

The Effect of Land Use on Water Quality of Mountain Water Tap in Kolong Sub-District Si Sakhon District Narathiwat Province, South Thailand

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Abstract. The objectives of this research were studied land use, physical quality of mountain tap water)MTW(, to compare the physical quality, the relationship of the physical quality of MTW, to know the problem conditions. Collecting water samples of 12 stations in MTW. The results showed. 1(The water source was a forest area the weir point was an agriculture area the clarifier was a habitation and an agriculture area the water distribution point was a habitation area. 2(The average of turbidity was 3.12 NTU, temperature was 26.3 Celsius, suspended sediment was 0.012 mg/L, pH was 7.10 and electric conductivity was 31.1 $\mu\text{s}/\text{cm}$. 3(The turbidity at the clarifier point was higher than the standard. 4(The turbidity related to the temperature and suspended sediment) p -value < 0.05(.

1. Introduction

The amount of water in the world was constant according to the water cycle. But the increase in population every year thus increasing the demand for water for consumption and human consumption humans needed to search for good water sources and more suitable for consumption. In the production of clean water, the main principle was to be clean, safe in terms of health must give the water a pleasant drink to use and the design of the production system must be the most economical process, both in construction and operating expenses. The clean water used for consumption was tap water itself. The water supply system was an important policy of many governments over the years. It has dedicated a very high budget to provide clean water for drinking - use people in every region have enough clean drinking water throughout the year.]1[From the number of tap water users in the year 2006 was 2,479,776 persons. The normal rate of water users was increased by 8.39 percent in 2007, increasing to 2,628,470 persons. The normal water users were increase 6.85 percent in 2008, increasing to 2,771,418 persons. The increasing normal water was users by 6.57 percent in 2009, increasing to 2,935,356 persons. The normal water user increased rate was 6.65 percent and in 2010 the number is 3,106,914. The rate of increasing users was normal water 6.75%. Si Sakhon district was one of 13 districts of Narathiwat Province with an area of 500.1 square kilometers, covers an area of 6 sub-districts, 35 villages, a total of 456 households, with a population of 34,533. Most of the

area was dense forest, and the complex mountains were the boundary of the Balahala forest. There was an eastern plateau in Si Banphot sub-district. Choeng Khiri sub-district some parts consisted of a lot of forest areas. There was the Saiburi River as the main river, that flowing through the middle of the district area along the line with the river's line at Sukhirin pass the district to suggest Srisakorn district, the latest in Sai Buri]2[. Si Sakhon district had a tropical monsoon climate, divided into 2 seasons: rainy season with two rainy seasons: May to October. And from November to January summer was between February and April. Si Sakhon was the populated area and had a large number of residential settlements. Thus resulting in the demand for water for consumption daily consumption was quite high. Si Sakhon district had organized a water production system. Which was in charge of the Provincial Waterworks Authority Region 5, Rueso Branch, using water from the Saiburi river as a raw water source. The use of water for consumption, whether it is drinking or cooking food Most people in Si Sakhon district will use the water obtained from the water supply. In the remote areas, Kalong sub-district had a complex mountainous terrain. Most of the houses are were located along the river, 10 kilometers away from the district of Si Sakhon will use the mountain water supply for consumption. It was created by Kalong sub-district self-development estate in 1991, due to the unrest of the area and the travel route. It was not conducive to access making the quality control of the mountain water supply low causing the mountain water supply to be of low quality as well which directly affects the health of people in areas that use tap water. Therefore, was another reason that causes people who consume mountain water supply to have more sickness from the statistics of gallstones of people in Kalong Subdistrict in 2011, there were 11 people, 3 males and 8 females.]3[this was importance, the study the effect of land use on water quality of mountain water tap in Kolong sub-district Si Sakhon district Narathiwat province , south Thailand therefore was important And for the purpose of following up on water quality monitoring.

2. Methods

This was study water quality for a period of 7 months from June 2012 to December 2012. Water sample stations were throughout the mountain water production process in Kalong sub-district, Si Sakhon district, Narathiwat Province. Which was specifies 12 water sampling stations, including (1) upstream sources, 3 stations (2) 3 water dams (3) 3 water reservoirs and (4) 3 water distribution stations. Research tools were characteristics field sampling tool, water sampler 1000 ml, HDPE water sample bottle 350 ml, ice crate for ice)To control water sample temperature(. Field analysis was instrument conductivity meter)measuring conductivity(turbidity meter)turbidity measurement(, thermometer)Temperature measurement(, pH-meter)measure acidity - alkaline(. Data collection survey of land use was analysed, land use study of Kalong sub-district, Si Sakhon district, Narathiwat province by studying satellite images. And exploring the area selected of water sampling areas study the physical water quality of the mountain water supply in Kalong sub-district, Si Sakhon district, Narathiwat province. Water sample study stations throughout the mountain water production process in Kalong sub-district, Si Sakhon district, Narathiwat province had set a total of 12 stations)1(upstream sources, 3 stations)2(3 water dams)3(3 water reservoirs and)4(3 water distribution points. The specifying was a collection point for purposive sampling. The discussion of the meeting group for brainstorming was focused group discussion technique will discuss the whole group 2 times, the first time was before the mountain tap water quality examination, in that group discussion. In order to it was known the behaviour of water consumption household consumption including problems and obstacles in the use of water. The second time was after the quality of the tap water. There were 4 participants in this group, including 4 community leaders, using a random sampling method. Representative of Kalong sub-district administrative organization, 6 people was used a random sampling method and representatives of family leaders, 8 people, using random or intentional random methods total 18 participants in the group discussion. Before the second group discussed, will return the information obtained from the mountain water quality analysis. Let the group chat first, and then

