Tropical Technology Journal
Volume 17, January – December 2014
ISSN: 1656-0264

HOUSEHOLD WATER AND WASTE MANAGEMENT OF COMMUNITIES NEAR SPRING WATERS IN ARGAO, CEBU

Alburo RP, Alburo HM*, Pinote JP and Cutillas AL
Cebu Technological University-Argao Campus
*Correspondence: hemres_alburo@yahoo.com

ABSTRACT

This study recognized the importance of water in life. As such, 241 households from 25 spring water communities in Argao, Cebu were interviewed. The interview looked into the utilization of spring waters, waste generation and disposal, as well as, their perceptions on water and waste management. Results showed that households used spring waters for drinking, cooking, washing and bathing. Eight (8) springs have existing piping system that transports water to other sitios. Nine (9) springs support rice farms. Kitchen waste, glass bottles, paper, garden waste (lawn trimmings), plastic bags, broken glasses, hard plastics, cartons/boxes, metals and pet wastes, comprised the top 10 wastes generated by households and the disposal varies with waste types. It was noted that the respondents' perceptions were significantly correlated with the level of education. Moreover, analyses showed that the respondents' belief were in conflict with their practices.

Keywords: disposal, level of education, perceptions, waste types

INTRODUCTION

Springs are natural water discharges in watersheds (Jennings, 1996). Traditionally, springs have been considered as important water sources where people can directly access water for domestic and farm needs (AGRI-FACTS, 2002, Pinote, 2003). In the Philippines, springs play an important role in meeting people's demand for water especially in mountainous areas where water system is not available. Spring water is filtered by the soil and rocks, and varies in an annual cycle depending on the amount of precipitation over a certain area (Jennings, 1996).

Spring waters were highly susceptible to contamination (Jennings, 1996 and AGRI-FACTS, 2002). Susceptibility was increased from people who placed their animals near water sources or from the irresponsible throwing of all sorts of wastes. Contaminants, especially those that are associated with animal and human feces are usually carried by surface run-offs during or after heavy rainfall (Heathcote, 2009). Others are also carried underground through seepage especially when water travels only for a short distance making natural filtration not enough to remove impurities (Jennings, 1996). Increasing population in upland environments add risks of water contamination through seepage from septic tanks and drainage canals. In fact, the absence of microbial indicators does not generally imply that there is no contamination (Barret, *et al*., 1999). Ideally, wastewaters must be collected and treated to maintain a healthful living environment (Linsley, *et al.,* 1992). Non-monitoring of water quality may result to a deadly epidemic such as typhoid fever, a dangerous waterborne disease. The US Center for Disease Control and Prevention

 ISSN: 1656-0264

(CDC) projected that about 900,000 people got sick and 900 died because of waterborne diseases (McCarthy, 1998).

Argao, is a first class municipality with over 60,000 inhabitants who have been experiencing erratic water supply. This occurs, particularly during longer dry periods or even during weekends when people simultaneously turn on their faucets to wash clothes as among other uses. With growing demands for water, the local water system in the municipality is planning to expand its sources. For this reason, an evaluation on the physico-chemical properties of spring waters in Argao was necessary. To compliment this, a parallel investigation on the socio-environmental aspects of spring waters was also done. This paper focused on water and waste management of the communities surrounding the springs being sampled.

