Socialization of Groundwater Treatment with Modified IPA Prototype in Doyomulyo, Lamongan District

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Abstract

Doyomulyo is a village located in Lamongan residents , most of the population's livelihood as a farmer. The village is also known have a source of groundwater. Even during a drought these sources remain abundant. Doyomulyo Village is indeed included in the drought-prone map during the rainy season like now. However, Donomulyo Village still has a source of raw water that is used for daily needs. One of them is near the Donomulyo Village hall mosque, but the water source is adjacent to the mosque's bathroom septic tank. So the laboratory results show the results of DO, TDS, COD, BOD, Total Coliform and E. Coli which do not meet the standards. And there is the desire of the people of Doyomulyo Village, Kembangbahu District, Lamongan Regency to produce groundwater into bottled drinking water (AMDK). So that Unisla through community service activities wants to improve the quality of Doyomulya village water sources so that they become drinking water that is ready for consumption. In Community Service (PKM) activities, the team used a groundwater treatment method with a modified IPAM prototype. Based on the results of groundwater characteristics obtained, the design of equipment for the drinking water treatment unit in Doyomulyo, Lamongan Regency requires that the filter media for the filter tube are activated carbon, silica sand and manganese zeolite used to remove dissolved particles above 50 µ in size and can also reduce concentration of iron and organic matter contained. Community Service Program (PKM) activities by FIKES UNISLA in Doyomulya Village have resulted in a planning program for drinking water treatment to increase the demand for drinking water for residents of Doyomulya Village and its surroundings.

Keywords: Socialization, groundwater quality, IPAM modified prototype

INTRODUCTION

The need for water in Indonesia is urgently needed, including in the Lamongan area where most areas lack water. Therefore, the residents of Doyomulyo village took the initiative to produce drinking water for the needs of their residents. Doyomulyo Village has an abundant quantity of groundwater sources. From the results of an initial survey by the Drinking Water Treatment Sanitation implementation team to the location of groundwater from the village of Doyomulyo, the water from the drilled wells found water to be yellow, brackish and smelly. And laboratory tests on water samples from Doyomulyo Village showed DO, TDS, COD, BOD, Total Coliform and E. Coli did not meet the requirements for DO, TDS, COD, BOD, Total Coliform and E. Coli, which were quite high because they were close to a pollutant source in the form of septick. tanks close to groundwater sources.

It should be noted that water that is suitable for use and consumption must at least pass the water standard test, with physics, chemistry and biology standards. These standards have been set for our own benefit. One of the factors that affect water quality is the selection of sources of origin of water used in daily activities. The infrastructure needed for water for the daily needs of the Doyomulyo residents is to use water from ground wells with a drilling depth of around 5-6 meters in the ground. Considering that the raw water source for Doyomulyo Village is close to the MCK, it is only 1.5 km from the Septic Tank and, it is certain that the water obtained is not good and contains E. Coli (Achmad, dkk. 2020).

The distance between the well and the septic tank must be considered and given a sufficient distance to prevent contamination of well water by the septic tank. Pollution of well water can occur when the liquid or water contained in the septic tank seeps into the ground until it reaches the groundwater well. Well water contaminated with faeces and urine, apart from containing E. Coli, can also contain other bacteria, such as Salmonella and Shigella. These bacteria can cause serious health problems if consumed repeatedly. Finally, the Faculty of Health Sciences, majoring in Environmental Health, UNISLA wants to help Doyomulyo residents in making drinking water treatment that is healthy and good for the health of the Doyomulyo people. By using the Modified sciences prototype for simple drinking water treatment, it is hoped that it will be able to produce better drinking water needs than before.

Because as we know drinking water is a basic need in life, healthy water creates a healthy body and environment. However, it is very unfortunate that access to drinking water that is healthy and suitable for consumption is still not accessible to everyone. To the extent that many of them have to be forced to consume unfit water in order to survive.

METHOD

The stages of community service as shown in figure 1.
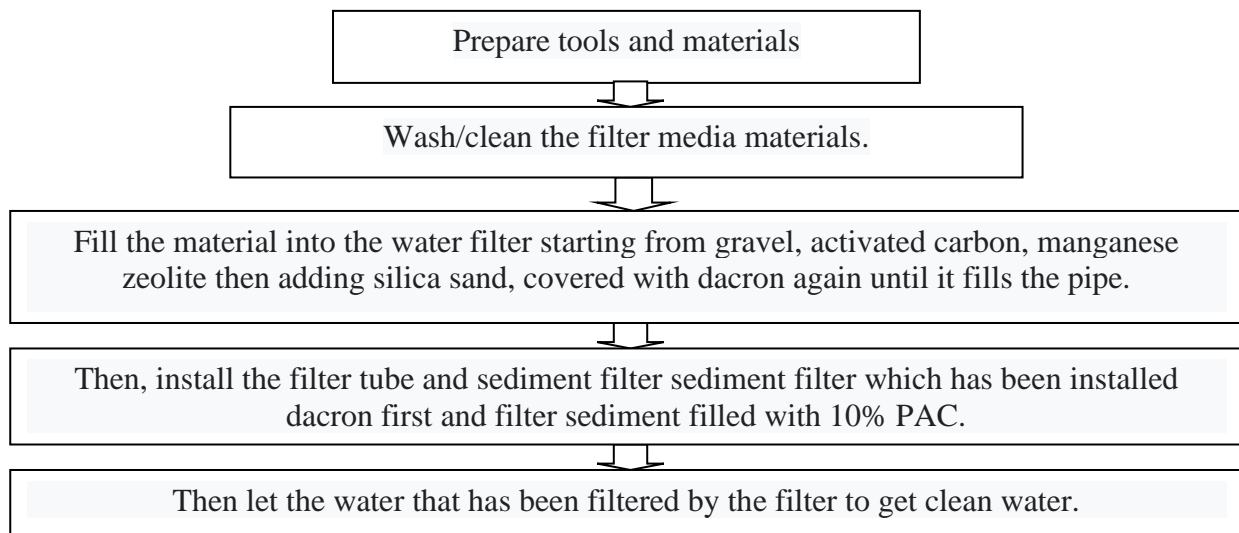
Figure 1. Community service activities

