

Determination Of Prospective Coconut Processed Products To Developed In Sungai Geringging Sub-District Padang Pariaman District

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Abstract – Coconut is a plantation commodity that has a lot of economic value. Almost all parts of coconut have benefits for various agro-industrial purposes, therefore coconut can be used as an agro industry that has high potential market. Sungai Geringging sub-district is the highest coconut producer district in Padang Pariaman District. Based on internal and external analysis of coconut agro industry in this sub-district, the products that have been pursued by the surrounding community are VCO, copra and shell charcoal. The purpose of this research is to determine prospective coconut processed products to be developed in Sungai Geringging Sub-district Padang Pariaman District. Determination of criteria and alternative coconut processed products were analyzed from interviews with respondents who were considered to understand the coconut agro industry. The number of respondents as many as 3 people. Data is processed used Analytical Hierarchy Process method and Expert Choice 11 software. From several criteria resulting raw materials and the market is the criteria with the highest weight in determining the prospective coconut processed products that can be developed, while for alternative coconut processed products that are prospective to be developed is VCO products where this product has the highest weight value in almost all criteria.

Keywords - AHP, Coconut Agroindustry, Coconut Products, Coconut Shell Charcoal and Copra

I. INTRODUCTION

Coconut is a plantation crops that has contributes to the Indonesian economy. Coconut plantations have the second largest area in Indonesia after oil palm plantations. Director General of Plantation shows that in 2018 this plantation has reached an area of 3.56 million hectares. The importance of coconut to the community is also reflected in the vast area of people's plantations which reaches 98% of 3.74 million hectares and involves more than three million farmer households (Allorerung *et al.*, 2015). Most of Indonesia's coconut production is used for domestic consumption and industry.

Indonesia is the country with the largest coconut plantation land in the world with an area of 3,649,645 ha with a coconut production rate of 2,865,870 tons (Direktorat jenderal Perkebunan, 2018). Production area is concentrated in three regions, Sumatra (32.8%), Java and Bali (26.2 %), and Sulawesi (18.4%). If seen from the area in relation to the existing coconut area then the largest development potential is in the region of Sumatra (Elly *et al.*, 2015).

West Sumatra province is one of the coconut producing areas that has considerable potential development. The area of coconut plantations in West Sumatra Province in 2018 are 87,300 ha and total production of 78,943 tons. Padang Pariaman District is the largest coconut production area compared to other districts in West Sumatra Province with a total land area of 40,312 ha and total production of 36,556.31 tons (Kabupaten Padang Pariaman Dalam Angka, 2019). Subdistricts in Padang Pariaman Regency that become the center of coconut production is the Sungai Geringgong (6.369,04 ton), IV Koto Aur Malintang (3.415,70 Ton) and Ulakan Tapakis (2.699,03 ton). Sungai Geringgong subdistrict is the highest producer in Padang Pariaman district (Kabupaten Padang Pariaman Dalam Angka, 2019).

Coconut is a plantation commodity that has a lot of economic value. Almost all parts of coconut have benefits for various purposes. Coconut meat can be processed into copra, Virgin Coconut Oil (VCO), coconut oil, grated coconut, coconut milk and coconut flour. Coir can be processed to serve handicrafts, mattresses, ropes, car seats, tile, carpets, coco fiber, cocopeat. Coconut water can be processed into nata de coco (Mardesci, *et al*, 2017). Therefore coconut can be used as an agro industry that has a high potential market.

Coconut agro industry is an industry based on local resources and one of the businesses that become the focus income for Padang Pariaman District residents. However, the development of this agro industry still does not fully produce maximum profit. This is because there are not many studies on processed coconut commodity products that are prospective to be developed. The development of this agroindustry still needs to be improved, considering that there are still many coconut farmers who don't want to process coconut into other derivative products. Whereas to get added value and greater profit, it is necessary to do further processing of raw materials. Coconut is the main commodity of plantation products in Sungai Geringgong Sub-district. In addition to being sold in the form of whole coconut, people began to process copra as the main raw material of coconut oil, VCO and charcoal shell as a by-product of copra and VCO production.

With the existence of several alternatives to the agro industry development of processed coconut products, it is necessary to make analytical tools to make decisions in choosing the priority of coconut products to be developed. Analytical Hierarchy Process (AHP) is one of the most frequently used methods in decision making. This method was developed to choose alternatives by organizing information. Complex unstructured issues can be simplified with AHP. The principle is to replace human perception with numerical values in making paired comparisons. The end result can determine which elements have high priority values (Piliang, *et al*, 2014).

