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ALTERNATIVE UTILIZATION OF TOBACCO LEAF WASTE USING THE ANP METHOD AT THE REDRIYING BOJONEGORO COOPERATIVE

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ABSTRACT

The Bojonegoro Redriying Employee Cooperative (Kareb) is one of the tobacco drying places/services in East Java under the auspices of the cooperative. The tobacco sticks (ste,) operated by KAREB are not grown and piled up in the storage warehouse. Each tobacco drying process in 1 year produces 8,665,409 stems, while there is no additional cost for stem storage. This research uses the ANP method because there are 3 alternatives chosen in this research, namely briquettes, compost and bioplastics. ANP is a structured problem-solving method and there is a dependence on the relationship between its elements, the ANP method was chosen because the proposals to be applied have interrelated criteria, ANP involves hierarchical relationships but does not require a standard structure. The priority of each cluster in the model is in the 3 alternatives, namely briquettes with a value of 0.73868, then from the 6 sub-criteria, the highest value is in waste utilization, which is 0.66140, then from the 3 highest value criteria, namely the economic aspect with a value of 0.68261. Charcoal briquettes can function as an alternative fuel to replace the use of oil and gas fuel in industry and households, these briquettes are a source of renewable energy produced from biomass, namely plants or plants that are abundant in the environment. The ecological aspect because seeing the opportunity for waste if processed can be useful into a product with high selling value, from an economic point of view, the community's ability to process agricultural waste into charcoal briquettes as a source of renewable energy can be an additional source of income. The briquette production is the first step of authoring all biomass is put into a jobong container and burned, then the charcoal powder filled in the jobong is stretched and separated between charcoal and dirt, followed by the addition of adhesive and printer adhesive material used is tapioca flour.

Keywords: Briquettes, ANP, Redriying

Introduction

Tobacco (Nicotiana spp. L) is a plantation product that continues to play an important role in the growth of the plantation subsector. The contribution of tobacco to the Indonesian economy has not decreased despite facing various challenges faced by tobacco farmers in Indonesia. The Redriying Bojonegoro Employee Cooperative (KAREB) is one of the tobacco drying places/services in East Java under the auspices of the cooperative and this tobacco drying cooperative has collaborated with well-known cigarette manufacturing companies such as Samporna. KAREB is a company of krosok and rajangan tobacco drying services. The

Bojonegoro Redrying Employee Cooperative operates every Monday to Saturday with a working time of 15 hours per day every Monday to Thursday for Friday and Saturday itself for 13 hours. During the production process, tobacco drying uses 2 shifts. The dried tobacco produced every day is around 12kg to 60kg per day. For the monthly production of around 800-1,000 kg or even more if the demand for tobacco drying soars or during the tobacco season, KAREB is a krosok and rajangan tobacco drying service company where many companies have trusted it in its tobacco drying. Many companies have used KAREB cooperative services, starting from companies from the local Bojonegoro itself or from outside the city or outside Java.

The ANP (Analytic Network Process) method is an analysis method that uses a structure and a set of criteria. The main way this method works is analysis, similar to the AHP (Analytic Hierarchy Process) method, because ANP is a development of AHP. The ANP method is used to solve problems that are unstructured and require dependency relationships between elements. In contrast to AHP, ANP can accommodate complex and uncertain problems that cannot be solved by traditional methods. ANP provides a framework for handling decisions without making assumptions about the independence of higher-level elements than lower-level elements, as well as the independence of elements within the same level. The dominance or relative importance of influence remains the main concept in the ANP, as in the AHP. ANP (Analytic Network Process) is a development of the AHP (Analytic Hierarchy Process) method. ANP allows interaction and feedback between elements in a cluster as well as between clusters

Tobacco stick charcoal briquettes can be made with or without initial treatment of tobacco stems. The tobacco sticks used are generally still wet and long. For charcoal briquettes with the initial treatment, tobacco sticks are extracted and then dried in free air with the help of sunlight. After drying, the tobacco stems are crushed using a grinder until they become powder. This powder is then sifted with a size of 30 mesh to 60 mesh to make it uniform, so that the formed briquettes have better strength.