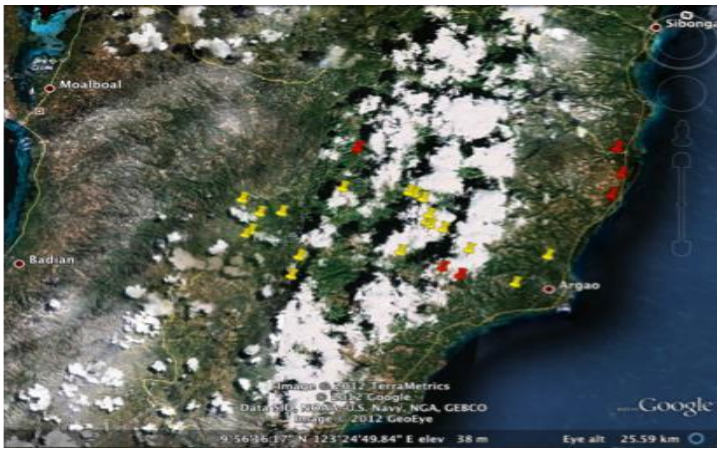

Figure1. Distribution of springs sampled in Argao, Cebu

MATERIALS AND METHODS

This paper complimented the study of the physico-chemical and biological characteristics of selected spring waters in Argao, Cebu, which was reported in a separate paper. Some questions for the interview were adopted from Opiniano (2008). With due consideration on the cost of water analyses, this paper focused only on the 25 spring waters being sampled. Quota sampling with a maximum of 10 households were interviewed to represent each spring. A total of 241 households were interviewed pertaining to the utilization of spring waters, waste generation and disposal and their perceptions on water and waste management. Physical observation on each spring was conducted to collect data that would supplement information gathered during the interviews. Qualitative information was used to supplement quantitative data in the discussion of results. Frequencies and percentages were generally used in presenting quantitative data although chi-square was used to determine if level of education among respondents were affected their perceptions.

The study site is categorized under climatic type III of the CORONA system of classification. Under this type, however, heaviest rainfall occurs from July to December while the least is usually in the months of March, April and May. The average annual rainfall in the study site was estimated to be 1,650 mm.

 ISSN: 1656-0264

Table 1. Profile of Springs

Name of Spring	Location	Coordinates	Elevation	Approximate HH using
Ka Luming (Ananamsi)	Butong, Argao	N9 54.434', E123 28.921'	682	40+-
Dalakit	Butong/Linut-od	N9 54.098', E123 29.276'	625	50+-
Apo spring	Calagasan	N9 54.184', E123 29.765'	408	10+
Balaas Spring	Balaas, Argao	N9 52.558', E123 29.157'	518	50+-
Ka Inong	Linut-od	N9 53.458', E123 29.058'	600	20+-
Sambilat Spring	Panadtaran	N9 53.686', E123 34.005'	148	50+-
Bulak spring	Canbantug	N9 52.383', E123 30.225'	543	50+
Ka Iran	Canbantug	N9 52.951', E123 30.307'	565	20+
Kilat spring	Tabayag	N9 53.430', E123 32.484'	222	80+-
NIA Bug-ot	Bug-ot, Argao	N9 52.906', E123 33.900'	120	50+-
Alawihaw spring	Bug-ot	N9 53.075', E123 33.491'	113	50+-
Canduran spring	Canduran, Lamacan	N9 52.830', E123 35.191'	10	93
Masulog spring	Masulog, Cansuje	N9 56.248', E123 31.111'	423	100+-
Kabungbungan spring	Kabungbongan, Cansuje	N9 55.060', E123 30.971'	565	30+-
Baki spring	Malacorong, Usmad	N9 55.165', E123 32.410'	290	12
Sandayong spring	Malacorong, Usmad	N9 55.144', E123 32.545'	262	6+
Balde spring	Malacorong, Usmad	N9 55.036', E123 32.757'	249	20+-
Matalaga spring	Usmad	N9 54.582', E123 32.959'	120	30+-
Banyo spring	Catang, Argao	N9 54.212', E123 33.335'	91	30+-
Pawa spring	Catang, Argao	N9 54.296', E123 33.029'	60	20+
Ulbuhan spring	Catang, Argao	N9 54.373', E123 32.927'	66	3+
Talaytay spring	Talaytay, Argao	N9 53.749', E123 35.795'	10	100+-
Linao spring	Bulasa, Argao	N9 55.769', E123 36.940'	2	100+
Arnis spring	Bulasa, Argao	N9 56.421', E123 37.049'	4	100+
Liki spring	Taloot, Argao	N9 57.172', E123 35.852'	5	200+

 ISSN: 1656-0264

RESULTS AND DISCUSSIONS

Utilization of Spring Waters

A total of 25 springs and spring communities located in 14 barangays from the coastal to the remote areas of the town up to 682 were included in the study. Commonly, the 241 households used spring waters for drinking, cooking, washing and bathing. People wash or take a bath either at the spring or at home because some of them have hoses that transport water to their respective houses. It was observed that eight (8) springs have hoses set to transport water to other areas (sitios) and closer to other households and schools, as well. It was also found out that 28 of the 241 household respondents boil their water before drinking. It was also learned that some households buy mineral water for drinking. Other than utilizing water for household purposes, nine (9) springs also support existing rice farms.

