

## **Abstract**

This study assessed the quality of drinking water sources in Catarman, Northern Samar. Specifically, it aimed to determine the physical, chemical and bacteriological properties of selected drinking water sources. One jetmatic pump in every barangays was used in this study.

Water samples from all three sites rated colorless, odorless and tasteless by five evaluators. Brgy. Cag abaca has pH a of 6.23 Brgy.Cularema has a pH of 6.14 and Brgy. Old Rizal has pH of 6.3 which indicates all water samples are slightly acidic. Temperatures, Brgy.Cag abaca is almost the same with Brgy.Cularema having the highest temperature of 28.2°C and Brgy. Old Rizal has a temperature of 26.7°C which is the lowest temperature of the three water sources, and the total dissolved solids[TDS} are 108mg/L, 39.7mg/L and 156mg/L respectively which means Brgy Old Rizal has the highest TDS among the three brgys due mainly that it was a dumping area before but still within the permissible limit based on the Philippine National Standard of Drinking Water.

The presence of Calcium, Chloride, dissolved oxygen{DO}, Iron, manganese, Nitrite and Potassium are acceptable in three water samples based in the Philippine National Standard of Drinking Water {PNSDW}. Bacteriological analysis revealed that E.coli is positive in the three water samples, Brgys Cag abaca, Cularema and Old Rizal respectively. Therefore all water samples of the three barangays sources not safe for drinking purposes.

Since all water sources are totally not safe to drink the Local Government Units (LGU'S) must conduct seminars/trainings on proper method of purification and water treatment for the safety of all. There must be a regular inspection on the sources of drinking water by the concerned committee particularly on the safety of human health.

## **Introduction**

Water is one of the most important and abundant compounds of the ecosystem. All living things organism on the earth need water for their survival and growth. As of now only earth is the planet having about 70 percent of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants.

Water for drinking and other domestic's uses is one of our most precious natural resources. We often take it for granted until the supply is threatened by the problems with the water quantity and quality. Water is a solvent and solves minerals from the rocks with which it come in content. (Theodore, 2003)

Water is necessary substance it is the most unique aspect of our world and is essential in life .It is the medium in which all living processes occur. It dissolves nutrients and distributes them to all regulates body temperature, supports structures, and removes water products (Theodore, 2003)

Water supplies are threatened virtually worldwide with pollution. Man would not know if the water is safe until such time that water quality is assessed in terms of its physical and biological parameters. Although groundwater is less contaminated that surface water, pollution of this major water supply has become an increasing concern in Catarman, Northern Samar because more people use groundwater for many purposes, especially for drinking and other domestic uses.

Catarman is in the stage of development and has an increasing

population .Its groundwater is affected due to men doing such as improper waste disposal, septic tank location and overcrowding .These conditions spurred the researcher to study the quality of groundwater in selected barangays of Catarman ,Northern Samar.