Problem Formulation

Based on the background description, the formulation of the problem in this study is different:

How to Alternative Processing of Tobacco Sticks Using the ANP Method in the Redriying Bojonegoro Employee Cooperative

Research Objectives

The objectives of this study are:

To determine alternatives to tobacco stem processing using the ANP method in the Redriying Bojonegoro Employee Cooperative.

Research Benefits

The benefits obtained from this study are:

1. Share Research

For the researcher, this research is to obtain additional information about the development and analysis of the best decision-making alternatives in the Redriying Bojonegoro Employee Cooperative using the ANP method and the use of financial feasibility analysis on the best alternatives produced.

2. For academics

It is hoped that this research can be a reference for other researchers in conducting similar research.

Bojonegoro Tobacco Redrying is a company engaged in tobacco processing, facing increasingly fierce competition. As a company that runs its business based on orders from outside parties (job on order system), this company has to compete with the increasing number of new tobacco drying companies that have emerged. This challenge is compounded by the government's plan to allow cigarette manufacturing companies to set up their own tobacco drying businesses

Pengertiaan ANP (Analytical Nerwork Process)

In getting the best alternative to improve a process, it must consider many or multiple criteria that have been determined and agreed. According to Anonymous et al (2021)The method used in the selection of the best alternative is to use ANP. The ANP method was chosen because the proposals to be implemented have interrelated criteria. ANP involves hierarchical relationships but does not require a standard structure like AHP, so it is able to handle complex relationships between decisions and predetermined attributes. Puspitasari & Yancadianti (2016) The ANP (Analytic Network Process) method is an analysis method based on a structure and set of criteria. The main way this method works is analysis, which is similar to the AHP (Analytic Hierarchy Process) method. The ANP method is a development of AHP, with the addition of criteria and subcriteria as variables to determine analysis decisions.

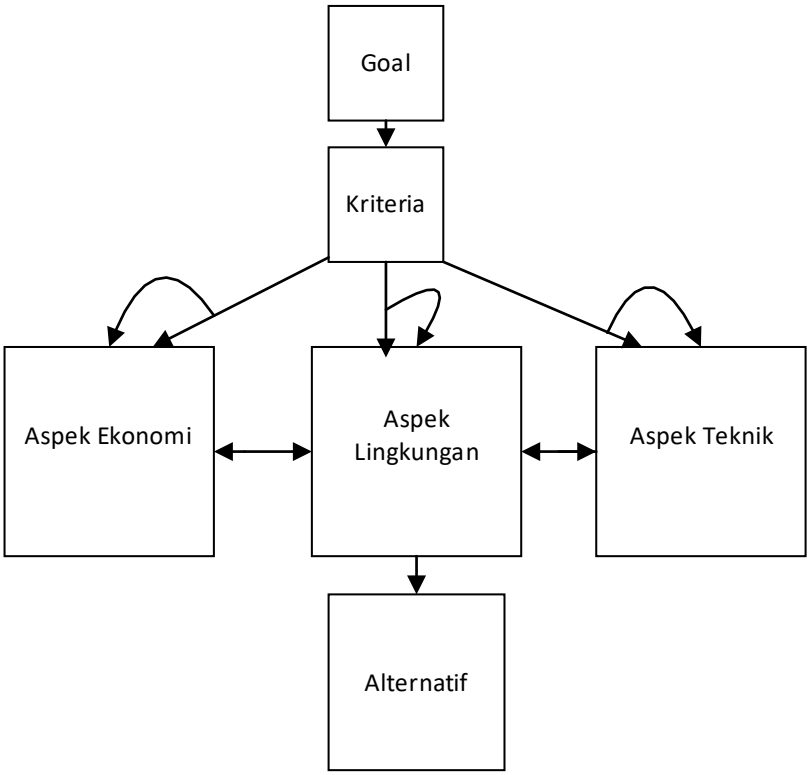


Figure 2. 1 General Drawing of ANP Structure

Time and Place of Research

This research was conducted in December 2023 at the Redriying Bojonegoro Employee Cooperative (KAREB) Jln. Basuki No. 07, jambean, sukorejo, Bojonegoro District, Regency. Bojonegoro, East Java 62115.