AHP is used to solve a wide range of problems wherein decision making based on numerous parameters demand weighting of the parameters based on their importance for the given condition on a pairwise comparison means for each of the parameters under investigation (Chakraborty, *et. al*, 2016). Hence, in the AHP, the rating is carried out based on Saaty's proposal and ranked from 1 to 9, where 1 denotes the least contribution and 9 represents the highest contribution (Pandey, *et. al*, 2018). The ranking and the finalization of the criteria and the decision making comes from the user's knowledge, expertise, and acumen based on the previous work carried out and the literature available regarding the study.

Research on the development of prospective coconut processed products has been done many of them: analysis of the development of coconut derivative products in Gorontalo Province (SS, Indriyani, Dai, 2018) which analyzed coconut derivative products used AHP method from several alternatives and obtained coconut cooking oil products as the most potential products to be developed with a weight value of 0.370 and determination of prospective products from three superior products processed coconut in Indragiri Hilir Regency, Riau that determines the prospective products processed coconut using fuzzy group decision making techniques with the preference of multi expert multi criteria decision making (ME-MCDM) from three superior products and produce a prospective product to be developed is coconut oil.

This research aims to determine the prospective coconut processed products to be developed in The District of Sungai Geringgong Padang Pariaman District.

II. METHODS

The research conducted is a case study that is to observe and collect data through several data collection techniques and some data analysis techniques. Case study research is the study of phenomena in a real-life context, when the boundaries between phenomena in the context do not appear firmly (Aziz, 2003).

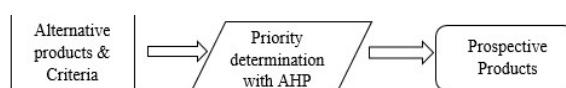
The location of the study was purposively selected as a deliberate sampling method for known reasons from the properties of the sample (Singarimbun dan Effendi, 1997). The research was conducted in Sungai Geringgong Sub-district Padang Pariaman District as a Sub-district that has the highest area of coconut plantations and coconut production in Padang Pariaman. The research was conducted in August 2020. The data was obtained from a direct review of the field on the research object and the provision of questionnaires for the relevant respondents. Respondents in this study are various parties who have a large contribution in the coconut agro industry, namely the chairman of the farmer group, the Trade Office of the Labor Cooperative and SMEs of Padang Pariaman Regency and the Chairman of the Padang Pariaman Regency Coconut Association. The determination of respondents was done deliberately (purposive sampling) based on the level of interest, knowledge, understanding and experience about coconuts in the Garinggong River. Interviews and questionnaires are the primary data in the implementation of this research.

The variables to be studied are internal factor variables (management and organization, marketing competencies, market structure faced, finance, production, and human resources) and external (demographics, economy, technology, politics and law, socio-cultural, suppliers, customers/consumers, competitors and communities), value added coconut products, coconut prospective products potentially developed in Sungai Geringgong District Padang Pariaman Regency.

Data types and sources are derived from primary and secondary data. Primary data is the data of interviews with respondents for weighting for AHP analysis. Secondary data obtained from the Central Statistics Agency, Directorate General of Plantation and literature studies on processed coconut products that have been developed.

Stages for the determination of prospective coconut processed products to be developed begin from descriptive analysis. This descriptive analysis is used as an initial analysis to describe the current condition of coconut product utilization. Indicators that will be analyzed descriptively are indicators related to the potential and utilization rate of coconut products. Indicators that can be analyzed descriptively are internal and external factors of coconut agro industry in Sungai Geringgong Sub-district Padang Pariaman District. So that the results of this analysis obtained the criteria of coconut processed products that are prospective to be developed. After determined criteria and alternative coconut products to be developed, then given weight by respondents according to their opinions and experience in the coconut agroindustry. The result of weighting by expert, then processed using expert choice 11 software with AHP method.

