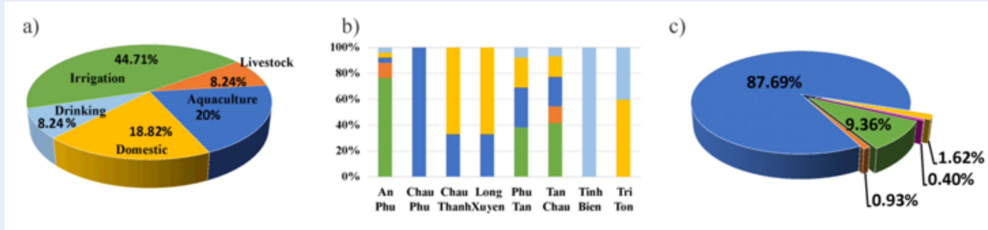

Figure 2: Groundwater extraction purposes [sources: authors]

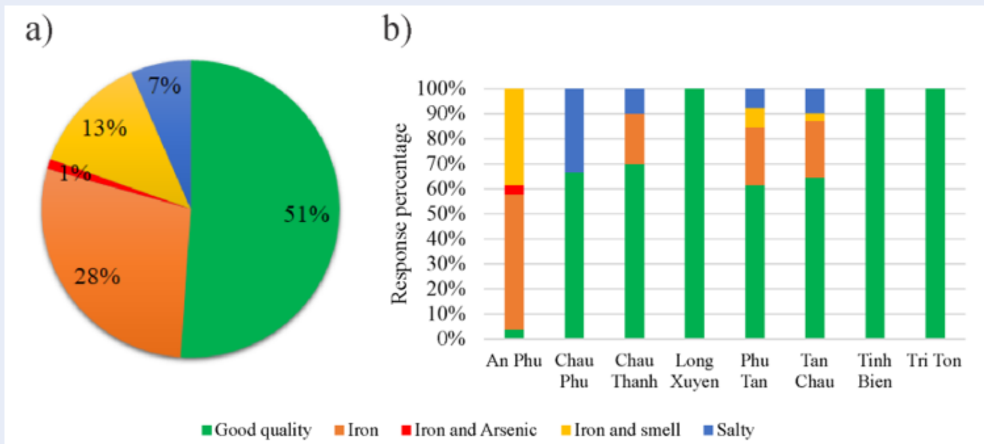

Figure 3: Local perception of groundwater quality [sources: authors]

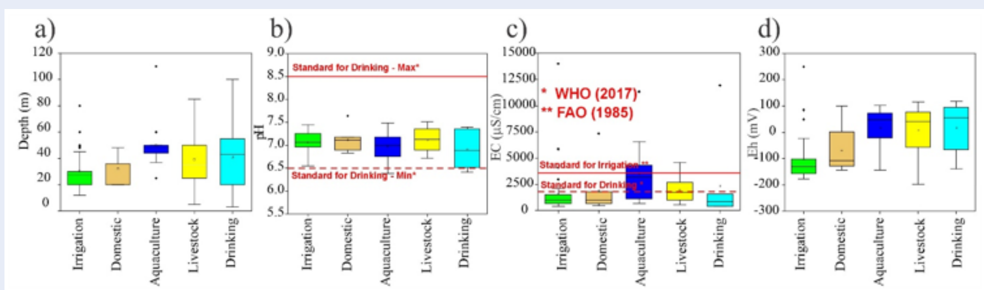

Figure 4: On-site measurements of Eh, pH, and EC values in groundwaters [sources: authors]

the dominant factor (Figure 6). In contrast, districts such as Tan Chau and Phu Tan district exhibited more diverse motivations, with cost, convenience, and backup use all contributing substantially. In An Phu district, groundwater are used by convenient, cheap and due to difficult for surface water extraction.

Despite high dependence on groundwater resources, 88.6% of households expressed a preference for using piped water. Only 6.3% reported access to piped water supply but continued using wells, while 5.1% stated they had no intention of switching to another water source. Reported barriers to piped water adoption included the intermittence of water supply availability (An Phu district), high cost (Phu Tan district), and underdeveloped water supply infrastructure (Tan Chau district).