The community service activity "Socialization of Groundwater Treatment (Bore Wells) for the Production of Bottled Water with a Modified IPAM Prototype in Doyomulyo Village, Lamongan Regency" was held on Monday, August 8 2022 at the Doyomulyo Village office, Lamongan Regency, (Novia, 2019). East Java Province. The activities carried out included KKN, socialization of groundwater treatment (drilling wells) and signing of cooperation (MOU) (Iqbal, dkk. 2022).

Doyomulyo Village is one of the villages in Kembangbahu District, Lamongan Regency which is still far from urban areas. In this village there are several micro-scale farming, animal husbandry and household businesses that have prospects for development. For drinking water needs, there are usually residents who sell water in gallons. The process of drinking water treatment is carried out using a water tube filtration device and a water filter sediment. For the filter tube using media in the form of gravel, activated carbon, zeolite, silica sand and dacron. And for the sediment filter itself using dacron and PAC (Poly Aluminum Chloride) (Fitriyah, dkk. 2020).

Based on laboratory results, the results of Doyomulyo Water samples did not meet the water quality requirements in DO, Turbidity (NTU), COD, BOD, Total Coliform and E. Coli according to Permenkes No. 32 of 2017 concerning Sanitation Hygiene Water Quality

Standards, Permenkes 492 of 2010 concerning Drinking Water Quality Requirements, PP RI No. 22 of 2001 concerning the implementation of Environmental Protection and Management (Jannah, 2019).

There are six parameters out of eleven parameters tested which failed. This means that the majority of the parameters tested from the Doyomulyo water sample did not pass the requirements. These parameters are dissolved oxygen (DO) (mg/L) with a standard value of 6 mg/L and a test result of 2.4 mg/L, followed by TDS (mg/L) with a standard value of 500 mg/L and a test result of 812 mg/L, then COD (mg/L) with a standard value of 10 mg/L and a test result of 541 mg/L, followed by BOD (mg/L) with a standard value of 2 mg/L and a test result of 134 mg/L, then total coliform (CFU/100mL) with a standard value of 50 and a test result of 300, ending with E.Coli (CFU/100mL) with a standard value of 0 and a test result of 125.

While the rest of the other parameters are parameters that are declared to meet the requirements. Of the eleven trial parameters, only five of them passed the trial. The parameters that meet the requirements are temperature (°C) with a test result of 22.8 °C, then turbidity (NTU) with a standard value of 5 and a test result of 0.05, then pH (mg/L) with a standard value of 6, 5-8.5 mg/L and the test result is 8.1 mg/L, followed by nitrate (mg/L) with a standard value of 50 mg/L and the test result is 32.0 mg/L, ending with iron (mg/L) which has a standard value of 0.3 mg/L and the test result is 0.00 mg/L.

Combined drinking water treatment is a combination of drinking water treatment units starting from the reservoir (water storage area) to the filter tube (clearing filter) and then channeling it to the sediment filter (water sterilizer). This combined drinking water treatment uses a raw water source that will use clean water that has been treated chemically (alum, chlorine or PAC) drinking water with the aim that the raw water used meets the requirements for clean water quality and is suitable for consumption. After everything is finished, then all the drinking water treatment units are combined and produce quality drinking water (Kristianto, 2016).

RESULTS

After receiving theoretical training in class through tutorials, KKN students and Doyomulyo residents already know the types of raw water sources such as groundwater and understand simple water treatment. Furthermore, based on the type of raw water they already know about the characteristics of water and water quality, so that Doyomulyo residents understand and understand how adequate water quality is for drinking water. Armed with this knowledge, they already know the quality of water according to its use so they know how to manage water properly so that water is valuable and plays an important role in their daily survival. In the water management material, the residents of Donomulyo Village will also be given knowledge about the types of water treatment methods including physical and chemical treatment. Each of these water treatment methods they are familiar with the types of equipment supporting the process. So that drinking water treatment is able to describe the quality of the resulting water that will be used and it is hoped that they can choose the type of equipment and process that is in accordance with the characteristics and quality of the raw water to be treated (Syafalni dan Pujiindayati 2015).