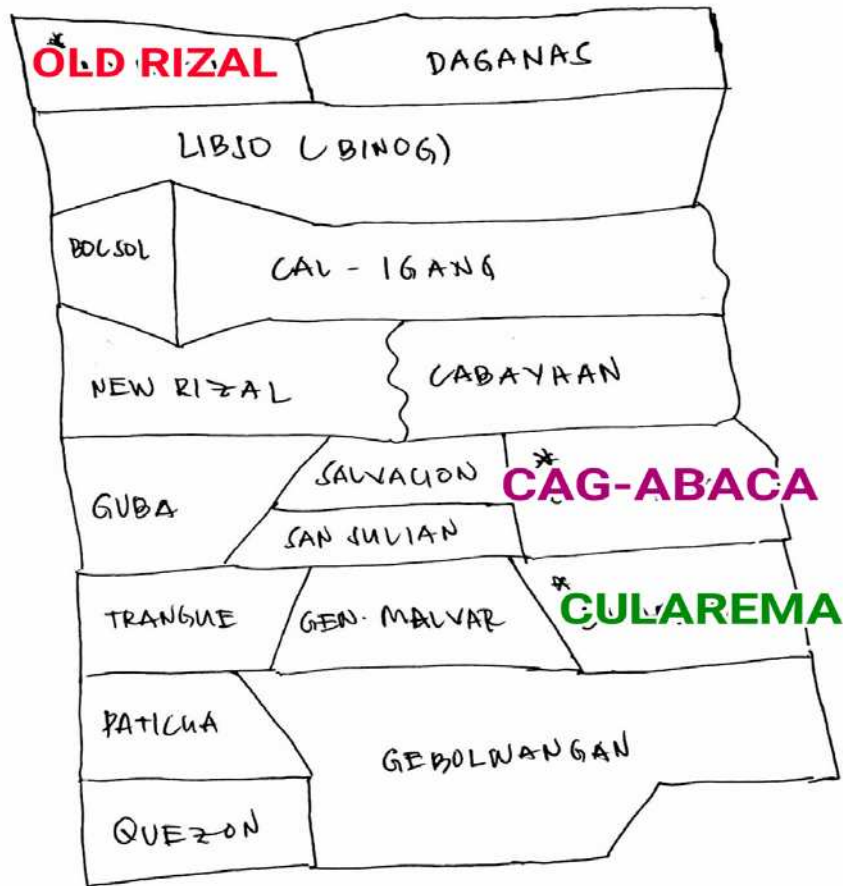
## **RESEARCH METHODOLOGY**

This study was conducted to determine the water quality using jetmatic pumps in three selected barangays in Catarman, Northern Samar.

For this study, the locale was limited only to three selected barangays: Cag.Abaca, Cularema, and Old Rizal.

Three (3) barangays were selected for the purpose of this study brgy. Old Rizal has a total of population of 2,235 and 488 household; Cularema has a total population of 428 and 85 household; Cag.abaca has a total of population of 2081 and 400 household.

Residents in the study area have their water pumps their source of water for daily use for drinking, laundry, bathing, etc.



**Plate 1.** Map of Water Sources

### **Sampling Techniques**

A purposive technique was used in this study. Sampling sites were purposely selected such that the water sources were represented of each barangay. Jetmatic pump is the major source of drinking water in the selected barangay. One (1) Jetmatic pump were taken per barangay; Barangay Cag.Abaca, Cularema and Barangay Old Rizal.

### **Research Design**

This study used the experimental and descriptive method of research. Descriptive research gathers, analyzes, classifies and tabulates data about prevailing conditions, practices, processes, trends and cause-effect relationships and then makes adequate and accurate interpretation about such data with or without the aid of essential

methods.

Descriptive research is the most appropriate method or design for this study because it attempts to analyze, interpret and report the present condition of the drinking water in the study area.

### **Water Quality Determination**

Water sampling was done to generate water samples, which were subjected for physical-chemical analysis in order to determine the potability of the water from the pumps in the study area.

### **Data Gathering Procedure**

#### **Sample Container**

In all cases, the glass container was used so as not to contaminate the sample. This sample container was used for the different parameters unless a specific requirement would exist.

A 1000 mL glass bottle was used to be the sample container. Detergent was used to clean the sample container and washed several times to remove all extraneous surface dirt, thoroughly rinsed with distilled water drained and sterilized by using electric sterilizer 15 PSI.

### **Collection of Water Sample**

The samples were collected after the water pump was sufficiently pumped many times to ensure that the sample represented the quality of groundwater that fed the water pumps. To fulfill these guidelines, the water pumps was continuously pumped to allow the water to flow for at least two minutes.

### **Determination of Physical Properties**

#### **Color**

The prepared water sample from water pump was determined by evaluating at least five respondents using their sense of sight. The perceive color of the most respondents was the color of the water sample.

#### **Odor**

The odor of the water sample was evaluated by five respondents using their sense of smell. The perceive smell of the most respondents was the odor of the water.