Waste Generation and Disposal

In terms of waste generation, results showed that kitchen waste, glass bottles, paper, garden waste (lawn trimmings), plastic bags, broken glasses, hard plastics, cartons/boxes, metals and pet wastes, comprised the top 10 wastes generated by households. The least were foils and batteries (Table 2). Data also showed that respondents have different ways of waste disposal.

As for kitchen wastes, common disposal methods were either fed to animals especially to dogs and cats or disposed outside through the sink, thrown in trashcans, in areas not commonly passed by people or in vacant lots/dumping areas. On the other hand, glass bottles, hard plastics and metals such as tin cans, as well as, electronic items were sold to buyers of junk and recyclable materials. Interestingly, junk buyers now go to remote mountain barangays due to various road networks. Such market encouraged people not to throw these materials. Moreover, these materials can be part again in the mainstream production as they are recycled. Paper, cartons/boxes, plastic bags and rubbers are commonly burned. Cartons and rubbers, usually old slippers, are usually used to produce fire for cooking particularly, during rainy days when firewood was moist and humid. It was also observed that cartons and plastic bags were being recycled.

A considerable number of households also burn garden waste although generally, these materials are just allowed to decompose in their backyard dumping area or applied to plants (e.g. bananas) as organic fertilizers.

Broken glasses are commonly buried or placed on holes or rock crevices so as not to pose risks of injuries. It was also observed that very few households are now using dry cell batteries even in the mountain barangays because they have shifted to electrical gadgets due to availability of electricity in the areas.

 ISSN: 1656-0264

Table 2. Types of Wastes and their Methods of Disposal

Disposal method	Types of wastes: Kitchen waste	Diapers	Glass bottles	Plastic bags	Hard plastics	broken glasses	Garden waste	Pet waste	Rubber	Cartons/boxes	Paper	Metals	Clothing	Foils	E-waste	Batteries
Burning	10	12	0	99	10	2	76	3	65	131	180	2	3	3	1	0
Composting	21	1	2	2	0	4	101	62	1	3	3	0	0	0	0	0
Burried/placed in holes or rock crevices	19	27	16	27	6	74	3	5	5	1	2	0	4	0	1	3
Placed in areas not commonly passed by people	35	12	21	17	5	45	10	9	11	11	8	3	4	6	6	7
Sold	0	0	142	22	142	29	0	0	3	19	4	158	2	2	22	4
Feed to animals	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anywhere	5	1	0	0	1	0	2	62	1	0	0	0	0	0	0	1
Dispose Outside/trash can segregated	37	4	6	7	0	8	1	1	2	2	1	0	1	0	0	1
"Tapukon"/placed in a sack	5	3	9	12	4	5	3	2	6	4	3	2	2	3	3	4
Junk	7	9	14	11	4	13	4	1	6	1	0	1	4	0	2	1
Drained in the sink	1	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0
Given to others	26	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Canal	0	0	0	0	1	0	0	0	1	1	1	0	30	0	3	1
Totals	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	219	69	210	197	173	180	200	147	101	173	202	166	50	14	49	22

Note: Some respondents gave multiple answers and others do not generate some of the wastes listed.

Perceptions on Water and Waste Management

Table 3 shows the perceptions of respondents on water and waste management. On statements directly related to water, results showed that majority of respondents agreed on all statements. Majority (96.68%) believed or agreed that their water in the spring should be shared. The statements "water should be saved and conserved"; "water should be made available to all at no/low cost" and that "faucets must be closed while brushing teeth" closely followed with 89.21, 87.55 and 85.48 percent, respectively.