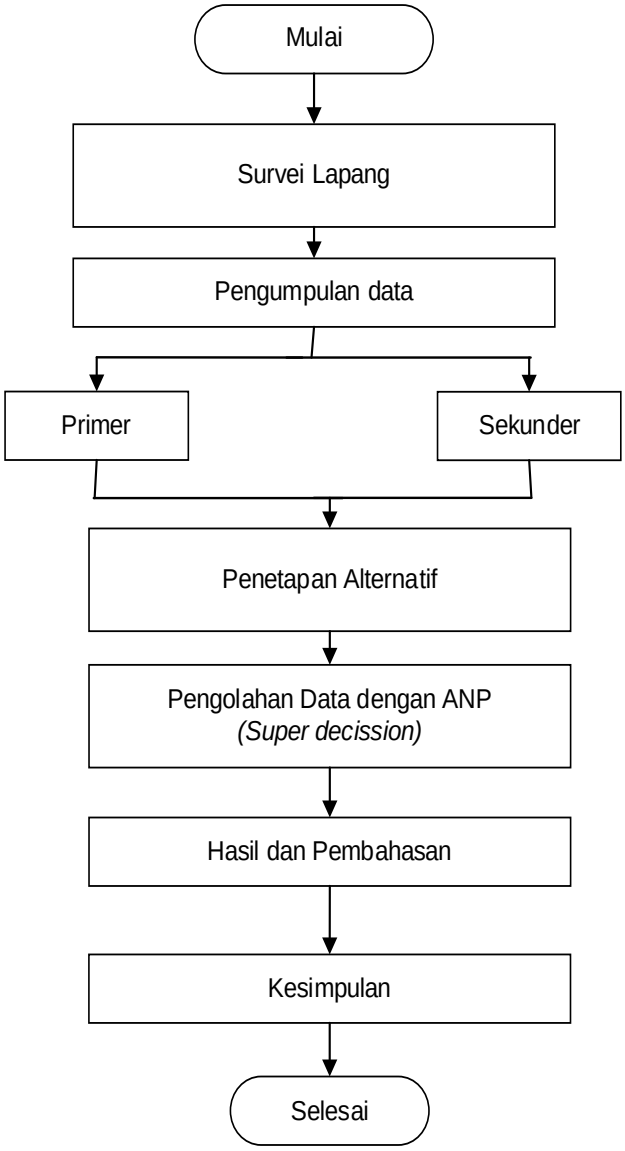
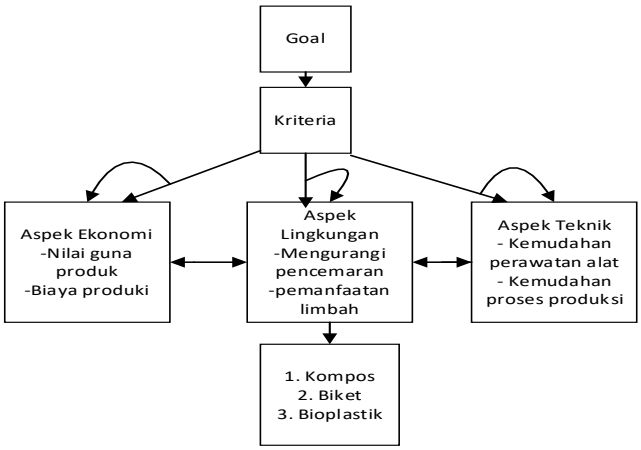