DISCUSSION

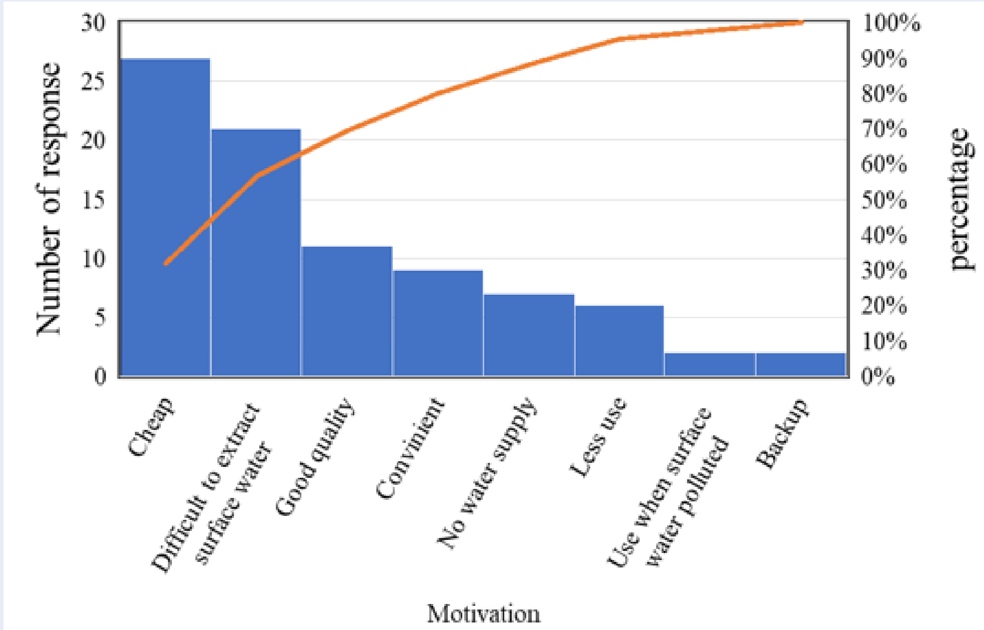

Figure 5: Motivation of groundwater Use [sources: authors]

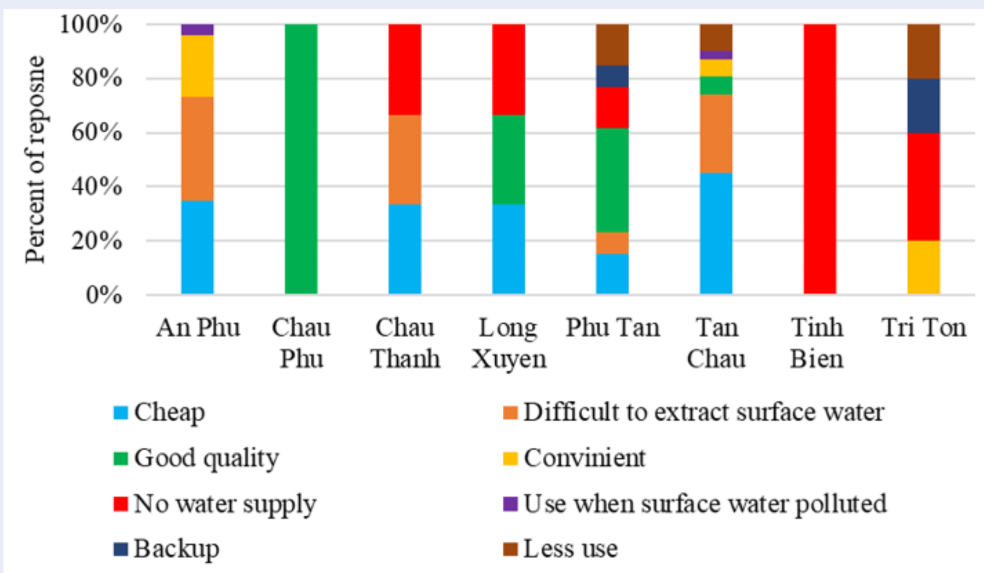

Figure 6: Motivation of groundwater use according to district [sources: authors]

Sectoral dominance of groundwater uses and shifting pressure on aquifers

This study confirms the evolving role of groundwater in An Giang province, where aquaculture has become the dominant user sector accounting for nearly 88% of total estimated abstraction. Importantly, this study represents a notable shift of water users were reported in previously studies in which domestic use was emphasized as the primary driver of groundwater dependence in the Mekong Delta [3]. The widespread use of brackish to saline groundwater for aquaculture, often extracted from medium-depth wells (30–60 m), reflects both the expansion of aquaculture practices and the adaptation of farmers to surface water limitations and quality concerns.