Table 3. Perceptions on Water and Waste Management

Statements	Perceptions: Agree	%	Dis-agree	%	No idea	%	Total	%
(on water)								
Water is an unlimited resource.	197	81.74	40	16.60	4	1.66	241	100.00
Water (specifically freshwater) should be made available to all at no/low price.	211	87.55	20	8.30	10	4.15	241	100.00

 ISSN: 1656-0264

Clear, odorless water always indicates good quality.	173	71.78	57	23.65	11	4.56	241	100.00
Water should be saved or conserved.	215	89.21	25	10.37	1	0.41	241	100.00
Faucets must be closed while brushing teeth.	206	85.48	15	6.22	20	8.30	241	100.00
Rainwater should be collected for other water needs.	193	80.08	44	18.26	4	1.66	241	100.00
Water in your spring should be shared to other people	233	96.68	6	2.49	2	0.83	241	100.00
Water system should be established to bring spring waters to every household user.	185	76.76	39	16.18	17	7.05	241	100.00
Fees should be collected in bringing the spring water to your doors.	172	71.37	50	20.75	19	7.88	241	100.00
Clearing of vegetation near the spring can reduce its water flow.	173	71.78	61	25.31	7	2.90	241	100.00
(on waste management)								
Septic tanks can contaminate water sources	180	74.69	47	19.50	14	5.81	241	100.00
Placing of animals near the springs cannot contaminate the water.	116	48.13	119	49.38	6	2.49	241	100.00
The use of pesticides in farms will contaminate spring waters.	204	84.65	17	7.05	20	8.30	241	100.00
It is okay to throw plastics and other wastes in the spring vicinity after washing or bathing.	57	23.65	181	75.10	3	1.24	241	100.00
Dumping of wastes anywhere will contaminate water sources	224	92.95	13	5.39	4	1.66	241	100.00

Worth noting in the foregoing results was the belief that water is an unlimited resource. This response was greatly influenced by the abundance of water in their area. Many respondents in the course of the interview said "*we have been using water in the spring for a long, long time and there is still water until now*". This notion may make it difficult to convince people in the areas to conserve water especially that they enjoy it free or at a very minimal monthly due. Unless they encounter shortages, this notion will be difficult to change. Utilizing much water on the other hand, as long as it comes from springs, is not bad for the environment because springs are natural discharges in watersheds unlike the water that are pumped from the water table. If people will not use the water, this will just flow to creeks and to streams. Of key importance here is the protection of the watershed such as maintenance of sufficient vegetation and responsible disposal of wastes, among others. Excessive clearing of the land for agriculture and the use of fertilizers and pesticides can load sediments and other pollutants in springs and rivers (Corompido-de los Santos, 2000). Contrastingly, respondents agreed that "water should be saved and conserved, faucets be closed while brushing teeth and the collection of rainwater". The first two statements were also significantly correlated with the respondents education, an indication that the more educated they are, the more they likely have better understanding on saving and conserving water. On the other hand, with people agreeing that cutting trees near the springs will reduce water flow, it may be easier to convince them to plant trees in idle lots.

 ISSN: 1656-0264

With people generally agreeing to share their water to those in need, it is a good indication for LGUs i.e the barangays or the municipality to develop water system to bring water closer to a maximum number of households. On the other hand, authorities should consider sufficient water flow at 1 gal/minute to be worth developing (AGRI-FACTS, 2002). A number of respondents, however, were concerned with a higher monthly bill once a good water facility is established. A number of respondents too, who expressed their willingness to share their water emphasized that it should be in excess of what they need because from the 25 springs sampled nine (9) support an existing rice farm although eight (8) already have piping system that distribute water to other areas.

Another crucial factor that needs to be addressed is the peoples' belief that clear, odorless water always indicates good quality. This suggests the importance of information dissemination to inform people what is right or wrong regarding safe water, because being clear and odorless do not necessarily indicate that quality of water is good or that water is safe because of the many substances that are dissolved in it (Pinote, 2002). Bacteria and other water contaminants will not change the physical qualities of water. Data generated in this study show that 214 out of 241 households drink water from the spring and from them only 28 households boiled the water before drinking. Data also showed that 26 households had members who suffered from diarrhea, nine (9) cases from skin disease and two (2) from typhoid fever in the last three (3) years reckoning from the survey period. Further inquiry revealed that from such ailments, 20 were attributed to water with two (2) specific cases of amoeba. It was found out that the local health unit of the municipality conducted monitoring on water quality however, the frequency of monitoring and on what parameters were monitored was not clear.