#### **pH**

Using the digital pH meter, the pH of the water was determined by chipping the electrode to the H<sub>2</sub>O sample for one two to three minutes and was recorded as shown in the reading of a digital pH meter. The procedure was repeated thrice.

#### **Taste**

The taste of the water sample was evaluated by five respondents using their sense of taste. The perceive taste of the most respondents was the taste of the water.

#### **Temperature**

The temperature was tested using a thermometer that was placed to the water sample directly. After one (1) minute it was recorded as shown in the calibration of the thermometer.

#### **TDS (Total Dissolved Solid)**

Total Dissolved Solids was acquired by the used of a portable TDS meter courtesy of the college of Agricultural Fisheries and Natural Resources. The portable TDS meter when switched on must have a reading of zero or else something was already wrong. Ten (10) mL of the sample was used and place on the beaker and the TDs meter was placed on it. After a while, the settled result would be the total dissolved solid result for the given sample.

## **Determination of Chemical Property Test**

### **Chloride**

About 20 mL of water sample was poured into the cylinder and was transferred to the flask and 5 mL of NaCl solution was added. Silver nitrite was poured into the burette using funnel and filled up to zero marking then the funnel was removed from the burette. Add 2-4 drops of potassium chromate was poured into the flask carefully. Then titration was started with the solution. The flask was placed right below the burette. The stopcock was gently twist to open the flow. The flask was swirled during the process continuously until a thick milky white was seen. And its get thicker up to a point. This marks the end of chloride ions in the solution when brick red color appeared, the reading was recorded from the burette.

### **DO (Dissolved Oxygen)**

Dissolved Oxygen was determined by the use of DO meter for determination of dissolved oxygen in water.

### **Iron content**

Water samples were placed in an ice box and brought to Department of Science and Technology (DOST), Tacloban City for Determination of iron content.

### **Manganese**

Water samples were placed in an ice box and brought to Department of Science and Technology (DOST), Tacloban City for Determination of manganese content.

### **Nitrite**

Water samples were placed in an ice box and brought to Leyte Metropolitan Water District for Determination of nitrite content.

### **Potassium**

Water samples were placed in an ice box and brought to Department of

Science and Technology (DOST), Tacloban City for Determination of potassium content.

### **Bacteriological Test**

The collected water samples were placed into sterilized bottles. Bottles were sealed thoroughly and placed in ice cooler containing ice to prevent possible contamination and bacterial growth. The samples were brought to the Department Of Science and Technology. Standard procedure on collecting and sending water samples for bacteriological analysis was followed.

### **Volume of samples**

The volume of sample should be sufficient to carry out all tests required, preferably not less than 1000 mL.

### **Sample Container**

Water sample was collected for bacteriological examination in 1000 mL clear bottles that have been cleansed and rinsed carefully, given a final rinse with distilled water and sterilized as directed in the standard method of analysis for water and waste water. Sampling bottles were provided with either ground glass stoppers or plastic screw caps.

### **Sample Collection, Handling and Storage**

The sample was the representative of the water under examination. Contamination during collection and before examination should be avoided.

