

Socio-Economic and Sustainability Impacts of a Community-Based Water Supply Project: A Case Study of the Agta Community in Gattaran, Cagayan

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ABSTRACT

This study assesses the socio-economic and sustainability impacts of a community-based water supply project on the Agta community of Sitio Padungsol, Gattaran, Cagayan. The community, which previously relied on distant, unsafe, and unreliable water sources, has historically experienced high rates of waterborne diseases. The primary objective was to evaluate the project's perceived effects and long-term viability.

A descriptive-correlational research design was employed, utilizing a purposive sample of thirteen (13) households. Data was collected through a semi-structured questionnaire and face-to-face interviews. The instrument gathered information on socio-economic profiles, perceived impacts on a 5-point Likert scale, and qualitative insights into the sustainability of the project. Data analysis involved descriptive statistics (mean and standard deviation) and a Spearman rank-order correlation to identify relationships between socio-economic profiles and perceived impacts. A thematic analysis was also conducted on qualitative data to provide a comprehensive evaluation.

The community demonstrated a strong positive perception of the project, with high levels of agreement on its economic, social, and health and sanitation impacts. A significant positive correlation was found between respondent age and perceived time savings from the project ($R=0.591$, $p<0.05$), and between family size and perceived health impacts ($R=0.539$, $p<0.10$). Conversely, a negative correlation was observed between family income and perceived impact on sanitation practices ($R=-0.531$, $p<0.10$). The qualitative assessment confirmed that the project helped reduce illness and save time. However, some families still report health issues. They also sometimes use the old water sources when the pump water looks discolored. This shows an important challenge for long-term sustainability.

The water supply project has a significant and positive socio-economic impact, fostering a sense of dignity, improving health, and redirecting time toward productive pursuits. However, its full sustainability hinges on addressing perceived challenges in water quality for a segment of the population. The findings show the importance of combining infrastructure projects with continued community support. Simple water purification methods and regular maintenance are needed to ensure all residents fully benefit from the project.

Research Theme: Community Empowerment and Development

Keywords: *Water Accessibility, Agta Community, Socio-Economic Impact, Manually-operated Pump Well, Community Development*

1. INTRODUCTION

1.1. Background of the Study

Extension services are a fundamental support of State Universities and Colleges (SUCs) in the Philippines, mandated by the Commission on Higher Education (CHED) to promote community development and social responsibility (CHED Memorandum Order No. 52, s. 2007). These programs serve as a crucial link between academic expertise and societal needs, ensuring that knowledge and technology are utilized for the benefit of local communities.

As part of this national mandate, Cagayan State University (CSU) actively engages in extension initiatives that address real-world challenges in underserved areas. This paper details one such initiative, a community-based water supply project implemented in Sitio Padungsol, an isolated enclave of Barangay Basao, Gattaran, Cagayan.

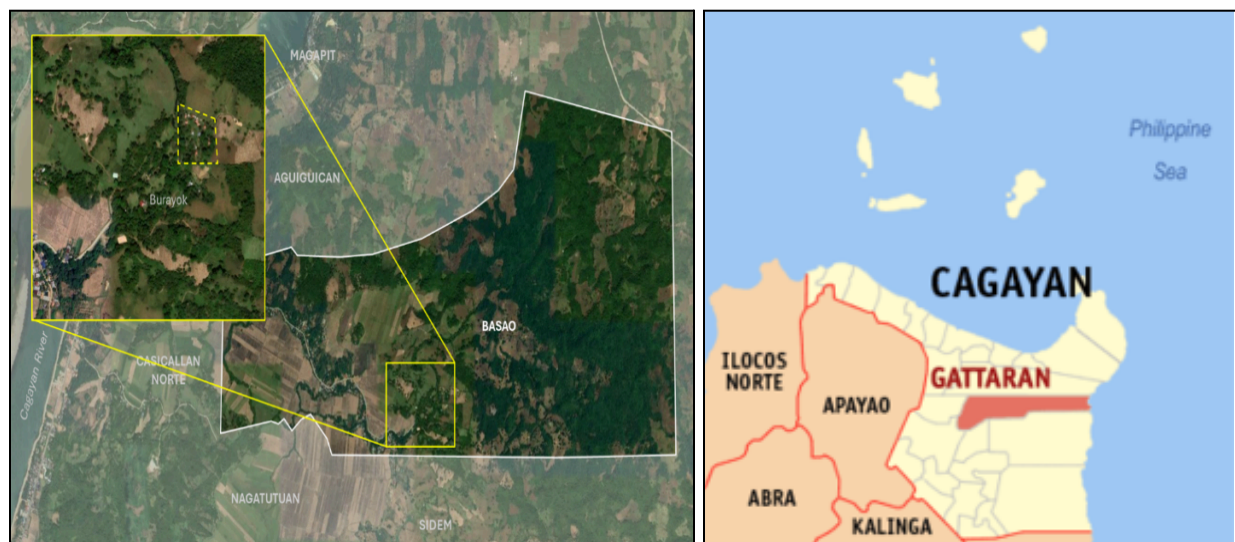


Figure 1.1. Google Maps view showing the location of the target community within Sitio Padungsol, an isolated area in Barangay Basao, Gattaran, Cagayan, where the water supply project was carried out. (Google Maps, 2025)