Figure 3. 1 Research Flow Diagram



The data collection stage is carried out in the following way:

1. Data Primer

Primary data is data obtained directly from the company. Primary data is obtained through recording, direct observation, and paying attention to activities in the field. Primary data can be obtained using several methods as follows.

a. Interview

Interviews were conducted with each expert who aimed to find out alternatives to waste treatment, the experts were the owner or director, KAREB production staff and lecturers.

b. Appointment of an expert

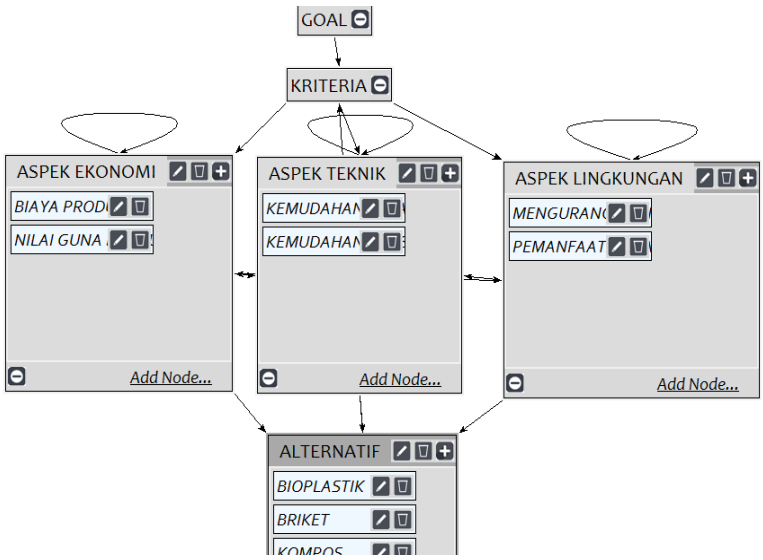
Experts selected for the purpose of sorting the tobacco must understand the treatment of waste from tobacco drying. According to Pratiwi et al (2021) The selected experts are 5 people, namely lecturers, company owners, and company employees (head of production and vice head of production). In determining the relationship between subcriteria.

2. Data Seconds

Secondary data is data taken through literature studies and company bookkeeping. Literature that can be used as a reference is sourced from journals, books, scripts, and scientific articles related to the method of anp and processing tobacco stem waste, briquette processing, compost processing and bioplastic processing . The data taken through literature studies are used as a reference. The data taken through the company's books and disseminated to the questionnaire is then processed in the super devison application

3. Data collection (Filling in the questionnaire)

Data collection is by distributing questionnaires to 5 experts, namely, Lecturers of Agricultural Industrial Technology, company owners and company employees (head of production and vice chairman of production). The distribution of questionnaires is carried out twice, namely, Criterion 1 determines the relationship between subcriteria and alternatives, and Criterion 2 weights the level of importance between subcriteria. From the results of the two questionnaires, they were recapitulated and then data input was made in the decision software.



There are 3 criteria and 6 subcriteria and 3 alternatives used in determining priorities in the treatment of tobacco waste of the KAREB Cooperative and can be seen in table 4.1.

Table 4. 1 Data on Criteria, Subcriteria and Alternatives in the Waste Treatment of Tobacco Sticks of KAREB Cooperative

CODE	INFORMATION
A	Briquettes
B	Compost
C	Bioplastics
BP	Production Cost
NGP	Product Use Value
MP	Reducing Pollution
PL	Waste Utilization
KPP	Ease of Production Process
KPA	Ease of Tool Maintenance
AE	Economic Aspects
AL	Environmental Aspects
AT	Technical Aspects
PLBT	Tobacco Stem Waste Treatment

aThe next step after the network is carried out is to calculate the weight of interests or priorities between subcriteria. The data obtained from the questionnaire was then input data with the help of Super Decisions Software.