Despite longstanding concerns regarding soil and water salinization, the economic benefits of saline groundwater use in aquaculture remain under-recognized in Vietnam's water management practices. According to local farmers, saline groundwater supports not only fish yields but also rural incomes through intensity of aquaculture activities. However, the growing dependence on saline groundwater, in particularly in traditional freshwater zones such as An Phu and Chau Phu, raises important challenges in sustainability. Prolonged extraction may increase the risk of salinization in adjacent freshwater aquifers and exacerbate land subsidence, especially in regions where groundwater withdrawals exceed natural recharge rates [4,5]. These findings call for the development of technical guidelines and regulatory frameworks that enable productive yet sustainable use of saline groundwater while protecting vulnerable freshwater resources.

Groundwater quality risk and redox-driven contaminant mobilization

Apart from the quantity issue, groundwater quality presents critical constraints on sustainable use. Survey data revealed widespread concern about iron contamination (42%), locally referred to as "*phèn*", while field measurements indicated strongly reducing conditions (Eh < −100 mV) in many irrigation wells. Elevated dissolved iron under low redox potential reflects the reductive dissolution of iron (oxyhydr)oxides, a dominant geochemical process in Holocene alluvial aquifers of the Mekong Delta [9,10,19].. The process also commonly releases As and is the main cause of high As concentration in this area [9] and other As contaminated area globally [22].

Although arsenic concentrations were not directly measured in this study, the observed geochemical signatures low Eh, high Fe, and shallow well depths mirror those found in arsenic-contaminated zones in the An Giang province [18–21] other arsenic-affected regions worldwide [22]. The alignment between reported water issues (iron, salinity) and hydrochemical conditions suggests that users have some awareness of water quality degradation, even if arsenic risks are not explicitly recognized. Despite An Giang province is being a documented arsenic hotspot since the early 2000s [4,9–12,19–21,23], only one household reported awareness of arsenic contamination. This finding highlights the need for more effective risk communication strategies and localized outreach, especially in areas where private wells are used for drinking or domestic purposes.

The findings from An Giang province are consistent with previous socio-hydrogeological studies in the Mekong Delta, which highlight strong dependence on groundwater and limited awareness of long-term environmental risks [24,25]. Similar to observations in Ca Mau [24] and Tra Vinh coastal provinces [25], groundwater use decisions in An Giang province are primarily shaped by convenience, cost visibility, and lack of viable alternatives. However, while salinity represents the dominant and readily perceived concern in Tra Vinh and Ca Mau, and is also present in An Giang province, where saline groundwater is often considered beneficial for aquaculture, the more critical issue in An Giang province is arsenic contamination. Unlike salinity, arsenic constitutes a *hidden risk* that cannot be detected through sensory observation, leading to the continued use of contaminated groundwater for domestic purposes despite its serious long-term health implications.

Similar perception risk mismatches have been widely documented in other deltaic settings. Community-based studies in Bangladesh consistently show that salinity and iron-related water problems dominate local risk perception, whereas arsenic despite its widespread occurrence is poorly understood due to its non-sensory nature [26,27]. Awareness of arsenic-related health risks depends strongly on access to information, education, and social communication channels, rather than on direct sensory experience with water quality, as arsenic is invisible, tasteless, and odorless [28]. The findings from An Giang closely mirror these patterns, indicating that low arsenic awareness is not site-specific but reflects a broader structural challenge in deltaic aquifer systems.