The Agta community of Sitio Padungsol is an indigenous group that has historically faced significant challenges, particularly limited access to clean water. Originally, this community was composed of eleven (11) households and has continued to increase since the launch of the extension project. Prior to this intervention, the residents of the community relied on a nearby stream for domestic purposes and a distant artesian well for drinking water. This reliance on unsafe and inconvenient sources posed significant health risks, as evidenced by a community needs assessment conducted in December 2020. The assessment found that colds and coughs were the most common illnesses (54.28%), followed closely by diarrhea or LBM (20.0%). Furthermore, the community lacked an efficient and working drainage facility, with 94.74% of households relying on open pits for wastewater disposal. The World Health Organization (WHO) has consistently emphasized that diarrheal diseases, which remain a leading cause of morbidity and mortality, especially in developing regions, are mostly caused by contaminated water sources (WHO, 2022).



Figure 1.2. *The original shallow water pump well in Sitio Padungsol, positioned next to the visibly turbid stream that served as the community's primary water source.*

A preliminary technical assessment of the former water sources of the community, the stream and the shallow pump well shown in Figure 1.2, confirmed a serious public health concern. Water samples showed turbidity at 40.4 NTU and color levels above 500 CU, both exceeding the limits set by the Philippine National Standards for Drinking Water (PNSDW). Microbiological tests also indicated high levels of total coliform and fecal coliform bacteria, confirming significant contamination.

The Civil Engineering department supported the initial phase of the project through a site inspection and geological survey. A site inspection and geological assessment confirmed that the existing water sources were inadequate. The team conducted a basic soil evaluation to find a suitable location for a new pump well. The elevated, rocky terrain where most homes were located proved difficult to bore without specialized equipment. To address this, the team selected a lower site that remained accessible to residents. A new pump well was designed to reach a depth of about 15 meters to allow access to a cleaner and more reliable aquifer.

In response, the College of Engineering and Architecture (COEA) of CSU Carig Campus implemented a series of initiatives under its “*Paggurufunan Para Ta Progreso*” extension program. Since 2022, Sitio Padungsol has been one of four beneficiary communities, with the program aiming to support the Agta community through interdisciplinary efforts. This study focuses on the initiative to provide a safe and reliable source of potable water, complemented by health and sanitation awareness activities. While the overall extension program is a collaborative effort involving all academic programs within the COEA, the water system initiative was specifically led by the Chemical and Civil Engineering departments. This study aims to assess the perceived impacts of the water supply initiative on residents’ health, sanitation, socio-economic conditions, and overall well-being more than two years after its implementation. It further seeks to determine if these perceptions vary among different socio-economic groups and to evaluate the sustainability of the project, thereby providing a comprehensive analysis of its long-term effects.

1.2. Description of the Extension Program

State universities, as centers of knowledge and innovation, enable the application of academic knowledge displayed through various academic research converted into sustainable extension activities that help support local communities. The Cagayan State University is one of the largest state universities in the region, with nine satellite campuses spread across the Cagayan Province. Since its establishment in June of 1978, the university has launched countless research-based extension activities aimed at supporting local communities in the province.

Under the leadership of Engr. Arthur G. Ibanez, the CSU Carig Campus launched the extension program “*Paggurufunan para ta Progreso* (Unity Towards Community Development)” to provide assistance to the Agta Community and three other municipalities. This program is structured into three main component projects: (1) Techno-Demo on Food and Non-food Products for Livelihood; (2) Development of IEC Materials; and (3) Resource Support Development.

The COEA was specifically assigned to manage the Resource Support Development project. Within this project, the COEA contributes through initiatives that promote access to solar energy, improve potable water systems, and introduce sustainable food production technologies such as hydroponics. The water system initiative was a collaborative effort of various departments within the COEA. Following a series of consultations and a formal needs assessment administered to residents, the project was designed to address the community's most pressing concerns, with a particular focus on water supply and health-related issues. The Civil and Chemical Engineering departments played a significant role in planning and implementing the technical aspects of the project, from water quality testing to the design and installation of the water pump.

A series of seminars was conducted to ensure the sustainability of the project. In March 2022, a training on potable water supply maintenance was conducted to 30 residents. The construction of the water pump commenced on December 5, 2022, and it was officially completed and turned over to the community on March 7, 2023. The event incorporated a seminar on gender and development as another step toward community empowerment that emphasizes the comprehensive approach of the project. A final water quality test was performed on the output of the pump to ensure its safety and potability, a critical step to prevent the recurrence of waterborne diseases. The key activities related to the water supply initiative are summarized in Table 1.1.