Based on the results of groundwater characterization carried out, it was found that the quality of groundwater available in Doyomulyo was slightly yellow, temperature 22.8 oC, oxygen 2.4 mg/l, turbidity 0.05 NTU, TDS 812 mg/L, nitrate 32, 0 mg/L, iron content (Fe) 0.3 mg/L, COD 5.1 mg/L, BOD 134 mg/L, Total Coliform 300 CFU/100 mL, E. Coli 125 CFU/100 mL. The test was carried out at the Environmental Health laboratory at the Islamic University of Lamongan. Based on the results of groundwater characteristics obtained, the design of equipment for the drinking water treatment unit in Doyomulyo, Lamongan Regency requires that the filter media for the filter tube are activated carbon, silica sand and manganese zeolite

used to remove dissolved particles above 50 μ in size and can also reduce concentration of iron and organic matter contained. Activated carbon media is used to absorb odors and colors are used for dissolved metal effects. Cation resin filter media is used to bind the salt content that causes the groundwater to taste brackish. While the series of equipment used in the drinking water treatment unit is shown in figure 1 below (Prasetya dan Saptomo, 2018).

Figure 2. Design of AMDK Donomulyo show to audiences

DISCUSSION

This community service activity was carried out at the UNISLA Environmental Health Lecturer Team. Some of the methods implemented by the team implementing community service activities, namely: socialization of debriefing on water treatment materials, including types of raw water sources, characteristics and quality of water and simple drinking water treatment using Modified IPAM Prototypes. The following is a picture of the Modified IPAM Prototype simple drinking water treatment system. (Fadhilah, dkk. 2019).

Clean water treatment is a system that is used to treat water of poor quality in order to get the desired/determined quality of water for further use according to the desired results. The clean water treatment process system used is highly dependent on the quality of the available raw water. The quality of groundwater as raw water is very different from one region to another and it all depends on the topology of each area. Some general methods that can be used as a reference for treating groundwater into clean water are as follows: 1. The groundwater in Doyomulyo village has low DO levels, so a tool such as an aerator must be provided to function as aeration (addition of oxygen to the water). 2. Groundwater in Doyomulyo Village has a high TDS level and can be removed by increasing the DO level itself, because high DO levels have a correlation relationship between TDS and DO which can indicate that water contains high dissolved solids (TDS) which will cause a low DO value (TDS > DO), but with a high oxygen content in water can reduce the TDS content to be lower (DO > TDS), High dissolved solids water (TDS) does not cause health risks, but can cause aesthetic problems (water is not clear). 3. Donomulyo Village well water contains high levels of COD and BOD and the factors that affect COD are dissolved oxygen, organic matter and other pollutant sources. The solubility of oxygen in water depends on the temperature, the pressure of oxygen in the atmosphere, and the salt content in the water. So, it requires filter media materials in the form of hydrogen peroxide, chlorine, and ozone to reduce COD levels in groundwater.

BOD is an approximate measurement of the amount of biochemicals that are degraded in waters. It is defined as the amount of oxygen required by aerobic micro-organisms to oxidize it to inorganic substances. And in addition, Cation Resin is also needed so that the water does not taste brackish. A high BOD value indicates low dissolved oxygen content in the

waters so that it can cause death in fish due to lack of oxygen (anoxia) (Jones in Salmin 2005). The BOD value is influenced by the amount of Total Suspended Solid (TSS) and the organic matter present in the water. The COD value is the total of TSS impurities, organic matter, low-valent minerals, added to chemicals that consume oxygen (Nurbana, 2015). The lower the BOD, the better the water quality or the cleaner the water. COD (Chemical Oxygen Demand) is the amount of oxygen needed to decompose inorganic pollutant substances (pollutants). Just like BOD, the lower the COD the better the water quality or the cleaner the water. Meanwhile, the higher the BOD and COD values, the worse the quality of the waste water (soil) is.

CONCLUSIONS AND RECOMMENDATIONS

Community Service Program (PKM) activities by Health Faculty of UNISLA in Doyomulya Village have resulted in a planning program for drinking water treatment, in order to increase the demand for drinking water for residents of Doyomulya Village and its surroundings. For the problem of polluted groundwater sources, it is hoped that the residents of Doyomulyo will close the septic tank and then move the drain directly to the ditch / to another place that is more sanitary. To ensure that the water from the clean water treatment is safe for consumption, it is hoped that a simple direct trial will then retest the results of the trial. (Purwoto dan Sutrisno, 2016)

It is hoped that with the success of this PKM activity, the residents of Doyomulyo Village can plan and make their own bottled drinking water production to meet drinking water needs in Doyomulyo village, Kembangbahu Lamongan District. The attention of village officials and the community is given in the form of supervision and attention to the need for drinking water management costs. As well as the Doyomulyo Village participating in carrying out maintenance of AMDK processing equipment to maintain the quality of the water produced will continue well.

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APPENDIX

Figure 3. Purchase and installation of water filters and sediment filters

Figure 4. Socialization of Groundwater Treatment with Modified IPA Prototype

Figure 5. MOU signing