

A WIKI-BASED DIGITAL KNOWLEDGE SHARING PLATFORM FOR WATER-EFFICIENT TECHNIQUES AND MINIMIZING WATER SCARCITY

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Abstract: Water scarcity is not caused by a single factor. Increasing demand, irregular rainfall, climate variability, groundwater depletion and avoidable losses can place pressure on already limited water resources. At the same time, many practical water-saving methods are known locally but remain scattered across reports, websites, institutional documents and personal experience. This paper proposes a wiki-based digital knowledge sharing platform that brings such information into one searchable and continuously editable knowledge space. The proposed platform allows farmers, households, community members, water management experts and moderators to create, improve and review pages describing practices such as rainwater harvesting, drip irrigation, sprinkler irrigation, soil-moisture conservation, wastewater reuse, irrigation scheduling and leak reduction. Each knowledge page is designed to record the method, suitable conditions, benefits, practical limitations, images or supporting material, and revision history. Search, categories and tags are included so that users can locate practices according to purpose and local conditions. Because water management advice can be sensitive to context, the system also includes a moderation and expert verification layer. The study follows a proposed-system research approach based on secondary literature and requirements analysis rather than claiming field results that have not yet been collected. The paper defines the platform architecture, information flow, user roles, quality controls and an evaluation framework for future implementation. The central contribution is a practical digital knowledge-sharing model intended to make water-efficiency knowledge easier to find, understand, compare and reuse, thereby supporting informed adoption of suitable water-saving practices and reducing avoidable water wastage.

Keywords: Water scarcity, Water-use efficiency, Wiki, Knowledge sharing, Rainwater harvesting, Irrigation, Community knowledge, Digital platform

1. INTRODUCTION

Water is fundamental to agriculture, drinking, domestic activities, industry and ecological systems. However, increasing demand, irregular rainfall, climate change, groundwater depletion and inefficient use are putting increasing pressure on available water resources. Water scarcity is not only related to the total quantity of freshwater available, but also to how water is stored, distributed, accessed, used and conserved. In many regions, the availability of water changes according to seasonal and environmental conditions, while growing demand from agriculture, households and other activities further increases pressure on existing resources. Groundwater depletion is also a major concern in areas where groundwater is widely used for agriculture and daily needs. In such conditions, improving the efficiency of water use and increasing awareness about suitable conservation practices become important for reducing unnecessary water consumption. At the same time, useful information about water-efficient techniques is often distributed across research reports, websites, documents and local experiences. Farmers and local communities may have valuable traditional knowledge, while researchers and experts provide technical information through studies and practical recommendations. However, when this knowledge remains scattered across different sources, users may find it difficult to locate relevant information and understand which practices can be applied in their own situations.

Digital technology provides an opportunity to organize this scattered knowledge in a common and accessible environment. A wikibased digital knowledge-sharing platform can be used to collect, organize and present practical information related to waterefficient techniques. The proposed platform is intended to provide searchable pages, categories, tags, images and discussion features so that users can easily find information according to their requirements. The wiki-based approach also allows knowledge to be continuously updated as new techniques, experiences and

information become available. Different users can contribute their practical knowledge, while water-management experts and moderators can help maintain the quality and reliability of the information. The platform can support areas such as agriculture, household water use and local community conservation practices, allowing knowledge from different sources to be brought together in an organized manner. It can also provide a space where users can share their experiences, discuss practical difficulties and learn from techniques followed by others.

The main purpose of this work is to develop a digital platform that makes practical knowledge about water-efficient techniques easier to access, understand and share. By bringing information from different sources into a structured wiki-based environment, the proposed system can reduce the difficulty of searching through scattered information and can help preserve useful local knowledge that may otherwise remain limited to particular communities. The platform is intended to support farmers, households, local communities and experts by providing a common space for learning and knowledge exchange. The focus of the work is therefore not on directly solving the physical shortage of water, but on using digital technology to improve the availability and sharing of knowledge that can support better water-management practices. Through searchable and organized content, user contributions, expert involvement and community discussion, the proposed platform aims to encourage greater awareness of water conservation and promote more responsible and efficient use of available water resources.