Table 1.1 *Activities Relating to Water Supply*

Activities	Participants	Date
Training on Potable water Supply Maintenance	30	Mar. 25, 2022
Potable Water Supply	40	Dec. 5, 2022
Gender and Development Seminar cum Turnover of Water Pump	20	Mar. 7, 2023
Mga Epekto ng Water Pollution sa Suplay ng Tubig	60	Oct. 2023
Water Quality and Availability	26	Nov. 16, 2023
Water filtration	26	Nov. 17, 2023
Impacts of Pollution on Water Supply	40	Sept. 6, 2024

A post-installation water quality test in November 2023 showed significant improvements, with total coliform count reduced from 920 MPN/100mL to >8, and fecal coliform from 220 MPN/100mL to 4.6. While these improvements were promising, the results did not fully meet the Philippine National Standards for Drinking Water (PNSDW). Due to other constraints, further purification steps involving water disinfection processes were not performed. Nevertheless, this study is focused on assessing the impact of the newly installed water pump on the socio-economic conditions of the community.



Figure 1.3. *A child from Sitio Padungsol drawing water from the community-installed pump (left), faculty members demonstrating the proper use of the filtration system to be given for each household (right).*

1.3. Significance of the Study

Impact studies play a vital role in ensuring the relevance, effectiveness, and sustainability of extension activities. These studies systematically assess the changes brought about by programs, projects, or interventions in the lives of target beneficiaries, providing evidence-based insights into their social, economic, and environmental outcomes. By measuring both the intended and unintended effects, impact studies help determine whether extension efforts have successfully addressed community needs and contributed to long-term development goals.

Furthermore, the findings will inform university administration and future extension program planners. The results will serve as a basis for allocating budgets and resources to extension projects to refine methodologies for community engagement and ensure that academic efforts lead to tangible, positive changes in the lives of partner communities.

1.4. Objectives of the Study

The main objective of the study is to assess the socio-economic impacts of the community-based water supply project on the Agta community of Sitio Padungsol, Gattaran, Cagayan.

Specifically, it aims to:

1. Describe the socio-economic profile of the respondent households.
2. Assess the level of agreement of the respondents on the perceived impacts of the project in terms of:
 - a. Economic Impacts
 - b. Social Impacts

- c. Impacts on Health and Sanitation
3. Determine if there is a significant difference in the perceived impacts based on the socio-economic profiles of the respondents.
4. Evaluate the sustainability of the water supply system by identifying perceived challenges and community-driven solutions.

2. METHODOLOGY

2.1. Research Design

The study utilized a descriptive-correlational research design, which is well-suited for examining both the characteristics of a population and the relationships between variables without experimental manipulation. This design was appropriate for two key reasons. First, the descriptive component enabled a systematic and accurate profiling of the socio-economic backgrounds of the respondents and their perceptions of the impact and sustainability of the water supply project. Second, the correlational aspect allowed the researchers to explore potential links between these socio-economic characteristics and how respondents perceived the benefits of the project, which offers insights into which factors may influence community-level outcomes. The research process followed a sequential flow as shown in Figure 2.1 below.

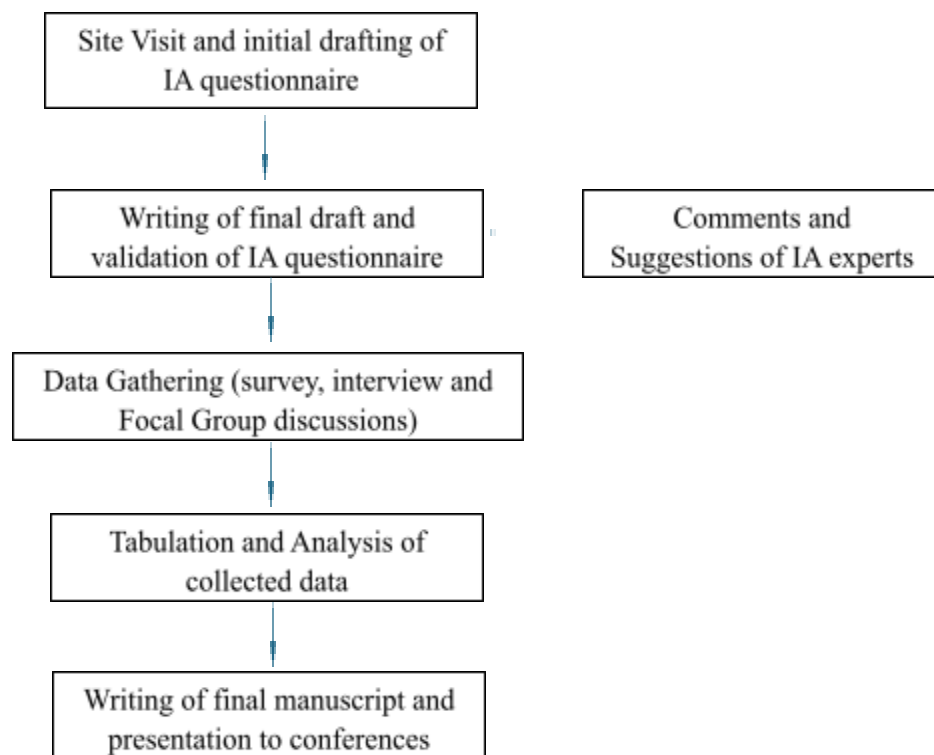


Figure 2.1. *The research flow diagram*

2.2. Participants and Sampling

The participants of this study were the heads of the households from the Agta community in Sitio Padungsol, Barangay Basao, Gattaran, Cagayan. The total population at the time of the survey was thirteen (13) households. Due to the small and distinct nature of the population, a purposive