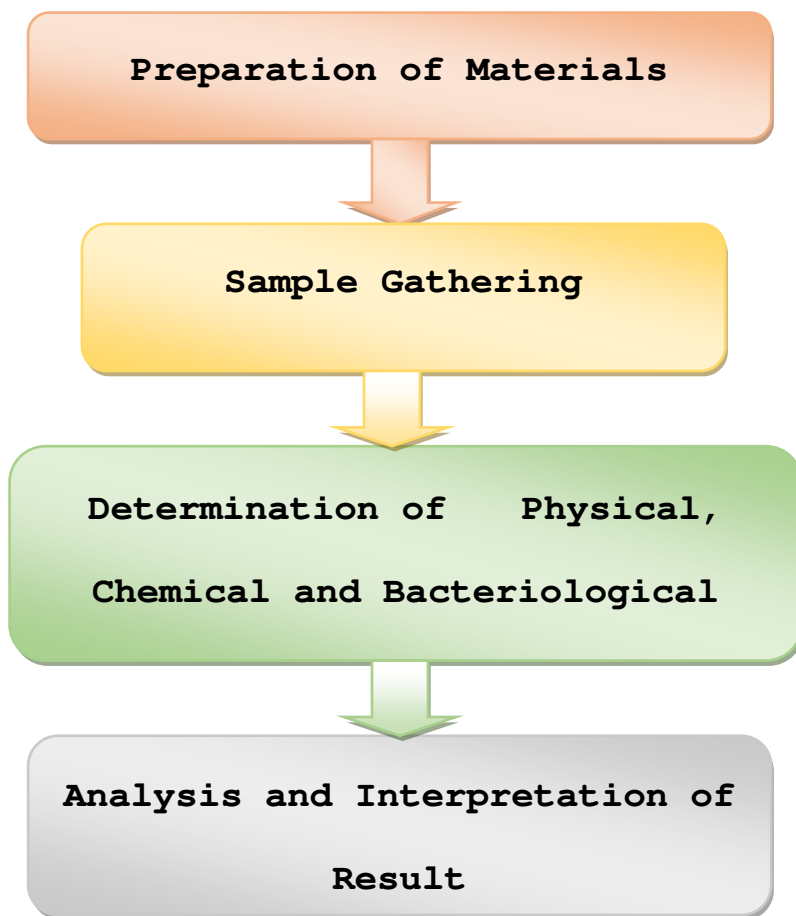
The tip of the water pumps was cleaned and free from attachments and fully opened with water allowed to waste for a sufficient time to permit the flushing/clearing.

The sampling bottle was kept unopened until it is ready for filling. The stopper or cap was removed as a unit; the inner surface of the stopper or cap and neck of bottle must not be contaminated. The container was filled



without rinsing and sample space (at least 2.5 cm) must be left to facilitate mixing by shaking.

Water sample was processed promptly or within six (6) hours after collection or if not possible the use of ice coolers for storage of water sample during transport to the laboratory was recommended. The time elapsed between collections and processing was in no case exceed 24 hours.



**Figure 2.** Flow Diagram of the Study

## Results and Discussions

### Determination of Physical Properties

The physical properties of water sample sources from jetmatic pumps in terms of color, odor, pH, taste, temperature and total dissolved solids (TDS) .

**Table 1:** Summary of the Physical Properties of the three selected barangay in Catarman, Northern Samar.

Physical properties	PNSWD	Barangays		
		Brgy. Cag-Abaca	Brgy. Cularema	Brgy. Old Rizal
Odor	No Objectionable	Odorless	Odorless	Odorless
Color	No objectionable	Colorless	Colorless	Colorless
pH	6.5-8.5	6.23	6.14	6.27
Taste	No	Tasteless	Tasteless	Tasteless

	objectionable	ss	s	ss
Temperature	24–28°C	28.2°C	28°C	26.7°C
TDS	500mg/L	108mg/L	39.7mg/L	156mg/L

Table 1 showed that the color, odor and taste of the water samples from jetmatic pump sources were not objectionable. The pH of all water sampling sites were slightly acidic which is within the range of 6.5–8.5 which is acceptable. Total dissolved solids (TDS) in three water sources are all acceptable. But then it was found out that Brgy. Old Rizal has the highest total dissolved solids value which indicates that maybe because before, it was a dumping area and it is flooded always during rainy season.