2. LITERATURE REVIEW

Mekonnen et al., in (Science Advances 2016) [1], examined global freshwater scarcity by analyzing water consumption and availability across different regions and seasons. The study highlighted that a large part of the global population experiences severe water scarcity during at least part of the year. The findings emphasize the importance of improving water-use efficiency and managing limited freshwater resources more effectively. This supports the need for accessible knowledge about practical water-saving techniques and better awareness of water conservation practices.

Rijsberman et al., in (Agricultural Water Management 2006) [2], discussed the concept of water scarcity and its relationship with water availability, increasing demand and agricultural requirements. The study examined different aspects of water scarcity and highlighted the importance of improving water productivity and managing available resources efficiently. This provides a basis for promoting better water -use practices and sharing practical information through an organized knowledge-sharing platform.

Chai et al., in (Agronomy for Sustainable Development 2016) [3], reviewed regulated deficit irrigation as an approach for improving water-use efficiency under drought conditions. The study discussed irrigation strategies that can help reduce water use while maintaining suitable crop production under water-limited conditions. The findings demonstrate the importance of selecting appropriate irrigation practices according to crop and environmental conditions. This supports the inclusion of efficient irrigation and drought -management techniques in the proposed platform.

Salman et al., in (FAO 2019) [4], provided practical guidance for improving water-use efficiency in small-scale agriculture. The work focuses on irrigation practices and field-level water management for making better use of available water resources. The practical nature of this guidance shows the importance of presenting water-efficient techniques in a simple and understandable form. This supports the proposed platform's focus on providing useful agricultural water-management information to farmers and other users.

Tay et al., in (Journal of Knowledge Management 2009) [5], discussed the use of wikis as knowledge management tools for creating, sharing and maintaining information collaboratively. The study reviewed different applications of wikis and considered their role in supporting knowledge-sharing activities. The work highlights how wiki environments can provide opportunities for users to contribute and access shared knowledge. This supports the use of a wiki-based platform for organizing and sharing practical knowledge related to water-efficient techniques.

Majchrzak et al., in (International Symposium on Wikis 2006) [6], examined wiki users and their participation in creating, accessing and sharing knowledge. The study demonstrates how users can contribute information and obtain knowledge through collaborative wiki environments. User participation is important for continuously developing and updating shared information. This supports the proposed platform's approach of allowing farmers, households, communities and other contributors to share practical water-saving information.

Kiniti et al., in (Journal of Systems and Information Technology 2013) [7], discussed wikis as knowledge management systems and examined the issues and challenges associated with their implementation. The study identified factors such as usability, clear purpose, management support and a culture that encourages knowledge sharing and collaboration. These aspects are relevant to the proposed platform because proper organization, moderation and usability are required for maintaining reliable and useful water-related information.

Biazin et al., in (Physics and Chemistry of the Earth 2012) [8], reviewed rainwater harvesting and water management

practices in rainfed agricultural systems. The study highlighted the importance of rainwater harvesting, water management and soil-moisture conservation for improving the availability and effective use of water resources. These findings demonstrate the value of practical conservation techniques in areas affected by irregular rainfall. This supports the inclusion of rainwater harvesting and soil-moisture conservation techniques in the proposed knowledge-sharing platform

Hoekstra et al., in (Water Footprint Assessment Manual 2011) [9], presented a standardized framework for assessing water footprints and understanding the amount and types of water used in different processes and products. The manual introduced concepts related to green, blue and grey water footprints and provided methods for water-footprint assessment. Such information can help users understand the broader impact of water consumption and the importance of using water resources efficiently. This supports the proposed platform by providing a basis for sharing information related to water use and conservation.