sampling method was employed. This non-probability technique allowed for the selection of specific individuals who met the criteria essential for the study, which were (1) bona fide residency in Sitio Padungsol and (2) voluntary consent to participate. A total of thirteen (13) respondents, with either the mother or father serving as the representative, were surveyed.

2.3. Survey Instrument

A semi-structured IA questionnaire was developed to assess the impact of the manually operated water pump and was validated by a pool of experts in Impact Assessments (See Appendix A). The survey was coupled with informal interviews with thirteen (13) heads of households or their representatives, asking them about topics regarding the impacts of the project on their daily routine. The instrument was structured into three parts:

1. Part I: Socio-Economic Profile of Respondents

Part I was the gathering of demographic and economic data, including age, gender, family members' other details, including occupation, and approximate family income. It also included an inventory of household utilities and properties to provide a more holistic view of the community's economic status.

2. Part II: Level of Agreement on Perceived Impacts

Part II consisted of nine statements rated on a 5-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The statements were designed to measure the perceived economic, social, and health impacts of the water pump.

3. Part III: Awareness on Socio-Economic Benefits

Part III contained open-ended and closed-ended questions to gather qualitative insights, such as previous water sources, perceived water quality before the project, and changes in daily routines and health outcomes.

2.4. Data Gathering Procedure

As per the Campus RDE protocol on the conduct of Impact Assessments (IAs) of extension projects, a study protocol is required as well as survey questionnaires (Impact Assessment Tools) that are duly validated and reviewed by a panel of experts in IA that were identified by the Campus RDE office. Upon approval of the study protocol and validation of the survey tool, the required data were gathered through individual, face-to-face interviews and discussions facilitated with community and barangay leaders. The survey tool was then administered to each of the thirteen participating households. Prior to the survey, participants were fully informed of the purpose and background of the study and provided written consent. Confidentiality of all responses was ensured, and completed questionnaires were collected immediately after administration.

2.5. Data Analysis

The data gathered from the survey was analyzed using both descriptive and inferential statistics. Frequency counts, percentages, and standard deviations (SD) were employed to summarize the socio-economic profile of the respondents.

Weighted mean and standard deviation, along with their corresponding verbal interpretations, were used to assess levels of agreement on perceived impacts. Spearman rank-order correlation was used to determine if there was a significant relationship between perceived impacts and socio-economic profiles. For this exploratory study with a small sample size, an alpha level of was chosen for the inferential statistical analysis. This decision was made to increase the statistical power and reduce the risk of a Type II error—failing to detect a significant relationship that may exist (Field, 2018). While a conventional alpha of 0.05 is standard, a less conservative level is appropriate for small-scale, non-random studies where the primary goal is to identify potential trends for future research.

Finally, a mixed-methods approach was used to evaluate sustainability. Quantitative responses on maintenance and durability were analyzed using descriptive statistics. Qualitative responses from open-ended questions about challenges and solutions were examined through thematic analysis. This helped identify recurring themes and patterns. The qualitative insights provided deeper context and supported the quantitative findings.

3. RESULTS AND DISCUSSION

3.1. Socio-Economic Profile of the Respondents

3.1.1. Gender of Respondents

Table 3.1 shows the frequency distribution of the respondent's gender. It can be noted that the majority of the respondents are female because most of the male members of the community were at work during the implementation of the survey. This setup is common to Agta communities since men spend most of their days either fishing, hunting, or tending to agricultural crops, while the women generally stay back and watch the children, which also reaffirms the findings of Ocampo and Ocampo (2018), who concluded that male Agtas are regarded as the head of the family and are the ones in charge of working for the family, while the female Agtas are regarded as the ones in charge of taking care of their children.

Table 3.1. *Frequency Distribution of Respondents based on Gender*

Gender	Frequency	Percentage
Male	3	23.08%
Female	10	76.92%
Total		100%

3.1.2. Age of Respondents

The majority of the respondents belong to the age group of twenty (20) years and below since it has been a tradition in the community to start their own family at a young age, which was confirmed by a report paper of Magana (2000).

Table 3.2. *Frequency Distribution of Respondents based on Age*

Age Group	Frequency	Percentage
20 years old and below	5	38.46%
21 to 30 years old	3	23.08%

31 to 40 years old	3	23.08%
41 to 50 years old	0	0.00%
51 to 60 years old	1	7.69%
61 years old and above	1	7.69%
Total		100%

3.1.3 Family Size

Agta communities are known to have big families since some households tend to have more than one family that are residing together. However, in the Agta community of Basao, it can be noted that the average size of a family is only three or below, which has a frequency of 5 (38.46%). This is because, according to their tribal chief, when their children reach the age of marriage and finally get married, they are encouraged to build their own house so that they can start their family independently.