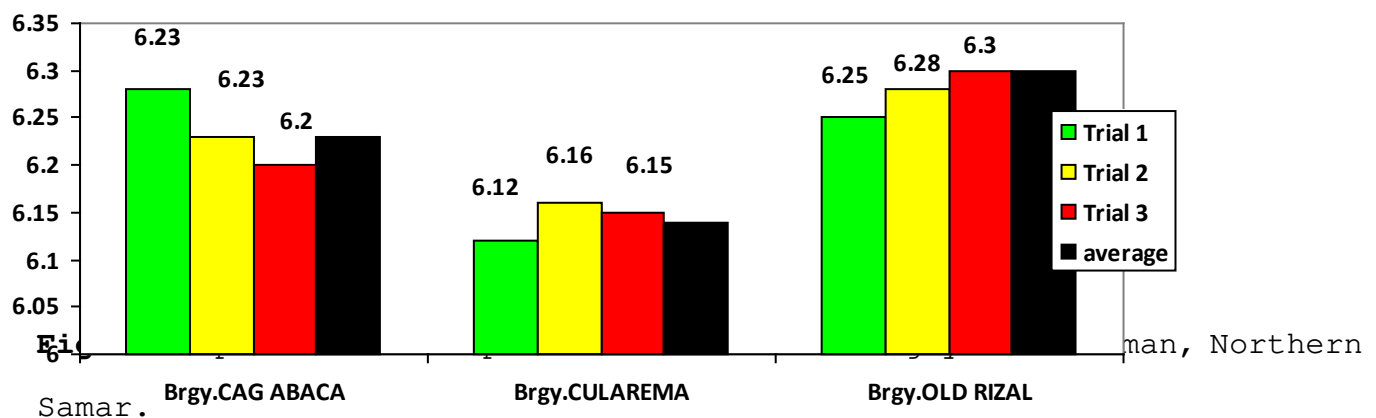


Figure 4 shows that the Barangay Cag. Abaca, Cularema, Old Rizal have a similar pH which is all are slightly acidic nearly neutral. pH has a permissible limit of 6.5–8.5 which is the pH of all water sample sources are all acceptable based on the PNSDW.

500 mg/L allowable limit

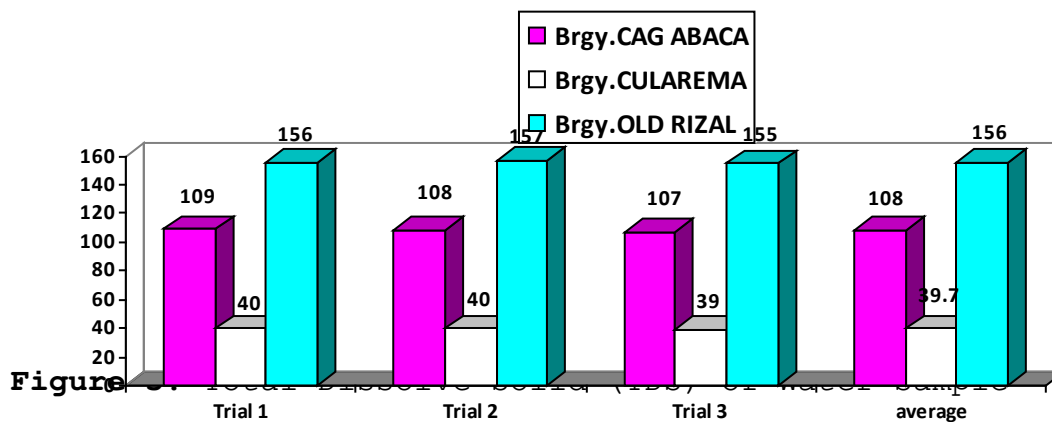


Figure 6

Figure 6 shows that Total dissolved solids (TDS) in three water sources are all acceptable. But then it was found out that Brgy. Old Rizal has the highest total dissolved solids value which indicates because before, it was a dumping area and it is flooded during rainy season.