Mekonnen et al., in (Ecosystems 2012) [10], assessed the water footprint of farm animal products and examined the amount of freshwater associated with their production. The study demonstrates that water consumption is connected not only with direct water use but also with the production of agricultural and food products. This highlights the importance of understanding water use across different agricultural activities. The findings can support the proposed platform by providing additional knowledge related to efficient water use in agricultural systems.

Research Gap-The reviewed studies cover important areas such as water scarcity, water-use efficiency, irrigation, rainwater harvesting, water footprints and collaborative knowledge management. However, these areas are mostly addressed separately, and a single platform combining practical water-efficient techniques, local knowledge, community contribution and expert verification remains limited. The proposed wiki-based platform addresses this gap by providing an organized digital environment where practical water-saving knowledge can be collected, shared, updated and accessed by different users.

3. METHODOLOGY

3.1 Research Design

This study adopts a proposed-system and design-oriented research approach. The research is based on the identified problem of scattered water-management knowledge and the need for a structured digital platform for sharing water-efficient techniques. The approach uses the problem statement, literature review findings and system requirements to define the proposed platform, its users, information structure, workflows and major functions. The study is primarily qualitative and conceptual, focusing on how a wikibased system can collect, organize, share and maintain practical knowledge related to water conservation. The design also considers content organization, user participation, expert and moderator involvement, search facilities and basic quality-control mechanisms. No field survey, experimental irrigation trial or measured community water-saving result is claimed in this paper; the work is limited to the design and conceptual evaluation of the proposed knowledge-sharing platform

3.2 Data Sources and User Roles

The proposed knowledge base is designed to collect information from two main types of sources. The first is secondary information, which includes research papers, reports, institutional guidelines and other documented practices related to water management and water-efficient techniques. These sources provide reliable background information and help in organizing the knowledge available on the platform. The second type is community-based information, which can include local experiences, photographs, practical notes and observations shared by users. Such contributions can help document water-saving practices that are commonly followed in particular areas but may not be available in formal sources. The proposed platform brings together farmers, households, local communities and water-management experts so that both documented information and practical experiences can be shared in one organized knowledge environment. The proposed platform includes four practical user roles to support both open participation and reliable information management. A contributor can create or edit knowledge pages and add supporting materials such as images or practical information. A general user can search and read available techniques, compare different methods and participate in discussions. A moderator is responsible for checking the basic structure, inappropriate content and completeness of submitted information. A subject expert can review important technical information and mark relevant pages as verified. These roles allow users to contribute and access knowledge while providing a clear process for reviewing and maintaining the quality of information available on the platform.

3.3 Knowledge Page Structure and Core Functions

Each technique page in the proposed platform is designed to follow a consistent structure so that users can easily understand and compare different water-efficient methods. A page can include the method name, a short description, its purpose, suitable conditions, required materials or equipment, implementation steps, expected benefits and practical

limitations. Where necessary, maintenance or safety notes can also be provided to help users understand the practical use of a technique. Location or climate tags can help users identify methods suitable for particular conditions, while evidence and references can provide supporting information. Photographs can make the techniques easier to understand, and discussion features can allow users to share experiences or ask questions. The platform can also maintain a version history so that changes made to a knowledge page can be tracked over time. The proposed platform is organized around six core functions: creating and editing knowledge pages, searching for information, using categories and tags, supporting multimedia content, discussion and feedback, and revision and verification. These functions are designed to make the platform easier to use and help users find relevant water-efficient techniques without going through large amounts of unrelated information. Categories and tags help organize techniques according to their type and application, while multimedia support allows useful photographs and other supporting material to be included with the content. Discussion and feedback provide a space for users to share experiences and suggestions. Revision history allows changes to be tracked over time, and verification provides an additional level of confidence for information that has been reviewed by an appropriate expert or moderator