Table 3.3. *Frequency Distribution of Respondents based on Family Size*

Family Size	Frequency	Percentage
Three and below	5	38.46%
Four to six members	4	30.77%
Seven members and above	4	30.77%
Total		100%

3.1.4. Educational Attainment

The Agta children of the community are generally literate; that is, they are already equipped in reading, writing, and counting, which can be attested by the school head of Basao Elementary School. Other heads of households also attended school, whose data can be seen in Table 4.4, where it shows that the majority of the respondents have attended elementary schooling with a frequency of eight (8), or 61.54%, and two (2) of them even completed elementary, and one (1) attended the Alternative Learning System (ALS).

Table 3.4. *Frequency Distribution of Respondents based on Educational Attainment*

Educational Attainment	Frequency	Percentage
No schooling	2	15.38%
Elementary Level	8	61.54%
Elementary Graduate	2	15.38%
Alternative Learning System (ALS)	1	7.69%
Total		100%

3.1.5 Occupation of the Respondents

The Agta community in Basao Gattaran, like any other Agta community across the country, relies on agriculture as its primary source of income. In fact, according to Mr. Lito Gonzales, their tribal chief, the women members of their community are engaged in backyard farming over which their produce were sold to nearby villages and tourists visiting the Burayok Falls located

near their village. This claim is supported by the data shown in Table 4.5, which shows that backyard farming and selling is indeed considered the most popular occupation among the respondents, with a frequency of 7 (53.85%), followed by farming, with a frequency of 4 (30.77%).

Table 3.5. *Frequency Distribution of Respondents based on their occupations*

Occupation	Frequency	Percentage
Farming	4	30.77%
Backyard farming and selling	7	53.85%
Domestic work (housewife)	1	7.69%
Handicraft	1	7.69%
Total		100%

3.1.6 Family Income

Since the majority of the respondents rely only on backyard farming and selling as their primary source of income, it can be noted that their average monthly income only ranges from 3,001 to 5,000 pesos. This income is further allocated to the sustenance of the family members and to sustain the needs of their children attending school.

Table 3.6. *Frequency Distribution of Respondents based on their Family Monthly Income*

Monthly Income	Frequency	Percentage
1,000 and below	1	7.69%
1,001-3,000	3	23.08%
3,001-5,000	8	61.54%
5,001-7,000	1	7.69%
Total		100%

3.1.7 Properties Inventory

Table 4.7 below shows the property inventory of the respondents from the Agta community of Basao. It can be noted that almost all households raise native chickens, which are either sold or used for personal consumption. The community is located in a remote area of Basao, which has not yet been reached by the electrification program of local electric cooperatives. Thus, all of the households are still dependent on the solar power system as a source of electricity. This is the reason why all of the appliances of the respondents are either battery operated or solar powered. In addition, the Agta households do not have much furniture since they are known to be itinerant and tend to move from one place to another.

Table 3.7. *Property Inventory of the Respondents*

Properties	Frequency	Percentage
Poultry		
Chicken	11	84.61%
Household Utilities		
Energy Source		
On-Grid	0	-

Off-Grid (Solar)	13	100%
Hybrid	0	-
Appliances		
Battery-powered radio	4	30.77%
Battery/solar-powered Electric Fan	0	-
Telephone/Mobile Phones	6	46.15%
Flashlights	4	30.77%
Furniture and Household Items		
Furniture		
Sofa Set	0	-
Dining Table Set	0	-
Cabinets	1	7.69%
Bed (<i>Papag</i> – bed made of bamboo)	7	53.85%
Household Items		
Gas Stove	0	-
Dish Rack	0	-
<i>Dalikan</i> (Wood/Charcoal Stove)	13	100%

3.2. Level of Agreement on Perceived Impacts of the Project

The descriptive analysis shows the strong agreement of the community on the positive impacts of the water supply project. As summarized in Table 3.8, the mean scores across all three impact categories (economic, social, and health and sanitation) indicate a very favorable perception of the intervention.

For economic impacts, the community generally agreed that the project played an important role in reducing waterborne illnesses, which in turn saves household income that would otherwise be spent on medical treatment (mean = 4.15). This finding supports the notion that improved health outcomes have a direct economic benefit for vulnerable communities by reducing healthcare expenditures and lost income from illness (WHO, 2022). Furthermore, the respondents strongly agreed that having a reliable water source at or near the home has enabled them to dedicate more time to work or other productive pursuits (mean = 4.77), as they no longer need to travel a significant distance to the nearest water source, which is approximately one kilometer away. This aligns with studies showing that reducing the burden of water collection leads to valuable time savings that can be redirected toward livelihood activities or education (Chandrasekaran et al., 2022).