AHP sees the problem separately. One element is compared to the other based on a single criterion which is the decision process of pairing comparisons, as well as assisting in the preparation of problems, encouraging consideration/ assessment, and collecting or incorporating all considerations into priority alternatives from the best to the worst (Masruri, 2012). The higher the value obtained indicates that the variable or factor is more priority than other factors that have a lower value. The following is the architecture of the prospective coconut product determination system to be developed:



Picture 1. Prospective Coconut Product Determination System Architecture

The steps in the AHP method include (Saaty, 1993):

- a. Develop a hierarchy of problems faced
The problems that will be solved, broken down into elements, namely criteria and alternatives are then organized into a hierarchical system. The assessment of criteria and alternative criteria is assessed through pairwise comparison. According to Saaty (1993) for various issues, scales 1 to 9 are the best scales in expressing opinions.
- b. Priority determination
For each criterion and alternative, it is necessary to make a paired comparison. Relative comparison values are then processed to determine alternative ratings of all alternatives, both qualitative and quantitative criteria, can be compared according to predetermined assessments to produce weights and priorities. Weights or priorities are calculated by matrix manipulation or through solving mathematical equations.
- c. Logical consistency

All elements are logically grouped and consistently ranked according to a logical criteria. Matric weights obtained from the results of comparisons in pairs must have a cardinal and ordinal relationship. In the actual circumstances there will be some deviation from the relationship, so the matrix is not perfectly consistent. This happens because of inconstancy in one's preferences. If the consistency ratio ≤ 0.1 , the results of the data calculation can be justified.

The hierarchy structure for the determination of prospective coconut products can be seen in Figure2.

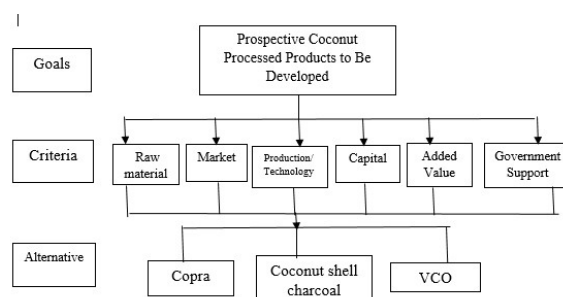


Figure 2. Hierarchy Structure of Coconut Processed Products

III. RESULTS AND DISCUSSION

1. Potential of coconut processed products in Sungai Geringgong Sub-district Padang Pariaman District

Coconut is the main commodity of plantation products in Sungai Geringgong Subdistrict. Beside being sold in the form of whole coconut, people began to process copra as the main raw material of coconut oil, VCO and Charcoal Shell as a by-product of copra and VCO processing. Copra is produced from the flesh of dried coconut fruit by drying or using an artificial dryer by smoking or heating indirectly. FAO and APCC reported that VCO production in the Asia Pacific region increased by 5%, it is stated that VCO in the local Indonesian market also increased after being introduced from the beginning of 2004 (FAO and APCC, 2015). With coconut production of 6,369.04 tons / year, it can be produced 2,229.15 tons of Charcoal Shell per year. It should be with high market share and high raw material potential, the processing of Charcoal Shell can be optimized. These three coconut processed products are the most potential products that can be developed into coconut agro industry in Sungai Geringgong District and market share for local and export is very open to coconut derivative products, especially copra, VCO, coconut meal and Charcoal Shell (Damanik, 2007).

2. Determination of prospective coconut processed products to be developed in Sungai Geringgong Sub-district Padang Pariaman District

After internal analysis, external and value-added analysis was done for the development of coconut agro industry in Sungai Geringgong Sub-district. Base on the analysis, criteria and three potential was obtained for coconut derivative products that can be developed, they are copra, VCO and coconut shell charcoal. From these three products, further analysis is carried out to see which coconut derivative products are the most potential to be developed in Sungai Geringgong Sub-district. The analysis used is Analytical Hierarchy Process to determine the weight of each criteria that will be used in determining prospective coconut processed products that can be developed. The stages of determining prospective coconut products to be developed in Sungai Geringgong sub-district are as follows:

2.1. Preparation of a prospective hierarchy of coconut processed products to be develop

External analysis and internal become a matrix in developing coconut processed agro industries in Sungai Geringgong Sub-district, because all aspects are affect the running of a business. After the analysis, criteria that become consideration in developing a business are resulted. The criteria that will be used in determining prospective coconut products to be developed are raw material criteria, market, production/technology, capital, added value and government support. After interviews with farmers, agro-industrial actors and related agencies, these criteria are considered as the most important by researchers in developing an agro industry, especially coconut agro industry in Sungai Geringgong Sub-district. This have the same result as Indriyani, Dai (2018) which conducts research on the analysis of the development of coconut derivative products in Gorontalo Province and used five aspects

in the preparation of the hierarchy, which are aspects of raw materials, market aspects, production aspects, capital aspects and aspects of government support.