3.4 Verification, Search and Recommendation Logic

New content submitted to the proposed platform can initially enter a draft or community-reviewed state before becoming part of the main knowledge base. Moderators can check whether the information is clear, complete, relevant and appropriately supported by sources. They can also check the basic structure of the page and remove or correct content that is inappropriate or unrelated to the purpose of the platform. When a page contains important technical information about water-management practices, a subject expert can review the information and provide a verified label where appropriate. Any later changes can remain visible through the version history, allowing users to see how the content has developed over time. This verification process provides a balance between open community contribution and the need to maintain reliable and useful water-management information. Along with verification, the platform can provide a simple keyword-based search facility to help users quickly find relevant techniques without searching through the entire knowledge base. Search can be supported by categories and tags such as agriculture, household, rainwater, irrigation, wastewater, soil moisture, leak reduction, region and climate. These classifications can make it easier for users to narrow their search according to their specific activity or local conditions. In a future implementation, recommendation logic can also be introduced to match a user's stated requirements or conditions with relevant knowledge pages. For example, the system could use information about the type of activity, water-related problem, region or climate to suggest potentially relevant techniques. The recommendations would remain informational and should not be treated as a guarantee that a particular technique will provide the same results in every location or situation. This approach allows the platform to provide useful guidance while keeping the final decision and practical application with the user.

3.5 Technology, Architecture And Considerations

The proposed platform is kept implementation-neutral because the supplied material does not prescribe a specific programming language, framework or database. A future prototype could include a web frontend, application server, database, file or object storage for images, user authentication, a search index and an administrative interface for content review. The selected technology stack should support important requirements such as collaborative editing, access control, searchable content and reliable version history. The system architecture separates three main areas: user contribution, knowledge management and user-facing access. Different stakeholders can contribute information to the wiki, while the knowledge-management layer organizes, stores and supports the review of this information before it is made available to users. The user-facing layer then allows people to search, read and reuse the available knowledge through the platform. Since the platform can contain information submitted by different users, ethical and quality considerations are also important. Personal experiences should be clearly distinguished from validated technical guidance, and contributors should be encouraged to provide supporting sources and mention the location or conditions in which a particular practice was used. Personal information should be kept to a minimum, and uploaded photographs should not unnecessarily reveal private details. Moderation should focus on accuracy, relevance, respectful discussion and the prevention of misleading or harmful information. These considerations can help maintain a trustworthy knowledge base while allowing community members to contribute practical water-management experiences.

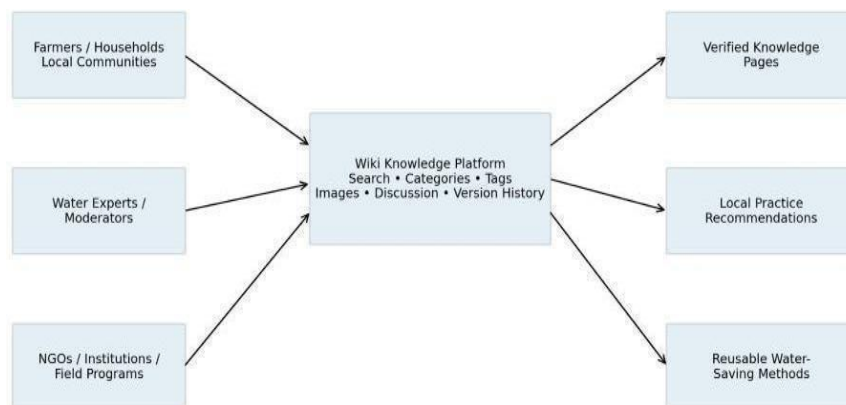


Figure 1. Proposed Wiki-Based Water Knowledge Platform Architecture

4. RESULTS AND EVALUATION FRAMEWORK

4.1 Proposed Functional Outcomes and Knowledge Organization

The proposed architecture will connect contributors, general users, moderators and subject experts through a shared knowledge base where water-efficient techniques can be added, reviewed and accessed. Figure 1 presents the overall system architecture, showing how information can move from different contributors into an organized knowledge environment and then become available to users. Contributors can provide information based on practical experience or reliable references, while moderators and subject experts can help review and improve the submitted content. The expected outcome will be a single and structured location where water-saving practices can be described with suitable conditions, practical limitations, supporting material and references. This can reduce the difficulty of finding useful information that may otherwise remain scattered across different documents, websites and individual experiences. The platform will also organize information through categories, tags and full-text search. For example, users looking for agriculture-related practices can search for irrigation or soil-moisture conservation, while household users can focus on leak reduction or wastewater reuse. Categories and tags will help users identify related techniques more easily, while full-text search will allow them to find information using relevant keywords. Such classification will help users narrow their search according to their purpose, activity and local conditions. The combination of structured pages, categories and searchable content will make the proposed knowledge base easier to browse, compare and reuse.

