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UNIVERSITAS BRAWIJAYA**

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Feasibility study of small scale ginger essential-oil agro-industry using indirect steam distillation

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Abstract. Indonesia is well known as one of main volatile-oil producers especially for patchouli, nutmeg, and clove, and also ginger (*Zingiber officinale* Rosc). The purpose of this research was to study the feasibility of small scale ginger essential oil agroindustry based on several aspects namely market, technical, and financial aspect. The method to be used in this research was descriptive method. Information and data obtained would be processed and analyzed based on market aspect, processing aspect, and financial aspect. The results showed that small scale ginger essential-oil agroindustry using indirect steam was feasible due to the increasing trend of essential-oil demand in market aspect; increasing trend of the raw material availability and high yield of ginger essential-oil using indirect steam system in processing aspect; and Rp. 733,294,087.29 of NPV, 1.281 of Net B/C; 15% of IRR of 15%, and 1.69 years of PP in financial aspect..

1. Introduction

Essential oils are one of the world's natural products that is widely used as basic ingredients for medicines, perfumes, food flavor and preservatives, aromatherapy, vegetable pesticides, and so on. The usefulness of various essential oils causes essential oils become one of the export commodities that generate high devisa for Indonesia that reached US\$120,000,000, while the world essential oil trade value was estimated at USD 4,000,000,000 [1]

Essential oil products from Indonesia were known dominant in the world market. Indonesia has even become the main supplier of 3 commodities namely patchouli oil which is widely used in the perfume industry, nutmeg oil as one of the ingredients for making cola drinks, and clove leaf oil. Data from the Indonesian Essential Oil Council (DAI) showed that patchouli oil from Indonesia supplid 90 percent of world market, followed by nutmeg oil around 80 percent, meanwhile clove leaf oil supplied 70 percent [1].

In addition to these 3 commodities, ginger is popular in Indonesian society because ginger has health benefits because it contained around 2-3% of essential oil, starch resin, organic acids, malic acid, oxalic acid and gingerin. The main components of ginger essential oil that produced distinctive aroma of ginger were zingiberen, gingerol, shagaol, and resin [2].

Eventough ginger has good prospect to be further proceesed into essential oil using destillation process, the ginger farmer mostly sold in in form of fresh ginger or simple ginger products in form of sliced and dried. Therefore, this research conduct feasibility study of small scale ginger essential oil agroindustry using indirect steam based on market, processing, and financial aspects [3].

2. Materials and Methods

1. Research Design

Research design was used descriptive method and focused on problem solving using quantitative and qualitative data that were obtained from experts, questionnaire, and related *literatures*.



2.1. Market Aspect

Market aspect was conducted using essential oil market data from related sources and would be analyzed by appropriate forecasting method [3]

2.2. Processsing Aspect

Processing aspect was conducted using raw material availabilty data from related sources and ginger essential oil destillation yield data from destillation process of ginger using small scale destillation model using indirect steam (200 kg of raw material capacity).

2.3. Financial Aspect

Financial aspect was conducted using NPV, IRR, Net B/C, and PBP value of small scale ginger essential oil agroindustry [3]

3. Results and Discussion

3.1. Market Aspect

The result of ginger essential oil market aspect analysis showed that Indonesia export amount and value of essential oil, cosmetics, and perfumes were increase from US\$ 637 in 2015 became US\$ 694 in 2016 and then US\$ 716 in 2017 [5].

The other condition that supported the market aspect of ginger essential oil was the price of ginger oil in the European market from China was quite high, ranging from US\$ 42 per kilogram, meanwhile ginger essential oil from India was US\$ 105 per kilogram [6]. With such a high price, it also gave an opportunity that ginger essential oil from Indonesia could match the value of the ginger essential oil from India.

Based on this condition, market potential for essential oil, included ginger essential oil, still available and there were opportunity to increase in the future.

3.2. Processing Aspect

The result of ginger essential oil processing aspect analysis showed that ginger as raw materials was relatively increased in amount based on harvest area (Tabel 1)

Tabel.1. Ginger harvest area in Lampung Province (Year 2012-2016) [7]

Year	Harvest area (ha ²)
2012	127.45
2013	175.11
2014	245.31
2015	175.80
2016	103.66

By using a model of small scale indirect steam distillation with 200 kg raw material of capaciyy showed that the the average yield of ginger essential oil was 2.16 percent (0.8841 of density) (Figure 1).

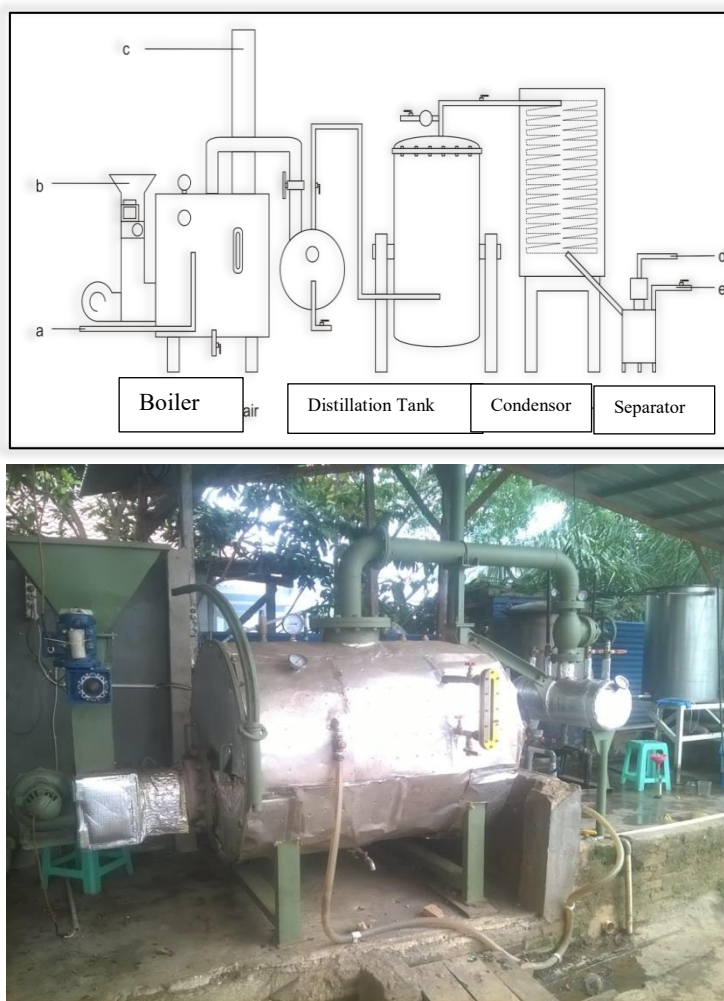


Figure 1. Schematic and Distillation Unit using Indirect Steam Model

3.3. Financial Aspect

The result of financial aspect analysis showed that small scale ginger essential oil agroindustry using indirect steam was feasible with Rp 736,665,862,00 of NPV; 1.28 of Net B/C, 14 percent of IRR, and 1.78 year of PP. The result of sensitivitas analysis showed that the project was feasible if raw material price increased up to 20 percent and product price decreased up to 14 percent.

4. Conclusion

Small scale ginger essential oil agroindustry using indirect steam was feasible based on market aspect namely increased of essential oil export value and high price of similar ginger essential oil; processing aspect namely availability of raw materials and relatively high yield of ginger essential oil produced, and financial aspect with value that meet the standard.

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