Application Of Appropriate Technology Ccbn5651 For Clean Water Supply Of Peat Regional Communities Sungai Gelam District, Muaro Jambi

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Abstract. Clean water is a basic need that must be met, there are still many people who experience difficulties with clean water, especially in lowland areas, peatlands. In Jambi Province, people living in Gambut Jaya Village always experience difficulties and clean water crisis, especially during the dry season. Sources of peat water are quite abundant and abundant, but cannot be used as a source of clean water, because the quality of peat water is very poor and unfit for consumption. One solution that can be done is to implement peat water treatment technology, namely CCBN5651 Technology. The activity was carried out in the community settlement of Gambut Jaya Village, approximately 90 km from the Jambi University Campus. The form of activity is an initial analysis of the condition of peat water to be treated (physical, chemical and biological parameters), designing two peat water treatment units for two community groups. Then install the installation of piping tools, procure and manufacture CCBN5651 powder, then carry out peat water treatment, test the quality of clean water produced and finally train and make SOPs for the application of CCBN5651 Appropriate Technology. The results of the activity are very beneficial for the community, two units of peat water treatment installations (PWT CCBN5651) have been built in the location of hamlet 1 and hamlet 2, Gambut Jaya Village, Sungai Gelam District, Muara Jambi Regency. Each installation was built with a size of 4.8 m x 2.5 m (location 1) and a size of 5 m x 2.5 m (site 2). Each treatment unit can produce 20,000 liters of clean water for each treatment, one day it can be processed 3-4 times. Thus the clean water needs of rural communities can be met.

Keywords: Application, Appropriate Technology, peat water, CCBN5651, Gambut Jaya

1 INTRODUCTION

Jambi Province is an area that has the third largest peatland on the island of Sumatra. The area of peat land in Jambi Province reaches 736,227.20 ha, or about 14% of the total area of Jambi Province, which is spread over 6 districts, namely Tanjung Jabung Timur covering an area of 311,992.10 ha; Muaro Jambi covering an area of 229,703.90 ha; Tanjung Jabung Barat covering an area of 154,598 ha; Sarolangun covering an area of 33,294.20 ha; Merangin covering an area of 5,809.80 ha; and Tebo Regency covering an area of 829.20 ha http://repository.unj.ac.id/2635/1/BAB%201-V.pdf.

The peat swamp area has peat characteristics. The peat will pollute the surface water in the area. Pollution caused by peat is increased levels of dyes, organic substances, and low pH. The low pH of the water will cause the mobilisation of metal ions to be faster, thus causing the heavy metal content to also increase. The high content of heavy metals in water will cause various health problems such as cancer, nausea, dizziness, skin allergies, digestive disorders and cause death (Goltz and Barnwal, 2018; Kim et al., 2007; Martin and Griswold, 2009; Pullammanappallil et al., 2015).

Gambut Jaya Village is located in Sungai Gelam District, Muara Jambi Regency, with

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an area of 19.67 km. The distance between Peat Jaya Village and Jambi City is about 90 km, with a travel time of approximately 2 hours. There are 400 households totaling 1600 people.The village of Gambut Jaya has not been served by PDAM because the location is quite far and to install the PDAM requires a large amount of money. In addition to the remote location of the area, the locations of the people's houses are far from each other. Some of the people of Gambut Jaya village still use peat water to meet their daily needs; some use well water, although it still smells and has a reddish yellow color. Conditions for clean water to be used must meet the requirements (according to the Regulation of the Minister of Health of the Republic of Indonesia No. 416/MENKES/Per/IX/1990). Environmental sanitation is the health status of an environment, which includes housing, sewage, clean water supply, and so on (Naswir, 2020)

The availability of water in peat areas is abundant and abundant throughout the year, but the available water cannot be utilised optimally by the community because until now the community has not been able to process peat water into clean water that meets clean water quality standards. During the rainy season, the community can accommodate only the storage tanks they have, but when the dry season arrives, there will be a clean water crisis. To meet their clean water needs, people are forced to buy refilled drinking water (Naswir et al., 2008, 2012).

