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The downstream potential of pineapple derivative products

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Abstract. Pineapple (*Anenas comosus* L. Merr.) is a fruit plant that has long been widely recognized by the public. This plant is quite easy to cultivate, and Indonesia's climate is very suitable for growing it. Given that pineapple is a commodity that has a high economic value, it is necessary to look for strategies for developing pineapple in the hope of increasing farmers' incomes so that it can ultimately improve the economy of the community. This research is a type of descriptive research that uses external data. The results of the analysis of this study indicate that the downstream pineapple processing industry has enormous potential. With so many types of pineapple derivative products, the community or farmers have many choices to do pineapple-based production activities and have the opportunity to get a global market share. Pineapple production increased from 2016 to 2018. This increase is proportional to the increase in exports of pineapple commodities to all export destination countries. In increasing downstream pineapple derivative products, seriousness from the government and entrepreneur is needed in solving problems that often occur such as farm management, land ownership, capital, farmers' culture, unbalanced fertilization, and limited market access.

1. Introduction

Pineapple (*Anenas comosus* L. Merr) is a fruit plant that has long been widely recognized by the public. This plant is quite easy to cultivate, and Indonesia's climate is very suitable for growing it. Pineapple plant growing on Indonesia is very diverse, diverse this is a source of germplasm which is very beneficial to the development program pineapple plant breeding [16]. Pineapple export volume is so large that Indonesia became the largest pineapple exporting country in the world until early 2012 [1]. The increase in canned pineapple exports also continues to increase along with the increase in demand, especially by the United States, Japan, the Netherlands, and European countries. While nationally in 1992 there were 18,597 ha of pineapple planted areas spread throughout Indonesia which meant an increase in demand, but the main production centers were North Sumatra, South Sumatra, Lampung, West Java, East Java, North Sulawesi, and Central Kalimantan. The area of smallholder pineapple plantations reaches 47% of 3.74 million ha and involves more than three million farm households. Pineapple development also opens additional job opportunities from the processing of derivative products and by-products which are very diverse in types [1].

Indonesia has agricultural commodities that are in demand by export markets, one of which is pineapple. According to Worldatlas.com, Indonesia is the 9th largest pineapple producer in the world with a production of 1.39 million tons per year. The world's largest pineapple producer is

Costa Rica. Its production reaches 2.93 million tons per year. In second place is Brazil, with pineapple production of 2.69 million tons per year. The Philippines is the third-largest producer of pineapple in the world, with production reaching 2.61 million tons per year. Other studies have shown that Western demands lead to innovation at the producer end of international supply chains and changes in governance structures towards chain coordination and vertical integration in developing countries [7].

Pineapple (*Anenas comosus* L. Merr) is one of the tropical fruits that are in great demand both domestically and abroad. Pineapple is generally consumed in the form of fresh or table fruit, but can also be enjoyed in the form of juice as a fresh drink or in the form of processed product such as *dodol*, pineapple chips and jam. In pineapple, bromelain acid enzymes that are beneficial to health include reducing blood pressure, cleaning blood, improving digestion, inhibiting the growth of cancer cells, and increasing the body's defense system. Pineapple consumption could reduce plaque index in children aged 10-12 years old [15]. Consumption of pineapple during pregnancy maternal morbidity and fetal health problems can be prevented through appropriate processing of foodstuffs [17]. In the food sector, pineapple can also be used for biscotti with local flavors [18]. In the field of animal husbandry, a solution of pineapple at a concentration of 0.5% can increase the degree of fertilization and hatching of *baung* fish eggs [20]. The more preferred products were fresh pineapple, pineapple pie, jelly, sweets, jam, chips, juice, nata de pina, candy, syrup, and stick [23].

Pineapple is a commodity that is proven to have sufficient market opportunities both at home and abroad. At present marketing of pineapple is not only in the fresh form but also in the form of processed food, for example, fresh pineapple but also in the form of processed food, such as canned pineapple, nata de pina, *dodol* and others. Indonesia's fresh pineapple exports from 1987 to 1990 continued to increase with an average growth rate of 287.83%. Pineapple export volume is so large that Indonesia became the largest pineapple exporting country in the world until early 2012 [1]. The increase in canned pineapple exports also continues to increase along with the increase in demand, especially by the United States, Japan, the Netherlands, and European countries.