Here are the priorities.

Icon	Name	Normalized by Cluster	Limiting
No Icon	BIOPLASTIK	0.05618	0.022024
No Icon	BRIKET	0.73868	0.289579
No Icon	KOMPOS	0.20514	0.080421
No Icon	BIAYA PRODUKSI	0.38623	0.011689
No Icon	NILAI GUNA PRODUK	0.61377	0.018575
No Icon	MENGURANGI PENCERMARAN	0.33860	0.040683
No Icon	PEMANFAATAN LIMBAH	0.66140	0.079467
No Icon	KEMUDAHAN PERAWATAN ALAT	0.36018	0.023606
No Icon	KEMUDAHAN PROSES PRODUKSI	0.63982	0.041934
No Icon	PENGOLAHAN LIMBAH BATANG TEMBAKAU	0.00000	0.000000
No Icon	ASPEK EKONOMI	0.68261	0.267598
No Icon	ASPEK LINGKUNGAN	0.22273	0.087316
No Icon	ASPEK TEKNIK	0.09466	0.037110

Figure 4. 1 Priority Weight in Tobacco Stem Waste Treatment

All pairs of comparisons are calculated with priority weights and then made into one into the supermatrix in **Table 4.2** below.

Table 4. 2 Supermatrix

Main Network: DITA (USER RATA-RATA)[111.sdmod: ratings: Unweighted Super Matrix

Clusters	Nodes	BIOPLASTIK	BRIKET	KOMPOS	BIAYA PRO...	NILAI GUNA...	MENGURA...	PEMANFA...	KEMUDAH...	KEMUDAH...	PENGOLAH...	ASPEK EK...	ASPEK LI...	ASPEK TEK...
ALTERNATIF	BIOPLASTIK	0.000000	0.000000	0.000000	0.062917	0.050093	0.055588	0.054477	0.061970	0.062050	0.000000	0.050093	0.076975	0.047619
	BRIKET	0.000000	0.000000	0.000000	0.753111	0.766600	0.695668	0.757456	0.711264	0.725742	0.000000	0.766600	0.649233	0.761905
	KOMPOS	0.000000	0.000000	0.000000	0.183972	0.183307	0.248744	0.188067	0.226767	0.212208	0.000000	0.183307	0.273792	0.190476
ASPEK EKON...	BIAYA PRODUKSI	0.000000	0.000000	0.000000	0.500000	0.500000	0.000000	0.000000	0.000000	0.000000	0.000000	0.166667	0.500000	0.500000
	NILAI GUNA PROD...	0.000000	0.000000	0.000000	0.500000	0.500000	0.000000	0.000000	0.000000	0.000000	0.000000	0.833333	0.500000	0.500000
ASPEK LINGK...	MENGURANGI PEN...	0.000000	0.000000	0.000000	0.000000	0.000000	0.500000	0.500000	0.000000	0.000000	0.000000	0.125000	0.200000	0.500000
	PEMANFAATAN LI...	0.000000	0.000000	0.000000	0.000000	0.000000	0.500000	0.500000	0.000000	0.000000	0.000000	0.875000	0.800000	0.500000
ASPEK TEKNIK	KEMUDAHAN PERA...	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.500000	0.500000	0.000000	0.125000	0.500000	0.250000
	KEMUDAHAN PRO...	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.500000	0.500000	0.000000	0.875000	0.500000	0.750000
GOAL	PENGOLAHAN LIM...	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
KRITERIA	ASPEK EKONOMI	0.682608	0.761905	0.397071	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.166101	0.000000	0.000000	0.000000
	ASPEK LINGKUNGAN	0.256944	0.190476	0.329500	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.777093	0.000000	0.000000	0.000000
	ASPEK TEKNIK	0.060448	0.047619	0.273428	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.056806	0.000000	0.000000	0.000000

The results of ANP processing using super decision software obtained the result that the alternative with the highest weight is briquettes with a weight of 0.73868 From the three alternative criteria starting from briquette alternatives, compost and bioplastic alternatives obtained the highest value in briquette alternatives Then the second alternative is compost with a priority weight of 0.20514. And the last alternative is the bioplastic alternative with a priority weight of 0.05618. In this case, briquettes are a prioritized alternative to processing tobacco stem waste.