4.2 Verification, Traceability and User Interaction

Figure 2 presents the proposed knowledge contribution and verification workflow. A community member will be able to submit practical information without needing to be the final authority on its technical validity. The submitted information can first pass through community or moderator review, where basic completeness, relevance and structure can be checked. When a page contains important technical information, a subject expert can review the content and provide verification where appropriate. Version history will preserve changes made to a page, allowing users and reviewers to trace how the information has developed over time. This process will support greater transparency while maintaining a balance between open community participation and reliable water management information. Figure 3 summarizes the major user interaction flow of the proposed platform. Users will be able to browse or search for techniques, add or edit knowledge pages, attach supporting images or evidence, participate in discussions and view previous revisions. Experts and moderators will have additional responsibilities for reviewing, correcting and verifying information. This separation of roles will allow users to contribute practical knowledge while ensuring that every contribution is not automatically treated as technically verified information. The interaction design will therefore support both community participation and controlled knowledge management.

4.3 Evaluation Framework and Technique Coverage

Since the present study proposes a platform rather than reporting a completed field deployment, the following measures will be treated as evaluation targets rather than claimed results. These measures will include page retrieval time, completeness of required knowledge-page fields, percentage of technical pages containing supporting references, moderator review turnaround time, number of useful community contributions and user satisfaction with the search facility. The evaluation can also consider whether users are able to identify techniques according to their stated requirements and whether the available categories and tags provide appropriate context. A future pilot implementation can use these measures to evaluate the usability, organization and effectiveness of the proposed knowledge-sharing platform.

Table 1 maps the main water-efficient practice categories to the type of knowledge that the platform will store. The table will remain descriptive rather than numerical because the supplied material does not provide measured water-saving percentages for these techniques. The proposed fields will allow users to record useful context, implementation information, supporting material and practical limitations for each technique. For example, information related to rainfall, crop type, soil, water availability, household conditions and maintenance requirements can be recorded where relevant. This structure will help users understand that the suitability of a water-efficient practice can depend on local conditions and available resources rather than being identical in every situation.

Table 1. Water-efficient practice categories and knowledge fields

Practice	Useful context	Platform information	Main limitation to record
Rainwater harvesting	Rainfall, roof/catchment, storage	Method, storage, maintenance, images	Storage/catchment constraints
Drip irrigation	Crop, soil, water availability	Setup, operation, maintenance, conditions	Cost and maintenance
Sprinkler irrigation	Crop, field layout, climate	System type, scheduling, conditions	Wind/operation conditions
Soil-moisture conservation	Soil, crop, rainfall	Practice, timing, local experience	Context-specific effectiveness
Wastewater reuse	Water source, intended reuse	Treatment/context, suitable uses, cautions	Quality and safety requirements
Leak reduction	Household/infrastructure type	Common leak points, repair method	Access to repair resources