Socio-economic and infrastructural drivers of groundwater dependence

Despite growing concerns about groundwater quality, households in An Giang province remain highly dependent on this resource, citing convenience (11%), cheap (32%), and lack of access to centralized piped supply (8%), and difficulty in extracting surface water (25%) as key drivers of groundwater dependence. These findings reflect the complex interplay between infrastructure availability, economic constraints, and local perceptions. Motivations for groundwater use vary geographically. In remote districts such as An Phu and Tri Ton districts, limited surface water access and incomplete piped infrastructure reinforce reliance on local wells. In more urbanizing areas like Long Xuyen and Chau Thanh, groundwater remains a default option due to perceived unreliability of piped water or high connection costs.

The perception of groundwater as a "cheap" water source is largely qualitative rather than based on comprehensive cost accounting. Although private groundwater abstraction is exempt from water-use taxes, households typically do not consider capital investments such as well drilling, pump installation, or ongoing electricity costs for pumping when evaluating groundwater affordability. As a result, groundwater use is often perceived as inexpensive, even though the long-term economic and environmental costs may be substantial.

Importantly, 88.61% of respondents expressed a preference for piped water, suggesting a latent demand for water availability and accessibility that remains unmet due to affordability and infrastructure barriers. These are largely addressable through targeted policy interventions such as connection subsidies, tiered pricing for low-income users, or public-private partnerships to complete distribution networks. Promoting piped water typically sourced from surface water or deeper, better protected aquifers can also help to alleviate pressure on vulnerable shallow aquifers and reduce exposure to geogenic contaminants. However, this transition must be supported by transparent water quality monitoring and communication mechanisms to restore and build public trust in municipal water supplies.

Implication for agricultural sustainability and food safety

Groundwater is also a critical input for agriculture, particularly in districts where surface water is seasonally unavailable or poor quality. However, its use is not without risks. Several farmers reported visible crop damage attributed to iron-rich groundwater. When such water is applied for irrigation, high iron concentration can even kill their plants. The toxicity of iron also well known so far [29]..

More serious, though less recognized by users, is the long-term accumulation of arsenic in agricultural soils through repeated use of arsenic-laden irrigation water [30] and rice grains. This accumulation can impair plant growth and facilitate arsenic uptake by rice plants, resulting in elevated arsenic concentrations in rice grains [31–33]. Under anaerobic conditions typical of flooded paddy fields, arsenic becomes more mobile, exacerbating its uptake and disrupting soil microbial communities. This can further reduce the availability of key micronutrients [34], threatening soil fertility and long-term crop productivity.

Despite the severity of these risks, none of the surveyed farming households reported any awareness of salinity or arsenic contamination in their irrigation water. Only a small number recognized iron contamination, typically after visible crop damage had occurred. This lack of awareness highlights a critical knowledge gap and underscores the urgent need for improved communication and outreach among scientists, local authorities, and farming communities. Promoting water quality monitoring and enhancing awareness is essential to support sustainable irrigation practices.

To mitigate risks associated with poor-quality groundwater, the development of a groundwater quality zoning map for irrigation use is urgently needed. Such a map would provide farmers with spatial guidance on safe water sources, helping them avoid areas with high concentrations of iron or arsenic. Concurrently, there is a pressing need to improve irrigation infrastructure, particularly through the development of adaptive systems capable of harnessing river water in areas subject to high seasonal fluctuations. These systems should be designed to operate efficiently under variable hydrological conditions, offering a viable alternative to groundwater and promoting more sustainable agricultural water management in the region.

CONCLUSIONS

This study integrates socio-hydrogeological data to examine groundwater use, perceptions, and hydrochemical risks in An Giang province, Mekong Delta. Groundwater remains essential for aquaculture, irrigation, and domestic activities, with aquaculture accounting for the majority of abstraction. However, this dependence persists amid increasing pressures from salinization, intensive extraction, and geogenic arsenic contamination in shallow to intermediate aquifers.

Despite extensive documentation of arsenic occurrence, user awareness of arsenic-related risks is extremely low. Instead, groundwater quality perceptions are dominated by iron and salinity, which are readily detected through sensory cues. This perception–risk mismatch highlights a structural limitation of perception-based risk management in the An Giang province's aquifer systems, where invisible contaminants cannot be recognized without testing. Socio-economic and infrastructural constraints continue to drive reliance on private wells, even though most households express a preference for piped water. Addressing groundwater risks therefore requires improved piped water provision, groundwater quality zoning for agricultural use, targeted arsenic risk communication, and integrated monitoring frameworks to support sustainable groundwater governance in An Giang province and across the Mekong Delta.