Having agreed on the statement "fees should be collected in bringing spring waters to the households" presents an avenue for development of water systems utilizing the spring waters. Thorough consultation however, was necessary especially hearing the sides of those who were currently utilizing the water as several respondents expressed that they were willing to share only the excess water. Being positively correlated to respondents' education also suggests that the highly educated respondents are, the more likely they express willingness to share their water resources.

As to the perceptions on waste management, results showed that respondents agreed on three (3) out of five (5) statements. These are "dumping of wastes anywhere will contaminate water sources" with 92.95 percent followed by "use of pesticides in farms will contaminate spring waters" (84.65) and "septic tanks can contaminate water sources" with 74.69). On the other hand, they disagreed on the statement that "it is okay to throw plastics and other wastes in the spring vicinity after washing or bathing" with 75.10 percent while respondents were generally confused whether or not "placing of animals near the springs cannot contaminate the water" with 48.13 (agree) against 49.38 (disagree).

Perceptions on waste management, imply that communities were not knowledgeable enough on how to maintain the cleanliness of their spring water. Their perceptions revealed some contradictions. While believing that throwing of wastes anywhere can contaminate their water,

 ISSN: 1656-0264

nearly half of them believed that placing of animals near spring areas will not contaminate their water. As observed in the field, animals (goats, cows and carabaos) were placed near four (4) of the 25 springs included in the study as shown in Figure 2. Further, their belief that "it is **not** okay to throw plastics and other wastes in the spring vicinity after washing or bathing" contradicts with what were observed in the springs or washing areas. It was observed that detergent wrappers scatter around in 15 of the springs observed as shown in (Figure 3). It appears that people do not practiced what they believe will cause threat to their water and to their health in general.

Figure 2. Animals like cows are placed near some spring areas such as in Kabongbongan insprings

Figure 3. Plastic wastes mostly detergent wrap pers and empty sachets of shampoo scatter

CONCLUSION

1. Spring waters in Argao are vital to surrounding communities as they provide water essential both for domestic and farm use.

2. Kitchen waste, glass bottles, paper, garden waste (lawn trimmings), plastic bags, broken glasses, hard plastics, cartons/boxes, metals and pet wastes, comprised the top 10 wastes generated by households. Disposal methods depend on the nature of the waste; however, materials that are reusable are kept for future use and those that are recyclable are sold to junk buyers.

3. Respondents' level of education affects their perceptions. It also appears that respondents do not practice what they believed especially in the disposal of waste in the spring vicinity.

RECOMMENDATIONS

Spring waters should be regularly monitored particularly, its biological characteristics to safeguard people from water-borne diseases.

1. Proper information should be disseminated to the public regarding water safety.

 ISSN: 1656-0264

2. Feasibility studies on establishment of water system facilities should be carefully made in order not to conflict with the existing water use.

ACKNOWLEDGMENT

The authors would like to express their gratitude to the CTU Research & Development Office and the local government of Argao headed by Hon. Mayor Edsel A. Galeos for funding the project.

LITERATURE CITED

AGRI-FACTS. (2002). spring development. A practical information for Alberta's Agriculture Industry. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex4595/$file/716a15.pdf?OpenElement

Barret, M., Nalubega, M. and Pedley, S. (1999). On-site sanitation and urban aquifer systems in Uganda. Waterlines: 17:4 p.10.

Corrompido-de los Santos, I. (2000). Assessment of water quality in Subangdaku River, Sogod, Southern Leyte: Basis for a proposed water quality management.

Heathcote, I.W. (2009). Integrated watershed management: Principles and practice. 2nd Edition. John Wiley and Sons, Inc.

Jennings, G.D. (1996). Protecting water supply springs. Water Quality and Waste Management. North Carolina Cooperative Extension Service. http://www.bae.ncsu.edu/programs/extension/publicat/wqwm/ag473-15.html

Pinote, J.P. (2003). Quality of water resources in 10 barangays of Argao, Cebu. Tropical Technology Journal 6:1

Linsley, R.K., Franzini, J.B., Freyberg, D.L. and Tchobanoglous, G. (1992). Water resources engineering 4th Edition. McGraw-Hill, Inc.

McCarthy, L.F. (1998). Family Life. p. 40-43.

Opiniano, R.P. (2008). Household solid waste management in Mandaue City, Philippines: Policy alternatives based from the Japanese experience. Master Thesis. International Christian University.