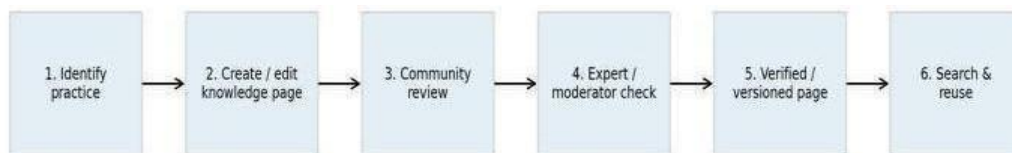


Figure 2. Knowledge Contribution and Verification Workflow

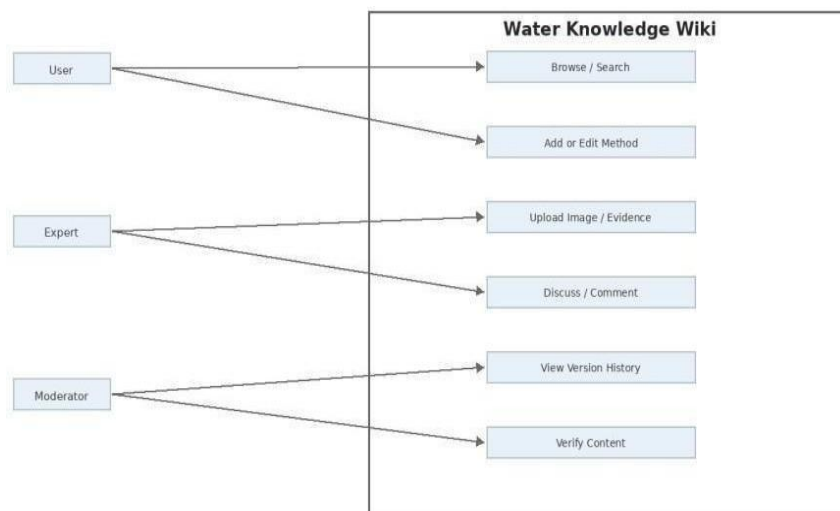


Figure 3. Major User Interaction Flow

5. DISCUSSION

5.1 Interpretation and Comparison with Existing Knowledge

The proposed system will address an information-management problem that exists alongside the physical problem of water scarcity. Water-efficient equipment and practices may already be available in different regions, institutions and communities, but their practical use can remain limited when people cannot easily discover suitable methods or understand the conditions in which they may be applied. Information may be available through research papers, institutional documents, websites and personal experiences, but these sources are often separated and may not provide the same level of practical detail. The proposed wiki-based platform will bring such information into a common digital environment where techniques can be described, organized, searched and updated. In this way, the system will treat practical water-management knowledge as a shared and continuously maintainable resource rather than as isolated information stored in separate sources.

The platform will also provide a connection between formal information and community-based experience. Farmers and local communities may contribute practical observations, while experts and institutions can provide supporting technical information. Moderators will help maintain the basic quality and organization of submitted content, and expert verification can be used for important technical information. Search, categories and tags will allow users to locate practices according to their purpose, activity and local conditions. Therefore, the proposed system will not simply store information but will provide a structured method for finding, reviewing and reusing knowledge related to water-efficient practices.

The literature reviewed in the study supports two complementary ideas: effective water management requires attention to water-use efficiency and local context, while wiki-based systems can support collaborative editing, knowledge sharing and change tracking. The proposed platform will bring these ideas together within one digital environment. This combination will directly respond to the identified research gap, where practical water-efficient techniques, local knowledge, community participation and verification are not commonly organized within a single knowledge-sharing platform. The proposed system will therefore function primarily as a knowledge-sharing and decision-support layer rather than as a replacement for professional water-management planning, engineering design or local governance.

5.2 Strengths and Limitations

One important strength of the proposed platform will be its ability to support wider participation in knowledge creation. Farmers, households, local community members and water-management experts will be able to contribute different forms of information according to their roles, experiences and areas of knowledge. This can help preserve useful local practices that may otherwise remain undocumented or difficult for others to access. Contributions from different users can also provide practical perspectives on water-efficient techniques and their suitability under different conditions. Another strength will be maintainability, because wiki pages can be edited and updated when new information, corrections or additional evidence becomes available. Unlike a static document, the proposed knowledge base will be designed to evolve as users contribute and improve information over time. Another strength will be discoverability. Categories, tags and search facilities will provide a structured way of locating techniques according to areas such as irrigation, rainwater harvesting, soil-moisture conservation, wastewater reuse and leak reduction. Images and supporting material can further improve users' understanding of practical methods and their possible applications. Version history will make changes to knowledge pages visible, while moderation and expert verification will provide additional quality-control mechanisms. These features can help maintain an organized knowledge environment and make it easier to identify how information has been added or updated. Together, these capabilities can support a more organized and accessible platform for sharing water-management knowledge while helping distinguish general community contributions from information that has received additional review.