COMPETING INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AUTHORS' CONTRIBUTIONS

Dan Thanh Vo: Investigation, Data collection, Formal analysis, Visualization, Writing – review & editing, Writing – original draft.
Ba Loc Tran and Ngoc Phu Tran: Investigation, Data collection, Formal analysis, Visualization
Van Tuc Dang: Writing – original draft, Writing – review & editing.
Le Phu Vo: Conceptualization, discussion, Writing – review & editing, Validation, Supervision, Funding acquisition
Quang Khai Ha: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Conceptualization.

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Bài nghiên cứu

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Sử dụng nước dưới đất và nhận thức của người dân về rủi ro ô nhiễm asen tại An Giang, Đồng bằng sông Cửu Long: đánh giá theo hướng thủy văn – xã hội

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TÓM TẮT

Ô nhiễm nước dưới đất do nồng độ arsenic (As) cao đã được ghi nhận tại tỉnh An Giang từ những năm 2000. Nghiên cứu này nhằm đánh giá hiện trạng sử dụng nước dưới đất tại khu vực có nguy cơ As thông qua cách tiếp cận tích hợp giữa xã hội học và thủy địa chất, xem xét các mô hình sử dụng nước, nhận thức của người dân và điều kiện thủy địa hóa. Khảo sát hộ gia đình và điều tra giếng được thực hiện vào tháng 4 năm 2025, bao gồm 85 hộ và 80 giếng. Phỏng vấn có cấu trúc được kết hợp với các phép đo hiện trường (pH, thế oxy hóa–khử và độ dẫn điện) nhằm xác định các động lực chính của việc sử dụng nước dưới đất và đánh giá rủi ro chất lượng nước. Kết quả cho thấy nuôi trồng thủy sản là hoạt động tiêu thụ nước dưới đất chủ yếu, chiếm gần 88% tổng lượng khai thác, với phần lớn nước được lấy từ các giếng có độ sâu trung bình (30–60 m). Mặc dù nước dưới đất chỉ được sử dụng rất ít cho mục đích ăn uống (0,4% tổng lượng sử dụng), khoảng 27% hộ gia đình vẫn phụ thuộc vào nguồn này cho các hoạt động sinh hoạt. Người dân thường nhận diện sắt và độ mặn là các vấn đề chất lượng nước chính, trong khi nhận thức về rủi ro As còn rất hạn chế, mặc dù đã có bằng chứng trước đây về ô nhiễm As trong khu vực. Các giá trị đo pH, thế oxy hóa–khử và độ dẫn điện cho thấy điều kiện nước dưới đất có thể thuận lợi cho quá trình huy động As, đặc biệt ở các giếng nông dùng cho tưới tiêu. Hạn chế về hạ tầng, khả năng chi trả và nhận thức về độ tin cậy được xác định là các yếu tố chính duy trì việc sử dụng nước dưới đất, ngay cả đối với các hộ đã có tiếp cận với nước máy. Tuy nhiên, 88,6% người được hỏi bày tỏ mong muốn sử dụng nước máy, cho thấy mức độ sẵn sàng cao trong việc chuyển đổi khỏi nguồn nước dưới đất nếu có các lựa chọn thay thế đáng tin cậy. Những kết quả này nhấn mạnh sự cần thiết của việc đầu tư có mục tiêu vào hạ tầng cấp nước, tăng cường giám sát chất lượng nước dưới đất, và thúc đẩy các chiến lược tương tác cộng đồng nhằm giảm thiểu rủi ro phơi nhiễm và hướng tới quản lý bền vững tài nguyên nước dưới đất tại các khu vực bị ảnh hưởng bởi arsenic.

Từ khoá: Sử dụng nước dưới đất, ô nhiễm arsenic, Đồng bằng sông Cửu Long, xã hội–thủy địa chất, nhận thức nông hộ, rủi ro chất lượng nước

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