

Training on the Use of Sluice Box for Alluvial Gold Separation for Traditional Gold Miners

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Abstract

The gold panning technique carried out by the Sikako Traditional Miners group is still manual using a wooden panning tool so that the recovery of the panning results is still low because the separation process is less effective and takes a long time. Sluice boxes are designed to increase the concentration of gold mining materials so that they can accommodate/deposit more gold particles and faster separation times. The sluice box is designed using aluminum material equipped with a riffle and a special carpet as a place to settle materials with higher density. The purpose of this Community Service is to provide training on the use of sluice boxes to separate gold from its impurity material in a more effective way and produce more recovery. This service activity is a collaboration between lecturers of Mining Engineering and Industrial Engineering of the Sekolah Tinggi Teknologi Industri (STTIND) Padang and lecturers of Mining Engineering at the University of Jambi. The Service Stage starts from the assembly of the sluice box, training in the use of the sluice box, mentoring and evaluation. From the results of the training, there was an increase in the level of empowerment with increased knowledge and skills in using sluice boxes in separating gold from impurities. In addition, the sluice box is portable so that it is easy to carry everywhere, especially for new location survey activities by partners.

Keywords: *Gold Separation, Recovery, Sluice Box*

1. Introduction

Sijunjung Regency is an area rich in mining products, especially: coal and various other mineral mines such as gold, sirtu, and urug soil. Gold deposits are estimated to be found in a number of locations that carry out mining activities. This activity is carried out by individuals with mining land ownership status in the form of their own ownership, rent and including

river areas. This mining has a direct impact on the condition of the Sijunjung Regency area, namely in the form of uncontrolled land conversion from forest and agricultural land functions to villages/villages and used as a place of business by residents who almost reach 51.15% of the area

The tributaries of Batang Kuantan include Batang Palangki, Batang Ombilin (from Lake Singkarak), Batang Sukam, Batang Kulampi and Batang Paranok all of which empty into the Batang Kuantan river with a watershed area of 437 km². In the past, this river was used by residents as a water source fulfillment and also used as irrigation for rice fields. But now it is used as mining land, because the Batang Palangki river contains gold minerals.

The target partner of this service activity is the Sikako Traditional Miners Group located on Jalan Silokek, Nagari Durian Gadang, Sijunjung District, Sijunjung Regency which carries out traditional gold mining around the Batang Kuantan Tributary which has land to be mined. The selection of target partners whose livelihood is as gold miners is an effort so that this activity can run in accordance with the expected goals. It is hoped that target partners who separate gold from its impurities (tailings) use sluice boxes that are environmentally friendly, fast, efficient and zero mercury, so that the river environment remains in good condition. This means that the carrying capacity and carrying capacity of the environment are maintained because it is important in sustainable development planning, to reduce the impact of environmental damage that may occur [1], [2].

The process of separating gold from its impurities carried out by the Sikako Traditional Miners Group is currently carried out using traditional techniques using pans made of wood. This gold panning technique mixes gold-containing materials with water in the tray, then shakes the tray so that lighter materials will be carried away by the water flow and heavier materials such as gold will be left at the bottom of the tray. This process is done manually and requires skill in controlling the flow of water and swaying the tray. Therefore, it is necessary to carry out gold separation activities from the impurities (tailings) with other methods, one of which is with a sluice box that takes advantage of the difference in density.

A sluice box is a tool with an open channel that has a certain slope with some form of riffing on the bottom surface of the tool to collect concentrate [3]. This tool is commonly used in spray mines for alluvial coatings [4]. The separation of gold from the sluice box is carried out by flowing the gold-containing material on a long, flat channel lined with riffles or bars. Water is flowed through a sluice box to separate lighter materials and heavier materials such as gold will be left behind in the riffles. There is a difference in specific gravity between heavy minerals and light minerals, so after being watered, heavy minerals will be left at the bottom as concentrate while light minerals will be carried away by water as tailings [5].

Sluice boxes become an alternative to gold separation for small-scale mining such as traditional miners do [6]. Sluice box designed for the gold separation process so that optimal results can be obtained, faster and accompanied by environmentally friendly techniques. This sluice box is expected to be able to accommodate or deposit more gold particles so that the recovery value increases. Sluice boxes can be placed directly in the field, such as in rivers that have flows that have been indicated to contain heavy minerals of economic value. Based on the above background, the purpose of this community service activity is to provide training to the Sikako Traditional Miners Group who carry out traditional gold mining activities to separate gold from their impurity materials in a more effective way and produce more recovery.

2. Implementation Method

The stages of service start from the assembly of the sluice box, training in the use of the sluice box, mentoring and evaluation. This Community Service Activity (CSA) uses the lecture or training method to explain starting from the meaning of the sluice box, demonstrating how to use the sluice box in the separation of alluvial gold. Then there was a discussion and question and answer. Furthermore, the Implementation Team also accompanies the Sikako Traditional Miners Group and assigns partners to practice it themselves. The Implementation Team sees and helps target partners who cannot or do not understand how to use the sluice box. The team also saw and asked what obstacles were encountered and revisited the CSA location to see the progress that has been made by the target partners on counseling and assistance in the use of sluice boxes as a monitoring and evaluation activity. Evaluation of program implementation and program sustainability in the field after the activities are completed is carried out by monitoring after 1 month of training to the community. Monitoring is carried out by observation and dissemination of feedback questionnaires from the community regarding the advantages and disadvantages of the training outputs provided.