In terms of social impacts, the respondents unanimously agreed that the project contributed to their sense of dignity and empowerment (mean = 4.92), a perception that is central to the human right to safe and affordable water (UN-Water, 2010). This finding suggests that providing access to a basic necessity can foster a sense of respect and self-worth within a marginalized community. Additionally, the project was seen as contributing to the community's resilience against droughts by providing a reliable water source for year-round use (mean = 5.00), even during the summer season. This shows how infrastructure projects can build community resilience to climate-related challenges and contribute to long-term stability. As Bulti and Yutura (2023) emphasize, climate-resilient water systems require holistic approaches that integrate

engineering, management, and soft skills to address rapid groundwater depletion and variability in water sources. Their results show the urgent need for localized, technologically supported infrastructure to adapt to climate-induced disruptions and sustain essential services in vulnerable communities.

Lastly, on health and sanitation, the respondents showed a strong, unanimous agreement that the project played a crucial role in reducing waterborne diseases in the community (mean = 5.00). This finding directly supports the project's primary goal of improving public health by providing clean water. They also strongly agreed that the presence of the project has made personal hygiene and sanitation practices more accessible (mean = 4.77), with the availability of clean water making handwashing and the use of sanitation facilities much more feasible (mean = 4.69).

Table 3.8. *Level of Agreement of respondents regarding the impact of the project*

Impact Statement	Mean Score	Standard Deviation	Verbal Interpretation
A. Economic Impacts			
1. Reduces illness, saving on medical treatment.	4.15	1.28	Agree
2. Frees up time for work and other productive pursuits.	4.77	0.60	Strongly Agree
3. Enables more agricultural activities for income.	4.69	0.48	Strongly Agree
Average (Economic Impacts)	4.54	0.34	Strongly Agree
B. Social Impacts			
1. Contributes to a sense of dignity and empowerment.	4.92	0.28	Strongly Agree
2. Fosters community cooperation around water management.	4.69	0.48	Strongly Agree
3. Makes the community more resilient to droughts.	5.00	0.00	Strongly Agree
Average (Social Impacts)	4.87	0.16	Strongly Agree
C. Health and Sanitation			
1. Essential for good hygiene practices.	4.77	0.44	Strongly Agree
2. Reduces the spread of infections through handwashing.	5.00	0.00	Strongly Agree
3. Allows for proper use of sanitation facilities.	4.69	1.11	Strongly Agree
Average (Health and Sanitation)	4.82	0.16	Strongly Agree

3.3. Relationship between the Perceived Impacts and the Socio-Economic Profiles of the Respondents

To explore potential associations between socio-economic profiles of the respondents and their perceived impacts of the project, Spearman rank-order correlation was used. The correlations were determined using ordinal data from survey responses and are summarized in Table 4.9. This non-parametric method was appropriate given the small sample size and the nature of the variables. Significant relationships identified in the analysis are discussed in detail to show emerging patterns that may inform future program design and evaluation.

Table 3.9. *Summary of Significant Spearman Correlation Coefficients (R) Between Socio-Economic Profiles and Perceived Impacts*

Perceived Impact	Independent Variable	Spearman R	p-value	Verbal Interpretation	
A. Economic Impacts					
2. Frees up time for work and other productive pursuits.	Age	0.5913	0.0333	Significant at an alpha level of 0.10	
C. Health and Sanitation					
1. Essential for good hygiene practices.	Technology Access Level	0.5398	0.0569		
3. Allows for proper use of sanitation facilities.	Family Income	-0.5316	0.0615		
Average (Health and Sanitation)	Family Size	0.5957	0.0317		

3.2.1 Economic Impacts

The analysis revealed a significant positive relationship between the respondent's age and their perception that the water pump allows more time for productive activities ($R=0.591$, $p<0.05$). This suggests that older respondents are more likely to agree that the new water source has freed up time that can be dedicated to work or other economic activities. This result aligns with previous research on the impact of improved water access, which often finds that time savings from reduced water collection disproportionately benefit older household members and women, who are typically responsible for water fetching and domestic duties (Demie et al., 2016). For older individuals, this saved time can translate into more time for farming, handicraft, or other income-generating activities, thus directly contributing to the economic well-being of the family.

3.2.2 Social Impacts

No significant relationships were found between the socio-economic profiles and the perceived social impacts of the project. This result suggests that social benefits, such as a sense of dignity or improved inter-community cooperation, were perceived similarly across all socio-economic groups. It is possible that social factors are not as directly influenced by individual characteristics like age or income as the more tangible economic and health impacts. Alternatively, the small sample size may have limited the ability to detect more subtle social correlations (Field, 2018).

3.2.3 Health and Sanitation

A significant positive relationship was found between the technology access level in a household and their perception that potable water improves hygiene and reduces disease ($R=0.595$, $p<0.10$). Technology Access Level was coded on a scale from 0 to 3, representing increasing access to basic household devices: 0 = none, 1 = flashlight or solar light, 2 = radio, and 3 = mobile phones. This suggests that households with access to more advanced technology like mobile phones or solar-powered items are more likely to recognize the health benefits of the new water pump. This correlation may be an indication of other factors, such as higher literacy rates, greater access to health information, or a general socio-economic status that fosters a more comprehensive understanding of health and sanitation practices.