The exact time of harvest needs to be known so that it can be marketed in good condition. In addition to maintaining fruit quality, proper mastery of post-harvest technology is needed so that fruit prices do not fall. The agribusiness system is the biggest contributor in the formation of Gross Domestic Product (GDP), opportunities for employment opportunities and participation in increasing exports. The results of the Ministry of Agriculture's analysis (2001) stated that the contribution of the agribusiness system in GDP reached around 48%, in the employment of up to 77%, and in total exports accounted for 50 - 80% of the value of non-oil exports. The agribusiness system also has an important role in environmental preservation because it is able to smooth the population distribution and all its activities so that it can prevent excessive population pressure in certain areas, population pressure and excessive activity only in certain areas can cause an imbalance of the ecosystem due to excessive exploitation so that it can damage the environment of the area.

One of the commodities identified as having great business potential to achieve these goals is pineapple. Harvested area in Indonesia ± 165,690 ha or 25.24% of the national fruit harvest target (657,000 ha). In the last few years, the area of pineapple plant ranks first in 13 types of commercial fruits that are cultivated in Indonesia [4]. Pineapple in addition to fresh consumption can also be processed into a variety of food and beverage products, such as canned pineapple, jam, dried food, juice, spirit/solvent, jam variety, juice, chips, syrup, *dodol*, concentrate, cocktail, etc. The use of pineapples in industrial products that have added value is only a small part realized in the form of industry. In addition, waste or by-products of pineapple fruit and leaf skins have not been widely used for the food, paper and textile industries [2]. One type of potential natural fibers are pineapple leaf fiber. result of a study showed that fabric with the proportion of 50% pineapple leaf yarn: 50% cotton had a higher value of tensile strength [21]. Besides being used as an adsorbent, high cellulose content in pineapple leaves can be used as pulp mix material in papermaking [22].

Considering that pineapple is a commodity that has high economic value, it is necessary to look for strategies for developing pineapple in the hope that it can increase farmers' incomes so that they

can ultimately realize the welfare of farmers. Therefore, this research was conducted with the aim of knowing the potential downstream of pineapple derivative products.

2. Methods

This research is a type of descriptive research which aims to illustrate the potential downstream of pineapple derivative products. The data used in this study are external data, that is, the data from the Central Statistics Agency are processed to illustrate information related to pineapple potential. Descriptive analysis of the studies using the curriculum as a descriptive and published at the Curriculum Inquiry journal [6].

3. Results and discussion

3.1. Pineapple commodity production

If a country exports more than imports, the country's national income will increase so that it will have a positive effect on economic growth [19]. In Indonesia, people have long been planting horticultural crops such as pineapple because it is very supportive of the climate and geography in Indonesia. Pineapple cultivation is considered an opportunity to develop processed pineapple production and can also improve the regional economy. In general, farmers or the community still many are cultivating pineapples independently. However, in addition, there were also those who received assistance in the form of funds and guidance from private companies through the Corporate Social Responsibility (CSR) program or related institutions. Based on statistics Indonesia data pineapple production in Indonesia has increased in 2018 compared to the previous year as shown in figure 1.