2.2. *Assesment of criteria and alternative criteria through pairwise comparison*

After the preparation of the hierarchy to be assessed, an expert assessment of the criteria and alternatives has been determined. The research was conducted by experts who really understand the development of coconut agro industry and have a long experience of coconut agro industry. The selected experts consist of the chairman of the VCO Cahaya Fajar processing farmer group, the chairman of the Padang Pariaman Regency coconut association and the Head of SME development from the Department of Trade, Cooperatives, Labor and SMEs. The following is a comparison of processed coconut products judging from the various criteria that have been selected:

2.2.1. Comparison of coconut products based on raw material criteria

The results of comparison analysis of each alternative coconut processed products that are prospective to be developed from the criteria of raw materials can be seen in Figure 3 below:

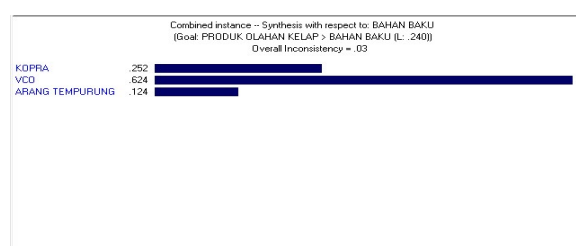


Figure 3. Synthesis result alternative coconut processed products seen from the criteria of raw materials

Based on the results of the analysis in the figure above, it appears that from the condition of the availability of raw materials and the quality of raw materials, respondents chose VCO coconut processed products as a priority. The value of VCO interest weight is 0.624 and copra has a weight of 0.252 while for coconut shell charcoal has a weight of 0.124. The inconsistency value of this assessment is 0.03, meaning that the data is acceptable because the value is less than the inconsistencies provision limit of 0.1. Respondents chose VCO with a higher level of importance than other processed products for raw material criteria because VCO requires coconut grain raw materials that are of better quality than copra and shell charcoal. The coconut needed is an old coconut that matures in a tree with a coconut size larger than the raw material for copra and charcoal shells. Another consideration of respondents is with the availability of large land and high production of coconut produced in Sungai Geringgong Sub-district is coconut that have better quality than neighboring provinces in producing VCO.

2.2.2. Comparison of coconut processed products based on market criteria

Based on the results of the analysis in figure 4, it appears that from market conditions, respondents chose VCO coconut processed products as a priority. The value of VCO interest weight is 0.656 and copra has a weight of 0.208 while for coconut shell charcoal has a weight of 0.136. The inconsistency value of this assessment is 0.01, meaning that the data is acceptable because the value is less than the inconsistencies provision limit of the AHP method of 0.1. Respondents chose VCO with a higher level of interest than other processed products for market criteria because VCO already has market share at home and abroad. VCO is needed as a raw material from the cosmetic industry and pharmaceutical industry and even VCO began to be used as a healthier cooking oil. While copra already has copra and charcoal shells also have a market structure but further developed so that the product can develop in domestic and overseas market share.

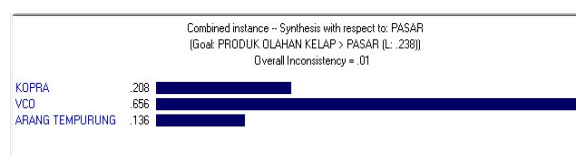


Figure 4. Synthesis result of prospective coconut processed products to be developed judging by market criteria

2.2.3. Comparison of coconut products based on production/ technology criteria

Based on the results of the analysis in figure 5, it appears that from the production/technology criteria, respondents chose VCO coconut processed products as a priority. The value of VCO interest weight is 0.664 and copra has a weight of 0.178 while for coconut shell charcoal has a weight of 0.158. The inconsistency value of this assessment is 0.01, meaning that the data is acceptable because the value is less than the inconsistencies provision limit of the AHP method of 0.1. Respondents chose VCO with a higher level of importance than other processed products for production/technology criteria because to make VCO required knowledge and experience so that the resulting VCO has a high selling value and to produce VCO with large capacity required technology such as processing machinery. Unlike copra processing which in its production doesn't required technology because it still used sunlight and sulfur for the drying process. As for charcoal shells in production still use traditional methods by burning directly, so that this coconut processed product has a low weight value compared to the other two products.