Peat water is red to brown, has high acidity, contains organic substances, pH ranges from 5.77 to 6.8, turbidity ranges from 4 NTU-12 NTU, colour ranges from 18.9 to 137 mg/L Pt-Co, hardness ranges from 6.1-8.1 mg/L CaCO3, KMNO4 values ranged from 50.85-104.77 mg/L, iron levels ranged from 2.44-2.88ng/L, and manganese levels ranged from tt-0.138mg/L. (Naswir et al., 2014, 2015). Sungai Gelam is a village whose people always experience a clean water crisis because the sources of clean water for the community in this area are peat water and rainwater, while the quality of peat water is not good for consumption, and rainwater is also very limited in availability. Based on the survey conducted, it can be seen that the people living in the Sungai Gelam area do not yet have a good awareness of the importance of clean water and environmental sanitation. The condition of the peat water used by the people of Peat Jaya Village can be seen in Figure 1.

Figure 1. Condition of Peat Water in Gambut Jaya Village, Sungai Gelam, Muaro Jambi

Clean Water Facilities and Sources Households in each village in the Kumpeh, Kumpeh Ulu, and Sungai Gelam sub-districts do not yet have adequate clean water facilities. There are even villages that do not have any clean water facilities at all. The clean water facilities owned

by the community in general are dug wells and rain-fed water (Naswir Survey, 2019). Based on the description above, in this community service, clean water treatment from peat water sources will be carried out using the adsorbent CCBN5651 (Naswir, 2019, 2020, 2021).

Bentonite deposits in Jambi Province have been identified in three areas, namely Bangko Regency with an area of 4400 hectares, Bungo Tebo Regency = 520 hectares, and Batang Hari Regency = 1350 hectares (Dis.Pentam. Jambi, 1998). Until now, in the Jambi area, there has been no activity or business engaged in bentonite processing. Examples of bentonite deposits in the Bangko and Sarolangun Jambi areas can be seen in Figure 2 [7].

Figure 2. Bentonite deposit in Jambi area

The survey results show that the people of Sungai Gelam, especially the village of Gambut Jaya, have difficulty getting clean water, especially during the dry season such as August and September. This is because the Sungai Gelam sub-district is a peat area, and the water source in this area is generally peat water. As a result of the lack of clean water, it has an impact on social life and environmental sanitation. It also has an impact on the family's economy because it requires a large additional cost to obtain clean water by buying bottled water.

2 IMPLEMENTATION METHOD

2. 1 Parties Involved in Application of Appropriate Technology AAT Activities

For the implementation of the Application of Appropriate Technology for the Provision of Clean Water for Rural Communities (PABD) in Gambut Jaya Village, Sungai Gelam District, Muaro Jambi Regency, cooperation from various parties is needed, namely: Research Institute and Community Service, Jambi University through the Community Service Team, Muaro Jambi Regency Government, through the District and Village Heads, Village Officials, and Community Leaders of Gambut Jaya Village. In addition, it also cooperates with companies in Sungai Gelam District, especially in utilizing the company's CSR funds for the provision of clean water for the community.

2.2 Methods and Stages in the Application of Appropriate Technology (TTG) to the Society

conduct direct field surveys and secondary data analysis. From the field survey, it is known the real condition of clean water facilities owned by the community and how the environmental sanitation conditions in Gambut Jaya Village, Sungai Gelam District, water sources used by the community, population and community clean water infrastructure, and the community's economy have declined since the pandemic. COVID-19. The next stage is to design, together with community groups and village officials, a peat water treatment installation unit using CCBN5651 Technology. The establishment of two clean water treatment units has been agreed upon by two community groups and will carry out operational trials of Appropriate Technology, making SOPs and assisting managers for sustainable Appropriate Technology in Gambut Jaya Village.