There was also a significant negative relationship between family income and the perceived impact of the pump on the proper use of toilets and sanitation facilities ($R = -0.531$, $p < 0.10$). This suggests that as family income increases, the perceived effect of the water pump on toilet use and sanitation decreases. Since the community have similar household facilities, this may reflect differences in behavioral adaptation rather than infrastructure access. Higher-income households may have developed alternative routines or coping mechanisms for water collection and hygiene that made the new pump less transformative for them. For example, some families harvest rainwater during the wet season, while others rent motorcycles to fetch clean water from a source approximately one kilometer away. These strategies, though resource-intensive, allowed them to maintain acceptable hygiene standards even before the pump installation, reducing the perceived impact of the intervention.

Lastly, the analysis revealed a significant positive relationship between household family size and their perceived overall health and sanitation impacts ($R = 0.539$, $p < 0.10$). This suggests that households with more members are more likely to agree that the new water pump has improved hygiene practices and overall health. This finding is intuitive, as larger families require more water for daily hygiene, handwashing, and sanitation. The introduction of a reliable, nearby water source would therefore have a more pronounced impact on their day-to-day health and sanitation practices compared to smaller households (Esteves Mills & Cumming, 2016).

3.4. Qualitative Assessment of Project Sustainability

The qualitative data collected from the interviews and open-ended survey questions provides critical context for evaluating the project's sustainability and perceived impacts. Prior to the project's completion in March 2023, the Agta community relied on a distant artesian well and a nearby stream. This reliance on unsafe and inconvenient sources posed significant risks. Respondents shared that fetching water from the artesian well, located approximately one kilometer away, was especially dangerous as it required passing through a creek and steep slopes. For their domestic needs, residents relied on water from a nearby stream, which they described as *nalibeg* (turbid) and visibly dirty. During the rainy season, the water often turned yellowish due to heavy runoff carrying soil, organic matter, and debris from the surrounding terrain. This discoloration was not only unappealing but also indicative of contamination, making the water unsafe for drinking, cooking, and hygiene. The condition of the stream worsened during storms, when flash floods posed physical danger and further disrupted access. These seasonal changes frequently isolated the community, cutting them off from any alternative water sources. Despite the risks, residents had no choice but to endure this situation for years, adapting to the unreliable and hazardous supply as part of daily life.

In response to questions about health, respondents unanimously agreed that prior to the project, waterborne illnesses such as diarrhea, stomach aches, and LBM were very common, especially among children. These claims were further supported by Ms. Maribel Prias, the midwife designate of the Municipal Health Office, who confirmed a notable decrease in the cases of waterborne-related illness since the project's completion.

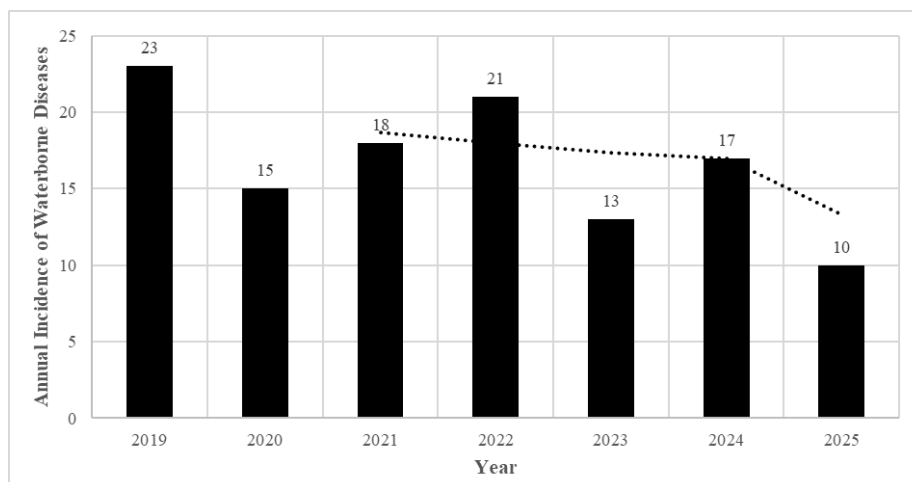


Figure 3.1. *Annual Incidence of Waterborne Diseases in the Agta Community, Sitio Padungsol, Gattaran, Cagayan (2019–2025), shown as a bar chart with dotted lines indicating the 3-year moving average.*

As depicted in Figure 3.1, the bar chart shows the annual case counts of waterborne diseases in the Agta community, compiled from official records by Ms. Maribel Prias of the Municipal Health Office. The data specifically covers cases of diarrhea and typhoid fever reported in Sitio Padungsol from 2019 to 2025. A 3-year moving average indicates overall trends, and a marked decline in incidence follows the 2020 implementation of the water supply project.