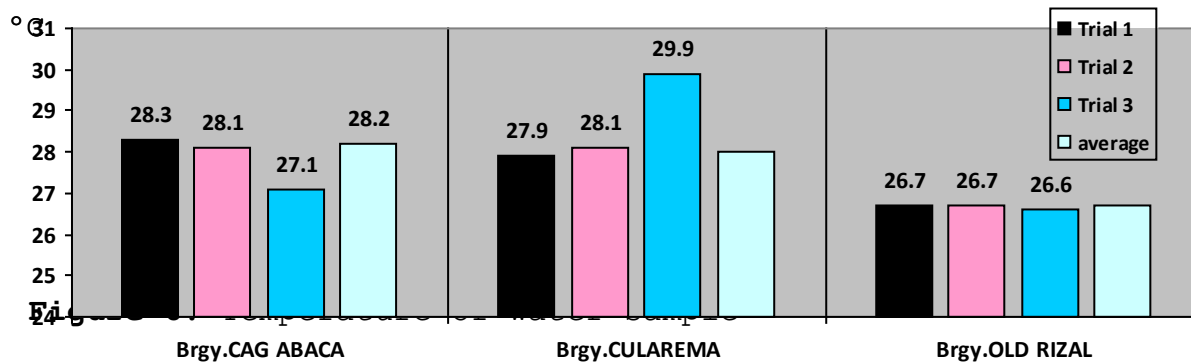


Figure 7

Figure 6 shows the temperature of each water sources are acceptable.

Temperature has a permissible limit of 24-28°C. It implies that the temperature is normal with three sampling sites.

## Determination of Chemical Properties

The Chemical properties of water samples from jetmatic pumps in terms of calcium, chloride, DO (Dissolved Oxygen), iron, manganese, nitrite, and potassium.

**Table 2.** Summary of the Chemical Properties of the three selected barangays in Catarman, Northern Samar.

Chemical properties	PNSWD maximum level (mg/L)	Barangays		
		Brgy.Cag-abaca	Brgy. Cularema	Brgy.Old rizal
Calcium	75	3.99	2.92	32.74
Chloride	250	130	96.7	101.7
DO	Minimum of 5 the higher the better	4.63	4.48	5
Iron	1.0	0.39	0.24	0.20
Manganese	$\leq 0.50$	0.089	0.89 (not acceptable)	0.108
Nitrite	$\leq 3$	0.007	0.006	0.110
Potassium		3.02	0.59	44.35

As shown in table 2 among the three water samples sources the highest chloride value was Brgy. Cag abaca with the value of 130 mg/L. It implies maybe because it is contaminated with some chemical used in the farm. Whereas in the dissolved oxygen (DO) only Brgy. Old Rizal got the highest value which is implies better quality of water. It indicates that the jetmatic pump source of water is higher than the sea water level. The

highest value for iron was Brgy. Cag abaca with a value of 0.39 mg/L because the jetmatic pump was rusty. Among the three Barangays the highest value of manganese was Brgy. Cularema which implies that it has more manganese among the other sampling sites which indicates that it is harmful to our health, which indicates that it is in Brgy.Cularema where has more naturally occurring manganese.

#### 250 mg Permissible Limit

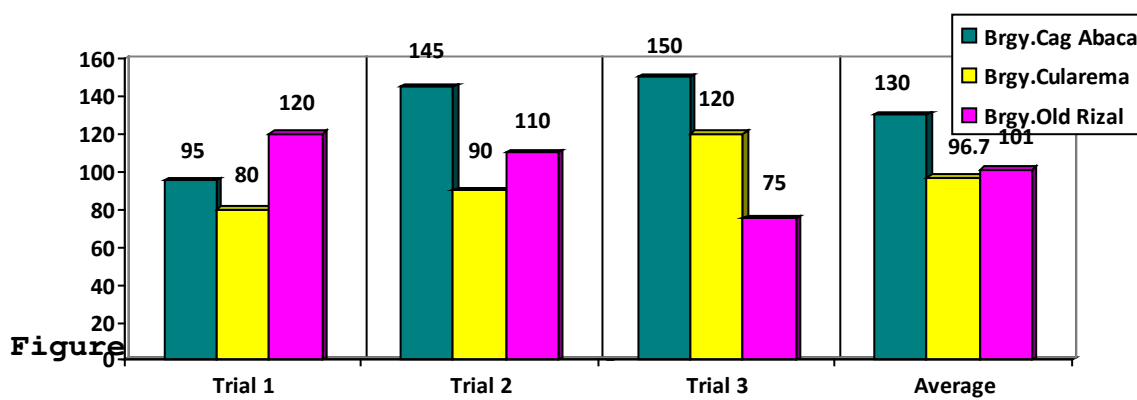


Figure 7 shows that the three water samples sources the highest chloride value was Brgy. Cag abaca with the value of 130 mg/L it is contaminated with some chemical used in the farm. But all water sample sources were acceptable.