3. Results and Discussion

The sluice box tool designed with a length of 120 cm and a width of 25 cm is able to increase the concentration of gold mining material so that it is able to accommodate or deposit more gold particles so that the recovery value increases. The sluice box is designed using aluminum and carpet. Sluice boxes with predetermined lengths and widths are made to classify the size that can pass and the size that cannot pass through the sieve holes. The sluice box is also equipped with a grizzly screen and a coarse carpet as a place to settle materials with higher density. Here the riffle can hold the concentrate. For concentrate collection, the riffle can be lifted and opened and then sprayed with water, the result of the sluice box is gold concentrate and environmentally friendly [4], [7]–[9].

Several training activities on the use of sluice boxes for alluvial gold separation for traditional gold miners to the Sikako traditional miner group have been carried out by the implementation team in September 2024 with the following details:

1. The team conducted a preliminary survey or initial survey to find out the conditions at the PKM location related to the gold processing techniques carried out by the Sikako Traditional Miners Group at this time. Through this survey, information was obtained that the target partners still use the traditional method of separating gold from their impurities by using a wooden tray, so that the recovery or acquisition of gold concentrate takes longer.
2. The stages of PKM implementation by the Team will be divided into several stages
The initial stage carried out by the PKM Team is to provide an initial questionnaire to the chairman and members of the target partners with 2 questions, namely
 - a. Do you know of any other tools for separating gold from its impurities?
 - b. Do you know about sluice boxes?

After the questionnaire was filled out and the answers were collected by the Community Service Team. The results of the initial questionnaire showed that there were still partner

members who did not know about another tool, namely the sluice box that can be used in the process of separating gold from its impurities

3. The PKM team explained to partners with a lecture or training method to explain starting from the meaning of sluice boxes, the advantages of portable sluice box tools, demonstrating how to assemble sluice boxes in alluvial gold separation and explaining the parts of the sluice box and its functions. This sluice box is designed using aluminum and carpet. The sluice box is equipped with a special coarse carpet as a place to settle materials with higher density. Here the riffle can hold the concentrate. For the extraction of concentrate, the riffle can be lifted and opened and then sprayed with water, the result of the sluice box is gold concentrate. The bait to be processed is weighed first as seen in Figure 1 below.



Figure 1. Team explained the assembly of the sluice box and its parts and functions as well as the feed that will be processed into the sluice box

4. Discussion and question and answer. Partners were enthusiastic in listening to the explanation from the CSA Team about the parameters of the sluice box in an effort to obtain greater recovery results. Next, the partner asked about the slope on the sluice box, what is the impact of the slope on the recovery obtained. The team then explained that the slope is the basic principle of the rate of water and materials so that, the more the tool is tilted, the faster the water rate will be and if it is not balanced with the type, height, and shape of the riffle, the excavated material will not be held and will be carried away by the current. On the other hand, if it is not tilted, the water will stagnate and the material will settle all as seen in Figure 2.



Figure 2. Discussion and Q&A about the effect of the sluice box tilt on the recovery results obtained

5. Furthermore, the Implementation Team accompanies the Sikako Traditional Miners Group and assigns partners to practice it themselves. The PKM Implementation Team sees and helps target partners who cannot or do not understand how to use the sluice box.



Figure 3. Partners practice the use of sluice boxes themselves

6. The process of picking up gold concentrate and impurities that are trapped in riffles and fine carpets. The sluice box is disassembled, washed into a bucket filled with water, as well as concentrate that has been left behind or deposited on a special carpet or in the body of the sluice box. This process is faster and more in the recovery of the gold particle concentrate obtained when compared to the tray tool commonly used by the target partner. After that, it will be put into a wooden tray with gold concentrate still mixed with the impurities, which is then carried out by the panning process so that only the gold

concentrate is left. The last step is to weigh the weight of the gold that has been obtained. The following is the documentation until gold concentrate is obtained.



Figure 4. Separation of gold from impurities and gold concentrate scales

4. Conclusion

The Training Activity on the Use of Sluice Box for Alluvial Gold Separation for Traditional Gold Miners has been well carried out to the target partners of the Sikako Traditional Miners Group. There is an increase in knowledge in the use of sluice boxes for gold separation for traditional gold miners so that the recovery results obtained are faster and more.

The gold panning technique carried out by the target partners is currently by mixing materials containing gold with water in the tray, then shaking the tray so that lighter materials will be carried away by the flow of water and heavier materials such as gold will be left at the bottom of the tray. This process is done manually and requires skill in controlling the flow of water and swaying the tray. Therefore, it is necessary to carry out activities to separate gold from its impurities by other methods, one of which is by taking advantage of the difference in density by using a sluice box.

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