2.3 Description ABOUT Applied to Society

The Appropriate Technology (TTG) applied to the people of Gambut Jaya Village is “Peat water purification technology with CCBN5651”. The invention of the CCBN5651 Peat Water Purifier Formula is a new formula found for processing peat water into clean water (Naswir et al., 2014).

This formula contains natural ingredients such as bentonite (Na, Ca), $(AlMg)_{12}Si_4H_{10}(OH)_2.nH_20$, and activated carbon and limestone as supporting materials.The results of this discovery have been tested in a project bankruptcy in the Tanjung Jabung area, West Jambi. The CCBN5651 product has a very good market opportunity because there are no competitors that produce similar materials. The local government and the community really need to realise the Peatland Rural Clean Water Supply Program (PABD). Academically, this invention is a downstream from the research of LPPM Jambi University, which has obtained HKI in the form of two simple patents that have been granted.

2.4 PPTG Work Procedures for Construction of Clean Water Installations

The work procedures carried out to support the realisation of the PPTG programme method in the Provision of Clean Water for Rural Communities (PABD) in Peat Jaya Village are:

a. Preliminary survey
b. Peat water sampling, and laboratory analysis of peat water parameters to be treated with CCBN5651
c. Consultation with the community to determine the location of the peat water treatment unit
d. Designing a peat water treatment plant using CCBN5651.
   The design that will be built is as shown in Figure 5. The installation is made using a Tedmod tank with a capacity of 2000 L, 1000 L, and 500 L (treatment tank). The installation framework is made using a wooden and iron frame.

Figure 3. Simple form of PABD installation with CCBN5651 Technology

The installation that will be made in Gambut Jaya Village, Sungai Gelam Jambi, consists of 4 tanks, 2 RO filter media, and one water pump. The addition of CCBN5651 powder is in the 2nd tank, namely the processing tank with a dose of CCBN5651 1 kg/M3, then carrying out the process of stirring, filtering, and storing in the 3rd and 4th tanks for hygiene. The technology is parallelized using Revers Osmosis (RO), so that the clean water produced is not only clean water but can also be used as drinking water for the community.

e. Conducting the Appropriate TechnologyTrial that has been set up while evaluating and improving the technology, then making its work operational procedures (SOP).
f. Establishment of Appropriate Technology management, which consists of at least a chairman, operational staff, and treasurer. If there is no management, the technology created will not last long, and there is no sustainability. This is the role of the community to build their own village and community.

g. CCBN5651 powder is available.CCBN5651 belongs to LPPM unja. For 6 months of operation, the need for CCBN5651 powder is supplied from LPPM through this PPTTG, and for the next time, the community is trained to be independent by way of contributions, which are managed by the management.
h. The PPTTG LPPM UNJA team provides community empowerment through mentoring/training, application, and maintenance of technology products.

2.5 Evaluation of PPTTG Program Implementation and Sustainability

For the evaluation of the implementation of the programme and for the sustainability of the PPTG program, several things were carried out:

1. Conduct a coordination meeting with the local government consisting of the Subdistrict Head of Sungai Gelam, Village Heads, Community Leaders, Companies in the area, Management of Appropriate Technology for Provision of Clean Water for Rural Communities (PABD)
2. Collaborating with or with LPPM Jambi University for the procurement/supply of CCBN5651 powder so that the need for CCBN5651 powder materials is guaranteed and uninterrupted.

3. Make SOPs for the implementation of TTG and maintenance of TTG and provide guidance both directly and online with PPTTG managers.
4. Conduct regular mutual cooperation for PABD technology maintenance and environmental sanitation, which is attended by one of the PPTG Service Teams.
5. LPPM Unja makes a service programme the following year for counselling and other forms of activity in the village or makes it a Jambi University Assisted Village.

3 RESULTS OF APPROPRIATE TECHNOLOGY APPLICATION

3.1 Preparation of the activity location

Prior to the preparation of the location for the service activities, consultations were carried out with the village head and his apparatus to determine the location for the construction of a peat water purification installation. The results of the deliberation determined two locations where the installation will be built. After the location is agreed upon, the forms and stages of the construction of clean water installations are socialized.