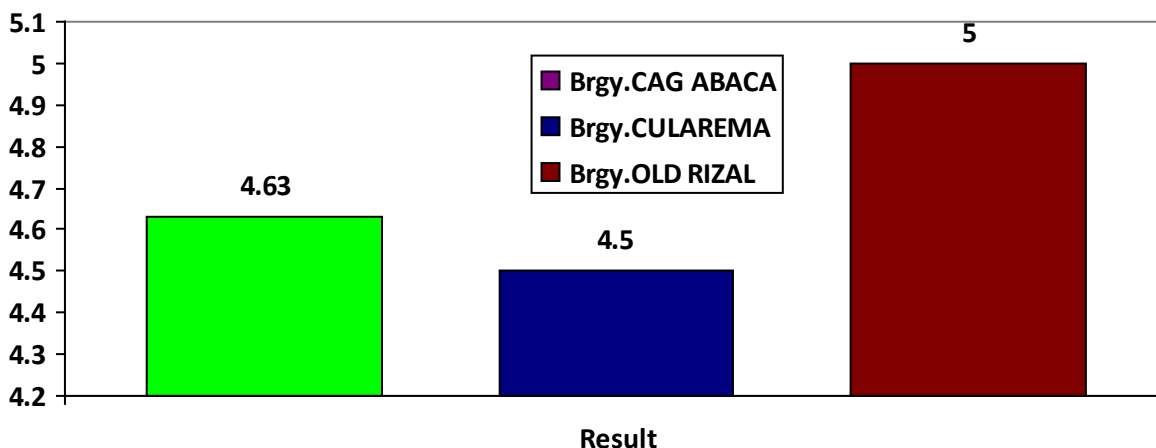


Figure 8 shows that the dissolved oxygen (DO) only Brgy. Old Rizal got the highest value which is implies better quality of water. It indicates

that the jetmatic pump source of water is higher than the sea water level.

### **Bacteriological Properties**

Water samples were place in sterilized bottles in an ice box and brought in Department of Science and Technology (DOST).

**Table 3.** Bacteriological Properties terms of E.coli

<b>Bacteriologic al Properties</b>	<b>PNSDW Maximum level (mg/L)</b>	<b>Barangays</b>		
		<b>Brgy.ca g- Abaca</b>	<b>Brgy. Cularema</b>	<b>Brgy.O ld Rizal</b>
E.coli	1.1	3.6	16	>23.0

As shown in table 3, that all water sample sources were found positive for E.coli contamination which is not acceptable. This implies that the three water samples are not safe for drinking water purposes.

### **Conclusions and Implications**

#### **Conclusion**

From the results of the study, the following conclusion were drawn.

Physical properties of water samples taken from all sampling sites are acceptable based on PNSDW for drinking water.

For the chemical properties as to the given parameters three sampling sites are all acceptable according to the test result from the DOST and based on the permissible limit from PNSWD.

For the bacteriological property, the three selected barangay are all positive for the E.coli and therefore not fit for drinking purposes.

## **Recommendation**

Based on the result and conclusions of this study the researcher would like to recommend the following:

Since all water sources are totally not safe to drink the Local Government Units (LGU'S) must conduct seminars/trainings on proper method of purification and water treatment for the safety.

There must be a regular inspection on the source of drinking water by the concerned committee particularly on the safety of human health.

## **Acknowledgement**

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