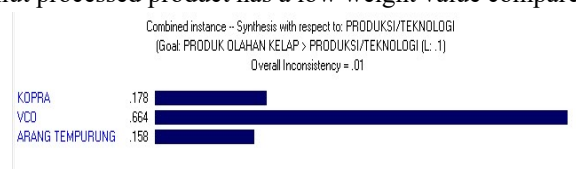


Figure 5. Synthesis result of prospective coconut processed products to be developed judging from the criteria of production / technology

2.2.4. Comparison of coconut products based on capital criteria

Based on the results of the analysis in figure 6, it appears that from the capital criteria, respondents chose VCO coconut processed products as a priority. The value of VCO interest weight is 0.643 and copra has a weight of 0.223 while for coconut shell charcoal has a weight of 0.134. The inconsistency value of this assessment is 0.03, meaning that the data is acceptable because the value is less than the AHP method inconsistencies provision limit of 0.1. Respondents chose VCO with a higher level of interest than other processed products for capital criteria because to develop VCO agroindustries it takes a large capital especially for the purchase of machinery so that VCO processed products have a higher level of interest than copra and coconut shell charcoal in the capital criteria. As for copra processed products have a higher weight value than charcoal shell, because for copra processing it takes fund for shelters for drying process of copra if it wants to produce in a bigger capacity.

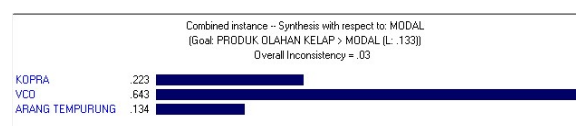


Figure 6. of prospective coconut processed products to be developed judging by capital criteria

2.2.5. Comparison of coconut products based on added value criteria

Based on the results of the analysis in figure 7, it appears that from the value added condition, respondents chose VCO coconut processed products as a priority. The value of the VCO interest weight is 0.666 then the charcoal shell has a weight of 0.204 while for copra has a weight of 0.130. The inconsistency value of this assessment is 0.06, it's mean that the data is acceptable because the value is less than the AHP method inconsistencies provision limit of 0.1. Respondents chose VCO with a higher level of importance than other processed products for value-added criteria because in the processing of coconut into VCO has a higher advantage compared to copra and coconut shell charcoal. This is together with the previous value-added analysis, which showed that VCO has an added value of Rp 13,400/Kg and with a corporate profit rate of 94,815%. For the assessment of respondents' weight is different from the results of value-added analysis of copra coconut processed products and shell charcoal, copra has added value and a greater profit rate compared to shell charcoal. Copra added value of Rp 2,610,003/Kg with company profit of 91,203% while shell charcoal has added value of Rp 1,136,756/Kg with a corporate profit of 86,614%. Respondents assumed that for the development of coconut agro industry charcoal products should be shell in a higher added value if the processed are using modern or traditional pyrolysis tools so it can produce by-products when burning charcoal such as liquid smoke and tar and coconut shell charcoal can be processed into briquettes that have a higher selling value in the market.

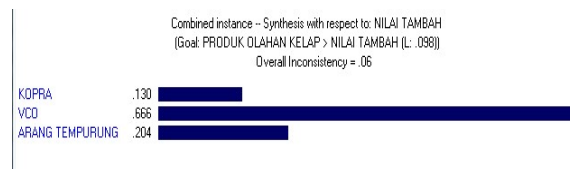


Figure 7. Synthesis result of prospective coconut processed products to be developed judging by the value-added criteria

2.2.6. Comparison of coconut products based on government support

Based on the results of the analysis in figure 8, it appears that from the criteria of government support, respondents chose VCO coconut processed products as a priority. The value of VCO interest weight is 0.594 and copra has a weight of 0.249 while for coconut shell charcoal has a weight of 0.157. The inconsistency value of this assessment is 0.01, it's mean that the data is acceptable because the value is less than the inconsistencies provision limit of the AHP method of 0.1. Respondents chose VCO with a higher level of interest than other processed for government support criteria because VCO processing in Sungai Geringgong Sub-District has received some support from the government although it's still few, one of which is the Cahaya Fajar farmer group that has processed VCO with a capacity of 4 tons a month is the largest VCO agro industry that gets support fund from the district government. Then followed by copra and coconut shell charcoal that has a weight value far from the weight value of VCO because government support for these two products is still not maximal, especially in Sungai Geringgong district which has copra agro industry and charcoal shell has no support from the government.