Figure 4. Location 1 construction of clean water installation in Gambut Jaya village

3.2 Procurement of Materials and Tools

The tools and materials that will be used in the construction of the peat water purification installation are prepared, such as: sand, cement, tanks, RO filter media, and a water pump, and the addition of CCBN5651 powder. Procurement of equipment and materials is carried out for both locations for the construction of clean water installations.

3.3 Making Peat Water Purifier Installation Site

The construction of the peat water purification installation site is carried out on the ground

as follows:

a. Location 1, the location of the Nurul Falah Mosque RT.9, Hamlet 3, Gambut Jaya Village, covering an area of 6.0 m x 3.0 m, 30 cm high.
b. Location 2. Location of Mashollah Al-Hidayah in Hamlet 1, RT 03 Village Peat Jaya area of 5.0 m x 3.0 m, Height 3 m

Arial of that size is first cleaned and registered. Next, the foundation is made and the project site or installation site is prepared.

3.4 Construction of a Clean Water Installation Site at the First Location (Dusun 3)

The installation begins by measuring the location where the peat water purification installation will be planned. Subsequently, the construction site was cleaned and levelled (Figure 5).

Figure 5**.** Construction of a peat water purification installation site in Dusun 3

3.5 Construction of a Clean Water Installation site in the Second Location (Dusun 1)

The installation begins by measuring the location where the peat water purification installation will be planned. Subsequently, the construction site was cleaned and levelled (Figure 6).

Figure 6. Construction of a peat water purification installation site in Dusun 1

3.6 Assembly Installation

The installation is put together with 5 water tanks that hold a total of 2000 litres of water and one water pump (Figure 7).

Figure 7**.** Assembly of peat water purification installation (Dusun 1)

The CCBN5651 product is made using local raw materials, namely bentonite, activated charcoal, and limestone as supporting materials. The manufacture of this CCBN5651 product is carried out in the laboratory.

CCBN5651 is an invention of a peat water purification formula that has been scientifically tested and is a newly discovered formula for processing peat water into clean water. This product contains a natural ingredient blend that includes bentonite ((Na, Ca) $(Al.Mg)_{12}Si_4H_{10}(OH)_2$ nH_20), activated carbon, and limestone. For the preparation of the first stage, the CCBN5651 product (Figure 8) used was owned by the LPPM Jambi University with a capacity of 5000 kg. For the second and subsequent stages, this peat water purifier is made independently by the community, with assistance provided.

Figure 8. The CCBN5651 product was used

3.7 Laboratory Test Results

The test results in the laboratory for processed clean water using product technology CCBN5651 in Gambut Jaya village have not been obtained because the processed peat water will only be obtained in early December 2020 after the installation of the piping installation is complete. Meanwhile, a small-scale test was carried out with physical indications showing that the treated clean water was colorless, clear and had a pH of 6.7 before processing. The colour was a reddish-red powder and the pH was below 4. (Figure 9).

Figure 9. Purification of peat water with CCBN5651.

3.8 Benefits obtained (outcomes)

Economic and Social Impact

The benefits obtained by partners with the construction of this peat water purification installation have a great impact on the lives of the people of Gambut Jaya village has an impact not only on health but also on the economy and social community. The social economic impacts or benefits obtained by partners include the availability of clean water sources for the people of Gambut Jaya village, who are experiencing a clean water crisis. Thus, the community can live clean and can improve the level of public health and maintain a hygienic environment. The social impacts caused by the construction of this peat water purification installation include:

1. Availability of TTG from local materials that are cheap economically and easily available
2. Improving the health status of the community through increasing household clean water services and maintaining a hygienic environment
3. Utilization of natural materials that are far from harmful compounds
4. Opening job opportunities for the community
5. Opening opportunities for student practice and entrepreneurial attitudes for students
6. Improving the life of mutual cooperation in society
7. Increase concern for others
8. Developing entrepreneurial businesses, both for the community and for students

3.9 Partner's Contribution to the Implementation of the Appropriate Technology

The contribution of the community and government officials of Gambut Jaya Village in the Implementation of the Appropriate Technology Application Program (PPTG) for the Provision of Community Clean Water in Gambut Jaya Village (PABMD), Sungai Gelam District, Muaro Jambi Regency, is quite large and has high enthusiasm and cooperation as partners. This can be seen from survey activities, determining project locations, making project sites, drilling wells, installing installations and pipelines.