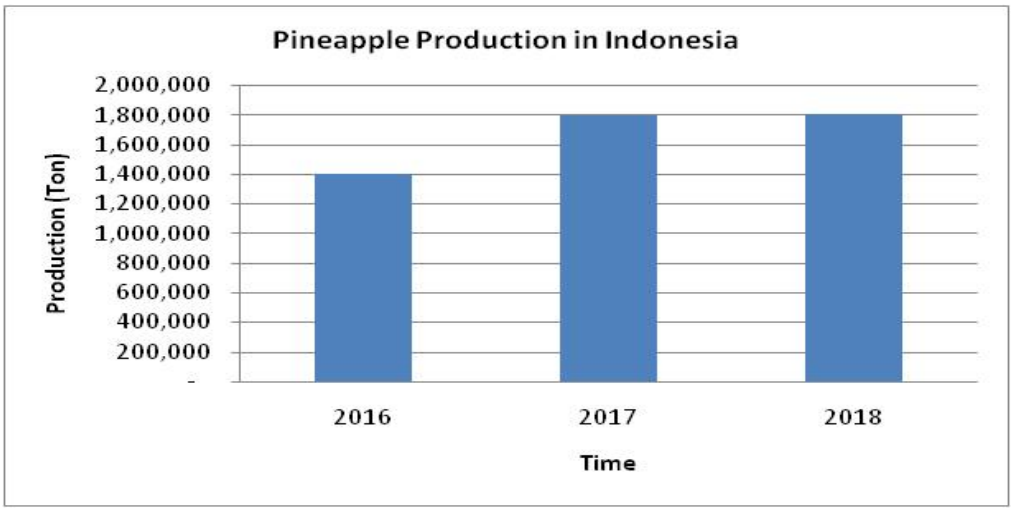
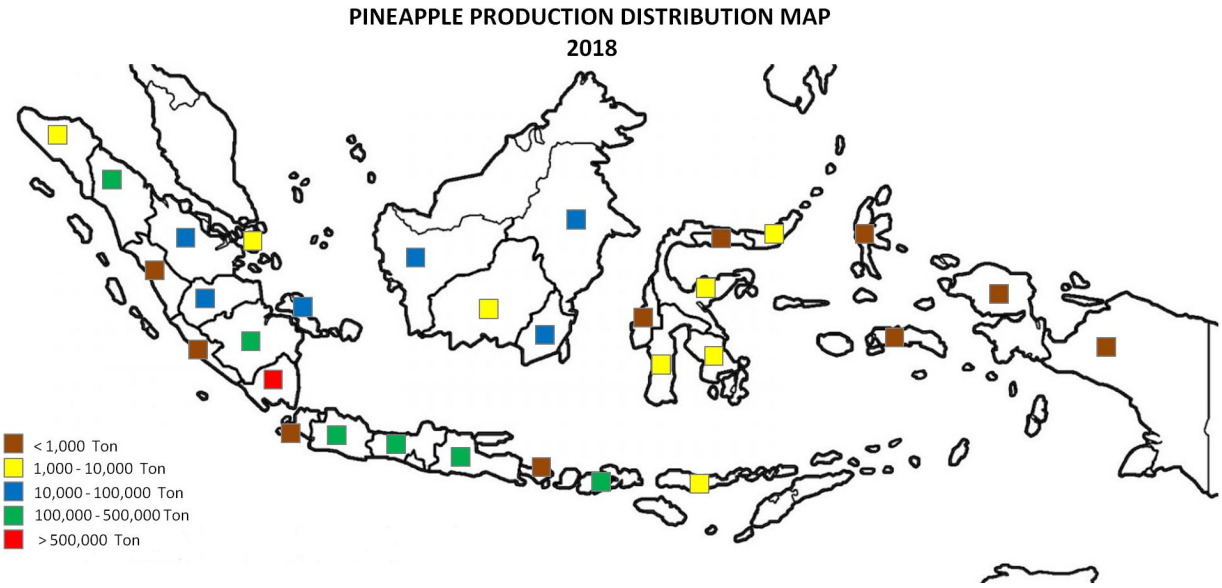


Figure 1. Pineapple production in Indonesia.

Based on data from pineapple production in 2016 - 2018, pineapple production in 2016 amounted to 1.39 million tons to increase to 1.80 million tons in 2018 with an average growth of 14.58% per year. The spread of pineapple plants in Indonesia is almost evenly found in the whole area, because of the region Indonesia has a diversity of agro-climates that allows the development of various types of plants, both plants tropical horticulture and horticulture subtropical. There are several areas that are become a pineapple production center, including South Sumatra, Lampung, West Java, North Sumatera and Java East. The area is an area compatible with the agro-climate pineapple cultivation. The data is a contribution from all regions in Indonesia whose distribution is shown in figure 2.