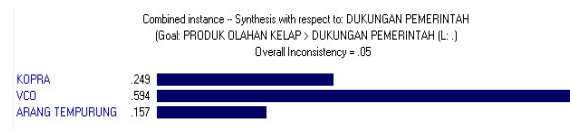


Figure 8. Synthesis result of prospective coconut processed products to be developed judging by government support criteria

2.3. Determination of prospective coconut processed products to be developed in Sungai Geringgong Sub-district

The synthesis result of the analysis using AHP method for the determination of prospective coconut processed products to be developed in Sungai Geringgong sub-district using the criteria previously presented can be seen in Figure 9 and Figure 10 below:

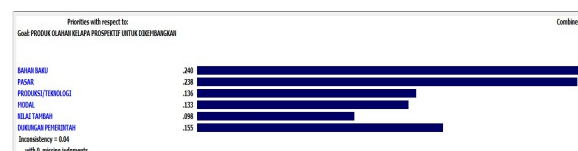


Figure 9. Synthesis result of respondents to the criteria of prospective coconut processed products to be developed

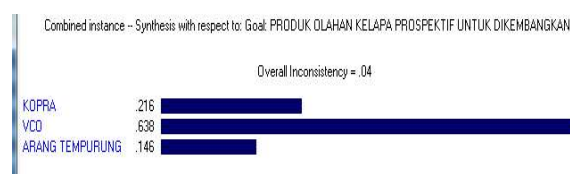


Figure 10. Synthesis result of respondents to alternative coconut processed products that are prospective to be developed

From the figure, the weight of each criteria and alternatives by respondents in the analysis using AHP with the help of software. It appears that the weight value of the criteria that has the highest value is the raw material criteria 0.240 and then the market criteria 0.238, the government support criteria 0.155, the production/technology criteria 0.136, the capital criteria 0.133 and the value-added criteria 0.098. The consistency value of weight assessment by respondents on the criteria weight of 0.04 which means that respondents have an average consistency of assessment on each criteria weight of 0.04 so that the data can be justified in accordance

with the opinion of Saaty (1993) that If the consistency ratio of ≤ 0.1 , the results of the data calculation can be justified. Weight assessment is obtained from the assessment of the average weight of respondents who choose raw material criteria and market criteria that have the highest level of interest than other criteria. This is because Sungai Geringgong which has the largest land area and the largest coconut production becomes as well as the market of processed coconut products that have been formed and that need to be developed for the coconut agroindustry in Sungai Geringgong. The results of this study are different from the research conducted by Indriyani, Dai, 2018 which has a capital aspect weight of 0.362 and a market aspect of 0.323 as the highest aspect weight given by respondents. The following is a performance diagram image of the goal of coconut processed products that are prospective to be developed:

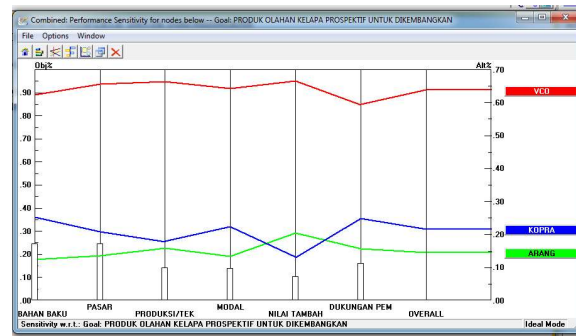


Figure 11. Performance diagram of prospective coconut processed product goals to be developed

The results of the analysis for alternative weights assessed by respondents can be seen in the figure that VCO processed products have the highest alternative weight compared to 2 other products. The average weight value of VCO is 0.638, then copra product is 0.216 and charcoal shell is 0.146. The average consistency of this alternative is 0.04 which means that the value of these weights is justified. The results of this analysis are almost the same as the research of Indriyani, Dai, 2018 which has an alternative weight of coconut cooking oil of 0.370, copra products of 0.285 and shell charcoal products of 0.182. Of all the criteria previously presented, VCO products have the highest weight value on all criteria compared to copra and shell charcoal products. This makes VCO as a priority coconut processed product that is prospective to be developed in Sungai Geringgong Padang Pariaman District.

IV. CONCLUSION

The potential development of coconut processed products in Sungai Geringgong subdistrict is still wide open, this is due to the wide availability of land and the availability of abundant raw materials. From several alternative coconut processed products that are prospective to be developed based on the criteria and assessment of expert respondents, the VCO product is a potential product of processed coconut that is prospective to be developed in Sungai Geringgong Sub-district. VCO products have advantages with high importance values in all criteria. While the criteria of the highest level of interest according to experts in determining the prospective coconut processed products to be developed are the criteria of raw materials, markets and government support. When compared to some previous research in other areas, VCO has never been selected as a prospective coconut processed product.

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