proceeded to search for ways to manage the mountain water supply system. Data analysis methods of land use data analysis, land use data analysis in Kalong Sub-district, Si Sakhon District, Narathiwat province it was affects water quality by studying satellite images. And exploring the area which classified the types of land use according to the actual condition into 4 types, namely category 1, forest land use, type 2, land use type, agricultural type 3, land use type, residential type and type 4, land use residential and agricultural types. Water quality analysis method Analyse physical water quality in both the field and in the laboratory. It was analysed the relationship between water quality and season and water sampling stations, physical water quality index of each mountain water production process that was using statistical correlation theory and analysing the relationship between water quality and land use in Kalong sub-district, Sonsakhon District, Narathiwat province by using statistical analysis and descriptive analysis. Statistics used in data analysis study of physical water quality such as turbidity, sediment suspended, temperature, acidity and alkalinity. It was electrical conductivity by using average statistics \bar{x} and standard deviation)Standard Deviation; SD(study the difference of rainfall and water quality by using the hypothesis test t-test to study the difference of land use and water quality by using one-way ANOVA; F-test(. It was study the relationship between physical water quality index of each process of mountain water production by using coefficient statistics Pearson correlation.

3. Results and Discussion

Geography of the area in Kalong sub-district, Si Sakhon district, Narathiwat province was studied the water quality study station at the watershed. To the water quality study station at the water supply point was both forest community agriculture and 4 types of land use types can be summarized as follows: type 1 was the use of forest land or as an area no human activities or little activity in this area there will be a lot of forest. According to the study, the area of the water quality study station provided in category 1 was the water quality study station S01 - S03, on the ridge of the degree. It was a mountain that separates Srisakhon district Narathiwat province and Bannang Sata district, Yala province, was a dense forest with no activity for land use. Because it was a high ground far from houses. The journey was difficult because he was very steep. Type 2 was the use of agricultural land as an area that was used only in agriculture without community settlement or housing. From the study, it was found that the use of land in agriculture was cultivation, which includes both horticultural and agronomic plants, including rubber plantations, fruit orchards such as rambutan. The crop was corn and cassava the area in category 2 was the water quality study station S04 - S06. type 3. The use of residential land type was an area that was used for community settlement or housing. There were other activities that affects the quality of water sources due to occupation which the water quality study station provided in category 3 was the water quality study station S10 - S12, which was the area of the water distribution point. Category 4 land use, residential and agricultural lands were areas that were used together both in the construction of houses and agriculture as well, the areas in this category include the S07 - S09 water quality study station, pond area.

Table 6 Average and standard deviation of physical water quality Classified by water sample study station

Water Sample Study Station	Mean and standard deviation of physical water quality									
	Turbidity		temperature		Suspended sediment		Acidity - alkalinity		Electrical conductivity	
	\bar{X}	S.D.	\bar{X}	S.D.	\bar{X}	S.D.	\bar{X}	S.D.	\bar{X}	S.D.
S01	2.03	0.73	26.9	2.44	0.013	0.011	7.13	0.04	30.0	1.66
S02	2.13	0.61	26.4	1.44	0.013	0.010	7.06	0.01	30.2	1.32
S03	2.14	0.88	26.5	1.52	0.010	0.007	7.11	0.01	29.9	4.28
S04	2.57	1.09	25.0	0.45	0.014	0.011	7.18	0.11	30.7	0.37

S05	2.73	0.80	25.1	0.52	0.018	0.018	7.07	0.02	31.5	0.47
S06	2.62	0.77	25.8	0.99	0.011	0.006	7.11	0.02	31.2	0.09
S07	5.45	2.39	27.0	1.95	0.015	0.009	7.06	0.02	33.0	0.58
S08	5.71	2.32	26.6	1.38	0.009	0.006	7.08	0.03	34.1	0.75
S09	5.83	2.30	27.0	2.13	0.012	0.007	7.08	0.01	34.2	0.82
S10	2.03	0.46	26.7	0.97	0.010	0.006	7.09	0.02	29.0	1.86
S11	2.08	0.49	26.0	1.59	0.013	0.010	7.09	0.02	29.7	1.81
S12	2.15	0.44	26.3	1.36	0.010	0.007	7.11	0.01	29.7	1.48
Total	3.12	0.99	26.3	1.33	0.012	0.006	7.10	0.01	31.1	0.35