The quantitative data shown in Figure 3.1 provides clear evidence of a significant decline in waterborne disease incidence following the project’s implementation. The initial sharp decrease in reported cases from 2019 to 2020 suggests that even the early stages of the project had an immediate and positive health impact. This trend, with the 3-year moving average showing a general decline over time, directly supports the qualitative findings. It shows that the project successfully addressed a major public health concern.

Following the installation of the water pump, most respondents reported using the new source for drinking and observed a decrease in the occurrence of waterborne and hygiene-related diseases. This directly demonstrates the positive health impact of the project. However, one important finding regarding sustainability and perception was the feedback from a few families who reported still experiencing stomach aches from the new pump water. In addition, some respondents shared that the pump water occasionally appeared yellow-tinted, especially after heavy rains, which led them to continue using the previous water source from time to time. While they noted that other families now use it for drinking, they themselves were more sensitive to the quality of the water. This indicates that while the project has significantly improved water access and health outcomes for the majority, concerns about water discoloration and residual health effects remain for a small but important segment of the population. These households may require additional purification measures for the water to be fully potable for them.

The project significantly reshaped daily routines. Respondents shared that with a reliable water source now within reach, they spend less time fetching water and more time on other meaningful activities, whether tending to livelihoods, caring for family, or participating in community affairs. This change emphasizes the practical, time-saving benefits of better water access, as well as its broader impact on well-being.

Based on the qualitative findings, the water supply project has a strong foundation for sustainability, primarily due to its tangible and immediate positive impacts on the community. The community has embraced the new water source, shifting from their previously unsafe and inconvenient sources. The most significant perceived impacts are the reduction in waterborne illnesses and the time saved from no longer having to travel long distances for water. This time has been redirected toward other activities, demonstrating a positive shift in daily life. The sustainability of the project is reinforced by its ability to directly address a critical need and improve public health for the majority of the community. However, the feedback regarding occasional discoloration and continued health issues suggests a need for a community-driven solution, possibly involving a simple water filtration system or further training on water disinfection, to ensure the long-term effectiveness and full health benefit for all residents.

4. CONCLUSION & RECOMMENDATION

4.1. Conclusion

This study aimed to assess the socio-economic impacts and sustainability of a community-based water supply project on the Agta community in Sitio Padungsol, Gattaran, Cagayan. The findings confirm that the project has been overwhelmingly successful in addressing the critical needs of the community, particularly regarding time savings, health, and dignity.

The socio-economic profile of the community, characterized by a low-income, agriculture-based livelihood and limited educational attainment, provides the necessary context for the impact of the project. According to the descriptive analysis, the initiative was strongly and favorably perceived by the respondents, who all agreed that it had benefited their lives in the areas of economics, society, and health and sanitation. The project has significantly reduced waterborne illnesses, freed up valuable time for productive activities, and fostered a sense of dignity and resilience.

Furthermore, the correlational analysis revealed meaningful relationships between the perceived impacts of the project and specific socio-economic variables. The positive correlation between age and perceived time savings suggests that older individuals, who likely bore the primary responsibility for water collection, experienced the most significant time benefits. Similarly, the positive relationship between family size and perceived health impacts is intuitive, as larger households would see a greater overall benefit from a clean, nearby water source. One important finding was the negative correlation between perceived influence on sanitation practices and family income, suggesting that the transformative effect of the project was greatest for lower-income families who had no other feasible alternatives.

Finally, the qualitative assessment of sustainability provides a comprehensive picture of the long-term viability of the project. While the community has largely embraced the new water source, a few families still occasionally rely on the previous source when the water of the new pump appears discolored. This widespread adoption, driven by the tangible benefits of the project, forms a strong foundation for sustainability. However, a crucial insight from the interviews was the feedback from a few families who experienced continued stomach aches from the pump water, indicating a subtle but important challenge to the full health benefit of the project for all residents. This suggests that while the water quality is improved, it may not be suitable for all members of the community without additional purification.

4.2. Recommendations

Based on the findings of this study, the following recommendations are proposed to build upon the success of the project and address its challenges:

1. To ensure the long-term effectiveness of the project and address the needs of all residents, a follow-up intervention should provide simple, community-level water purification tools and training.
2. The study found that the water project has freed up significant time for productive pursuits, particularly for older community members. It is recommended that this newfound time be supported through skills-based training or micro-enterprise development programs focused on agriculture, handicrafts, or other income-generating activities that build upon existing community skills.
3. For the project to be truly sustainable, a community-driven management and maintenance plan should be put in place. This includes training select community members on basic pump repair and maintenance and creating a small community fund for future parts replacement. This would ensure the pump remains functional for years to come without the need for external support.
4. Given the exploratory nature of this study and its small sample size, a follow-up study is recommended to track the project's long-term impacts over several years. Future research should also explore the relationship between technology access, health literacy, and water-related behaviors more deeply to better inform future interventions in similarly situated communities.

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