However, the proposed platform will also have several limitations. It will not directly solve the physical problem of water scarcity because the availability and adoption of water-efficient practices will depend on factors outside the digital platform. Local resources, cost, infrastructure, technical skills, incentives, environmental conditions and governance can all affect whether a particular method is practical. The same technique may also have different suitability in different locations. Therefore, information provided through the platform will need to be considered according to local requirements rather than being treated as universally applicable guidance. Participation and information quality may present additional challenges. Some regions or user groups may contribute more information than others, which could result in uneven coverage of local practices. Community experience will also not automatically represent scientific or technically validated evidence. Although references, moderation, expert review and version history will help reduce this risk, they will not completely eliminate incorrect, incomplete or context-specific information. These limitations will need to be considered during future implementation and evaluation of the proposed platform.

5.3 Practical Significance and Future Development

The proposed system could provide practical value to different groups by making water-management knowledge easier

to discover, understand and reuse. Farmers could search for information related to irrigation scheduling, drip irrigation, sprinkler irrigation and soil-moisture conservation. Households could use the platform to find information about leak reduction and suitable wastewater reuse practices, while community groups could document local experiences related to rainwater harvesting and other water-saving methods. Experts and water-management professionals could contribute structured explanations, references and technical guidance in a format that can be accessed and reused by different users. The platform could therefore act as a bridge between dispersed knowledge and day-to-day decision making. The proposed system may also support the preservation of local and practical knowledge. When useful experiences are documented in structured knowledge pages, they can remain available for future users rather than depending only on personal communication or individual experience. Discussion and revision features can allow users to add additional information, clarify existing content and identify areas where further evidence may be required. In this way, the platform can support a continuous knowledge-sharing process in which information can be improved rather than remaining unchanged after its initial publication.

Future development can move the work from conceptual design toward a working prototype and later to a small pilot with selected users or communities. Possible extensions will include multilingual interfaces to improve accessibility, location-aware filtering to identify locally relevant practices, and offline or low-bandwidth access for users with limited connectivity. Structured evidence fields can be added to improve the documentation of sources and conditions, while expert dashboards can support the review and verification process. Duplicate-content detection, accessibility improvements and analytics can also be introduced to identify areas where information is incomplete or requires further documentation. A future implementation could additionally examine how users interact with the knowledge base and whether the proposed search, classification and verification mechanisms are useful in practice. Evaluation could consider page retrieval time, completeness of information, review turnaround time, user satisfaction and the usefulness of recommendations under different conditions. A later study could also investigate whether platform use is associated with the adoption of suitable water-saving practices. Such relationships should be evaluated through an actual implementation and appropriate evidence rather than being assumed from the conceptual design.

6. CONCLUSION

The study proposes a wiki-based digital knowledge-sharing platform for organizing and distributing practical water-efficient techniques. The central problem is not simply that water-saving methods are unavailable; useful information is often scattered, context is missing, and the reliability of community knowledge can be difficult to judge. The proposed platform responds by combining structured knowledge pages, search, categories, tags, images, discussion, version history and moderation or expert verification. These features will provide a common environment for users to find, share, update and maintain water-management knowledge. The paper deliberately avoids claiming field-level water savings because no primary dataset or deployment results were provided. Instead, it defines a practical architecture and an evaluation framework that can be tested in future work. If implemented with careful attention to local conditions, content quality, accessibility and participation, the platform could make water-management knowledge easier to discover, understand and reuse. In this sense, the proposed system will act as a digital support layer for community learning, preservation of practical knowledge and more informed water-use decisions.

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