Briquettes have several benefits, especially in the context of substitution or co-use with traditional fossil fuels. Here are some of the key benefits of using briquettes:

1. Reducing Waste The use of biomass waste to make briquettes helps in waste management. For example, the use of straw or wood chips that were previously considered agricultural waste can be converted into briquettes, reducing the amount of waste that must be disposed of. It is hoped that the use of briquettes can help reduce the ever-increasing pile of waste from this waste
2. Energy Efficiency: Briquettes often have a higher combustion efficiency than the crude fuel used in their manufacture. The process of making briquettes involves the compression of fuel, so it burns it more efficiently and produces less waste or ash. The higher the density can increase the energy contained in the fuel at the same mass (Dwi Danang et al., 2013)
3. A Versatile Choice, Briquettes can be used in a variety of applications, including household heating, power plants, industrial heating, and others. They are available in a variety of sizes and compositions, according to the needs of specific users and applications. The use of briquettes can reduce household expenses for the purchase of fuel oil, as well as provide alternative renewable energy sources in abundance and affordable prices for the wider community. In addition, the use of briquettes can also stimulate business ideas for rural communities and help reduce environmental pollution These benefits make briquettes an attractive alternative in efforts to reduce greenhouse gas emissions, increase energy availability, and promote environmental and economic sustainability.
4. A Versatile Choice, Briquettes can be used in a variety of applications, including household heating, power plants, industrial heating, and others. They are available in a variety of sizes and compositions, according to the needs of specific users and applications. The use of briquettes can reduce household expenses for the purchase of fuel oil, as well as provide alternative renewable energy sources in abundance and affordable prices for the wider community. In addition, the use of briquettes can also stimulate business ideas for the village community and help reduce environmental pollution

These benefits make briquettes an attractive alternative in efforts to reduce greenhouse gas emissions, increase energy availability, and promote environmental and economic sustainability.To make biochar briquettes, a place called a jobongan is needed. A simple version of jobongan can be made by digging up the soil and inserting a heat-resistant container like a used drum. The container was then modified to be hermetically sealed, equipped with a chimney, and had holes in some parts.
The value of the comparison weight between clusters can be seen in **Table 4.3**

Table 4. 3 Comparative Weights Between Clusters

COMPARISON	Alternative		
	Bioplastics	Briquettes	Compost
Economic Aspects	0,68	0,76	0,39
Environmental Aspects	0,25	0,19	0,32
Technical Aspects	0,06	0,04	0,27