All communities participate in helping, in detail the forms of Partner contributions include:

1. Willing to provide two locations of their land as a place for the construction of two units of clean water installations, namely in hamlet 1 next to the mosque and hamlet 3 next to langgar.
2. Participate in cleaning and preparing the project site
3. Assisting with mutual cooperation in making the installation site (PWT CCBN5651) on two locations
4. Assist in making boreholes with a depth of 8 meters to supply raw water for processing
5. Help work on the building where the installation and roof work is installed
6. Assisted with team installation at both locations
7. Willing to be the management and operational staff of Application Technology Program technology after the project is completed. This is very important for the sustainability of the program (sustainable).
8. Village officials, starting from the Village Head, hamlet 1 head, hamlet heads2 and mosque administrators always accompany the team in carrying out activities and provide assistance if there are problems during the implementation of activities.
9. Accompanying students of Environmental Engineering study program for practicum courses on peat water treatment technology in Sungai Gelam village which is part of this PPTGG activity.

3.10 Inhibiting Factors/ Obstacles

Obstacles or obstacles faced in the application of the Appropriate Technology Program (PPTTG) in the development of rural community water supply (PABMD) with PWTCCBN5651 technology include:

1. Road access to the installation construction site was damaged, so that the travel time to the location could reach Obstacles or problems that came up when the Appropriate Technology Program (PPTTG) was used to build a water supply for rural communities (PABMD) with PWTCCBN5651 technology are: i 3.5 hours, which previously could be reached in 1.5 hours.
2. Weather that often rains, hinders the construction of peat water purification installations.
3. The land used as the site for the CCBN5651 PWT installation is peat soil and in Gambut Jaya village it is deep peat type, so it is very difficult to build a site that will accommodate a load of more than 6 tons of clean water. If wrong in constructing it, then the building will fall or tilt.
4. Provision and processing of raw materials for the production of formula CCBN5651
5. Late work contracts, so there are doubts about starting implementation and also late disbursement of funds.

3.11 Factors that Support the Implementation of Technology Application Program:

1. The peat water deposit available in Gambut Jaya village is quite large and never runs out, so it can support the sustainability of Technology
2. Concern for village officials and the community

3. Availability of raw materials for CCBN5651 in Jambi area is quite a lot
4. Team members with appropriate skills for PPTT CCBN5651
5. Availability of funds allocated by DRPM Dikti is sufficient.
6.

3.12 Solution and Follow-up

The following steps were taken to find solutions to the obstacles/obstacles found:

1. Using a field car that is durable, and can drive on damaged roads
2. Work on the construction of the installation is carried out during the heat, which starts earlier. This was done because, most of the rain fell in the afternoon.

4 CONCLUSIONS

From the results of this community service activity, it can be concluded that:

1. Establishment of peat water purification installations that are ready for community use in two locations, namely in hamlet 1 and hamlet 3, Gambut Jaya village, Muaro Jambi district.
2. Each installation was built with a size of 4.8 m x 2.5 m (location 1) and a size of 5 m x 2.5 m (site 2).
3. The installations were built using 5 tedmons in sizes of 2000 liters, 1000 and 500 liters, equipped with pipe installations and electrical installations.
4. The implementation of PPTTG community service activities in Gambut Jaya Village, Sungai Gelam District, Muara Jambi Regency was carried out well. The implementation of this activity is due to the hard work of the team and the support from the Village/RT/Dusun officials and the community, which is very large.