The results of the hypothesis testing of physical water quality differences with were a range of rainfall and land use the results of the comparison of physical water quality by the amount of rainfall found. The suspended sediment had an average during the low rainfall period, lower than the average rainfall. Acidity the average value in the rainy season was the same as the average rainfall period. The average electrical conductivity in the rainfall period was the same as the average rainfall. When tested using the t-test statistic, it was found that in all 3 parameters, the amount of rainfall resulted in a difference in the quality of the tap water. In accordance with [4]. Who studied water quality and nutrient increase in rivers from seasonal changes in Ibaran Nigeria found that the amount of organisms in the water depends on the pH value. Which the pH value was not related to the season and the flow of water but will change according to the watershed, when the pH value was lower than 4.5, it affects the aquatic animals because the amount of dissolving of heavy metals will increase Monitoring of various activities May human beings help to better control the pH change. The turbidity, the average value in the range of rainfall was lower than the average rainfall period, the temperature was average during the rainy season, slightly higher than the average rainfall. When tested using the t-test statistic, it was found that the two parameters were different in the quality of the tap water in each rainy season with statistical significance at the level of 0.05, consistent with the research of [5]. Studying the relationship between water quality and large invertebrates the study indicated that Water quality in the Bangpakong river was seasonal. Most water quality was high in the summer (March and April), because there was less water content, greater intensity of substances in the water and contaminated with rainwater during the rainy season, early rainy season (May) and late winter (January and February), the volume was reduced from the normal water season. Most water quality was in the water quality criteria. In the water source category 3, consistent with the research of [6], who was studied the change transforms in the tidal cycle of currents temperature and salinity of sea water Laem Thaen area Chon Buri province during the 2 monsoon season with the objective of studying the changes in temperature, salinity and currents according to the tidal cycle at Laem Thaen. Chonburi province. The study indicated that the average temperature of sea water was high (30.41 ± 0.26 degrees Celsius) in sharp months. It was the summer season of Thailand and has a low value (24.95 ± 0.24 degrees Celsius) in December which corresponds to the winter, corresponds to the research of Chandigarh Gapikar and faculty (Gangadhar B. Kapsikar et al., 2011: 12-14). Study the physical and chemical water quality of the Kali River, carvard province which won the west coast of India by collecting data from October 2009 to March 2010, the study found that the atmospheric temperature was in the range of 12.7 to 25.3 degrees Celsius. The water temperature was in the range of 11.3 to 19.6 degrees Celsius. October to January. The results of the comparison of physical water quality classified by land use found that the suspended sediment was the highest in the area of land use. Type 2 agriculture had an average value of 0.014 mg / L, the lowest in the area of land use category, with an average value of 0.011 mg / L when tested by using One Way ANOVA (F - test) statistics. It was found that turbidity caused the quality of the tap water to be mountainous with no

difference in land use. The highest turbidity in the area of land used category 4, housing and agriculture had the lowest 5.66 NTU, the lowest in the area of land use category 3, housing with an average of 2.09 NTU, the highest temperature in the area of use. Type 4 land was benefits, housing and agriculture, with an average of 26.9 degree Celsius, the lowest in the land use area. Category 2 Agriculture had a value. 25.3 degree Celsius the highest acid-alkalinity in the land use area, Category 2 The agriculture has an average of 7.12, the lowest in the area of land use category 4, housing and agriculture, with an average of 7.07, the highest conductivity in The area of land use category 4, housing and agriculture, has an average of 33.8 $\mu\text{s} / \text{cm}$, the lowest in the area of land use category 3. With an average of 29.5 $\mu\text{s} / \text{cm}$ when tested by using One Way ANOVA (F - test) statistics. It was found that all 4 parameters made the quality of the tap water to be different according to the land use, with statistical significance at the level of 0.05. Consistent with the research of Oke Adeemio and the faculty [4]. Food in the river from seasonal changes in Ibaran Nigeria it was found that suspended sediment and water plants were increased due to the influence of increased oxygen content. The amount of phosphate and nitrate was related to land use, especially animal and agricultural farming, and will be high during the rainy season because there is leaching of soil, sediment, food nutrients, dead plants and animals, dead at various sizes in to the river causing the eutrophication phenomenon, resulting in the amount of dissolved oxygen.

4. Conclusion

This research was to study land use, physical quality of mountain tap water, to compare the physical quality, the relations of the physical quality of mountain tap water, to know the problem conditions. It was collecting water samples of 12 stations in mountain tap water. The results of this research had showed that the water source was a forest area, the weir point was an agriculture area, the clarifier was a habitation and an agriculture area, the water distribution point was a habitation area. The average of turbidity was 3.12 NTU, temperature was 26.3 Celsius, suspended sediment was 0.012 mg/L, pH was 7.10 and electric conductivity was 31.1 $\mu\text{s}/\text{cm}$. The turbidity at the clarifier point was higher than the standard 4(the turbidity related to the temperature and suspended sediment) p -value < 0.05(. In this study, the information on how to manage land use does not affect the overall quality of the environment. There must be a plan to use land that is correct according to the academic principles and can be applied in the area when with the changing situation.

5. References

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