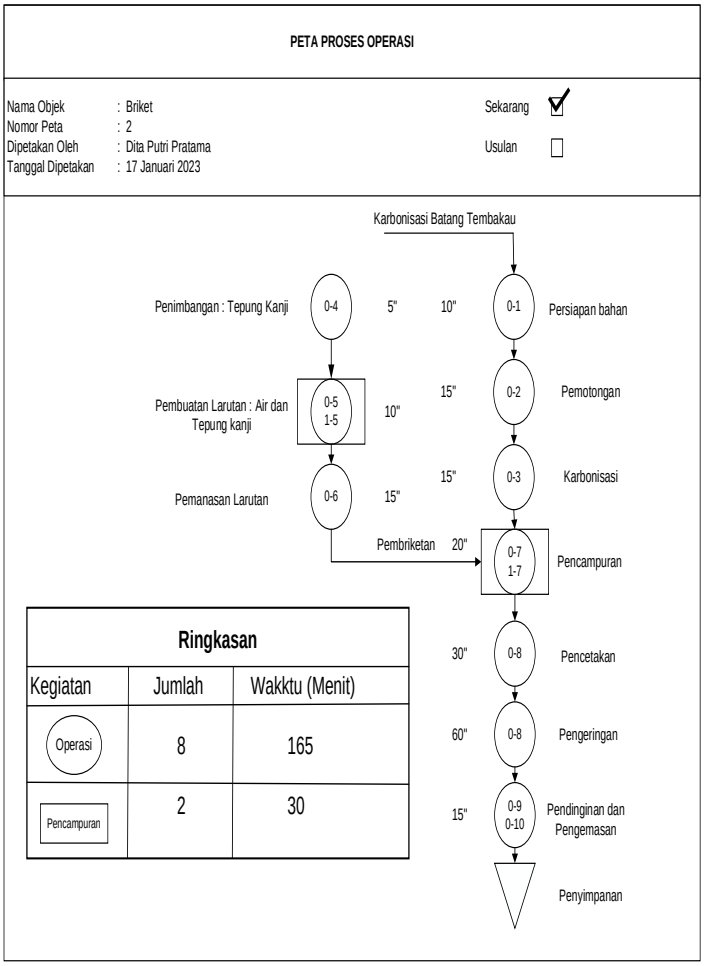


Figure 4. 2 Briquette Operation Process Map

To make biochar briquettes, a place called a jobongan is needed. A simple version of jobongan can be made by digging up the soil and inserting a heat-resistant container like a used drum. The container was then modified to be hermetically sealed, equipped with a chimney, and had holes in some parts.

The steps to make charcoal briquettes in a simple way are as follows:

1. Pengarangan

All biomass materials are put into a jobongan container and burned. After burning, the container is tightly closed and the air holes are opened. The combustion process is stopped when the chimney smoke thins and becomes bluish. The container is tightly closed and allowed to cool for about six hours.

2. Charcoal powder manufacturing

The contents of the jobongan are removed and separated between charcoal and feces. The charcoal is then ground until smooth and further mashed using a lumpang or other mash. The result is then sifted to obtain charcoal with a soft texture.

3. Addition of adhesive and printing materials

The adhesive used is liquid tapioca flour. Tapioca flour is mixed with water and cooked until it forms a glue. The glue is then mixed with fine charcoal until smooth. The charcoal mixture is then molded using a felting machine into solid briquettes. The briquettes are then dried in the sun and can be used as an alternative energy source or stored for future use

Figure 4. 3
Burning Tobacco Leaf Stems

Figure 4. 4
Smoothing of Tobacco Leaf Stems

Figure 4. 5 Mixing Flour And Stem Powder

Figure 4. 6 Briquettes

Conclusion

The results of the analysis concluded that the first priority alternative is briquettes with a priority weight of 0.73868. Furthermore, the second priority is compost with a priority weight of 0.20514. And the last priority is bioplastics with a priority weight of 0.05618. Alternative briquettes are the top priority based on 3 aspects; (1) Economic aspect, the cost of producing charcoal briquettes is not too expensive and much, and the use value of the product (briquettes) is very high even if the demand reaches abroad. (2) Technical aspect, the level of ease of producing charcoal briquettes is classified as the easiest than compost and bioplastics. And ease of tool maintenance, briquettes after use are simply stored in a dry place and room temperature only. (3) Environmental aspect, tobacco waste treatment overcomes environmental pollution caused by the waste of tobacco stems. The processing of tobacco stem waste into charcoal briquettes adds to the benefits of using tobacco stem waste, which was initially no longer useful so it had to be destroyed, but is no longer destroyed.

Suggestion

It is hoped that further research will analyze the processing of tobacco stem waste on other alternatives, namely compost or bioplastics or other products. Recommendations for the KAREB Cooperative to be able to use the research results as a solution to overcome the waste of tobacco stems produced.