References

[1] Goltz, J. Von Der, Barnwal, P., 2018. Mines: The local wealth and health effects of mineral mining in developing countries. Journal of Development Economics 139, 1–16. https://doi.org/10.1016/j.jdeveco.2018.05.005

[2] Kim, Ju Yong, Lee, B.T., Shin, K.H., Lee, K.Y., Kim, K.W., An, K.G., Park, Y.S., Kim, Jeong Yeon, Kwon, Y.H., 2007. Ecological health assessment and remediation of the stream impacted by acid mine drainage of the Gwangyang mine area. Environmental Monitoring and Assessment 129, 79–85. https://doi.org/10.1007/s10661-006-9429-9

[3] Martin, S., Griswold, W., 2009. Human Health Effects of Heavy Metals. nd Technology Briefs for Citizens Page 1 Environmental Science and Technology Briefs for Citizens 15, 1–6.

[4] Muhammad Naswir and Haviz, A., 2008. Study of Peat Moss water for consume water with CCBN-RO Technology. Prociding Seminar International to UNSOED Jawa Tengah

[5] Muhammad Naswir, Susila Arita, Marsi and Salni., 2012. International Workshop on Sustainable Management of Lowlaand for Rice Production. Theme: Lowland for Food

Sufficience in the Global Climate Change. Banjarmasin, September 27-28th 2012.

[6] Naswir and I. Lestari. 2014. Characterization Active Carbon and Clum Shell In Reducing pH, Color, COD, Fe and Organic Matter on Peat Water. International Journal of Innovative Research in Advanced Engineering (IJIRAE), vol. 1, no. 11, pp. 137–146

[7] M. Naswir, S. Arita, Marsi, and Salni. 2015. Optimization of Peat Water Treatment Be Clean Water in the Lowlands Technology with Local Raw Material Formulation. Asian Journal of Chemistry. ISSN 0970-7077, vol .27 no.11 pp 3951-3956.

[8] M. Naswir, S. Arita, P. Jumaida, D. M. Lince, and Tasmin. 2018. The development of nanotechnology bentonite as adsorbent of metal Cadmium (Cd). International Conference on Science and Technology 2018. Vol. 1116, no. 042026, pp. 1–9.

[9] Muhammad Naswir., 2021. Utilization of Compilation of Bentonite and Activated Carbon from Coal to Reduce BOD and COD Levels in Rubber Factory Liquid Waste. Journal of Communication Media Precipitation and Environmental Engineering Development https://doi.org/10.14710

[10] Naswir, M, 2019. Paten Nomor : IDS000002321. Composition To Process Peat Water Into Clean Water.

[11] Naswir, 2020. Paten Nomor: IDS00201707672 ; Sea Shell Shell Powder (Anadara Granosa) To Raise the pH of Peat Water

[12] Muhammad Naswir., Yusnelti., L.Septiarini., Yudha Gusti Wibowo. 2019. Activated Bentonite: Low Cost Adsorbent to Reduce Mercury Content in A Solution. Research Journal of Applied Sciences ISSN 1815-932X (Print) 14 (8): 243-249

[13] Muhammad Naswir, Susila Arita, Dsfaur Ntalia, Jalius , Yudha Wibowo. (2020). Adsoprtion of Mecury Using Defferent Types Of Activited Bentonite : A Study of Sorption Kinetics , and Isotherm Models . Jurnal Rekayasa Kimia dan Lingkungan (Journal of Chemical Enginering and Environment) Vol. 123-131 2020 ISSN : p-1412-5064 e-ISSN: 2356-1661 http://jurnal.unsyiah.ac.id/RKL/article/view/17784/13332,

[14] Pullammanappallil, P., Inyang, M.I., Gao, B., Zimmerman, A., Xue, Y., Yao, Y., Ok, Y.S., Cao, X., Mosa, A., 2015. A review of biochar as a low-cost adsorbent for aqueous heavy metal removal. Critical Reviews in Environmental Science and Technology 46, 1–57. https://doi.org/10.1080/10643389.2015.1096880