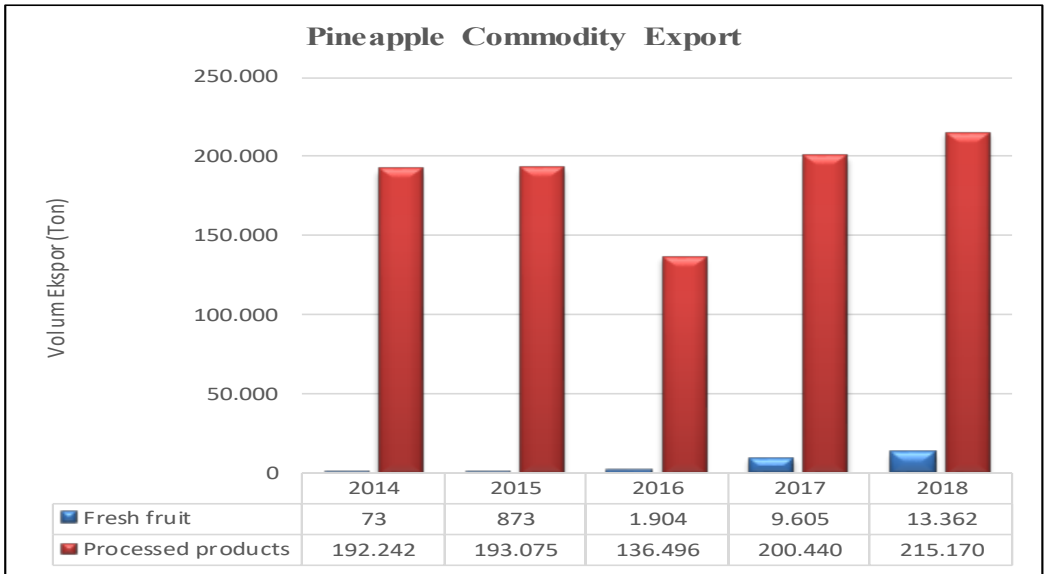
Source: Statistics Indonesia

Figure 2. Pineapple production distribution map in 2018.

Based on the distribution of pineapple production in figure 2, it shows that Indonesia has great potential to undertake pineapple processing industry activities. Almost all provinces in Indonesia produce pineapple according to the type or character in their respective regions. each region does not always have the same type of pineapple. For example, Pemalang regency is one district that has good potential for planting honey pineapple, due to the geographical location on the slopes of Mount Slamet with its sandy soil able to absorb more water and good for the growth of honey pineapple [24]. in another area, Kediri district, pineapple cultivation has produced two varieties superior pineapples are queen and cayenne types [26].

3.2. Pineapple commodity export opportunities

Indonesia is one of the potential natural resource-producing countries, including agricultural sector resources. Although Indonesian fresh pineapple export competitiveness is based its market share is still relatively small compared to others producers and exporters of fresh pineapple [25]. The agricultural sector is expected to be able to provide fields work, provide raw materials for industrial agricultural products and increase foreign exchange earnings in countries by increasing the volume and value of agricultural exports [14]. Indonesian pineapple export conditions based on statistics Indonesia data are shown in figure 3. The export value of pineapple commodities in the form of fresh and processed products has increased by 8.8% in 2018 compared to 2017. In general, the exported products are processed pineapple products, namely as much as 94% of total exports in 2018. This shows that the need for pineapple-based products in importing countries has increased. Countries importing pineapples and their processed products with a significant amount of imports include the United States, Spain, the Netherlands, Germany, Japan, Hong Kong, Singapore, Saudi Arabia, Australia, Mexico, and Argentina.



Source: Statistics Indonesia

Figure 3. Pineapple commodity export data.

The RCA index shows that Indonesia is superior to the Philippines in several countries such as the Netherlands, Germany, Singapore, Spain and Argentina for pineapple commodities. The ISP and IIT indices show that Indonesia has a tendency as an exporting country [11].

3.3. Development of pineapple-based products

Based on the pineapple industry tree shown in figure 4, it explains that there has been very much pineapple-based product development. Thus, the pineapple producers will have many choices in producing products that are in accordance with the planned capacity and targets. The Pineapple industrial tree in figure 4 describes derivative products from pineapple [12].

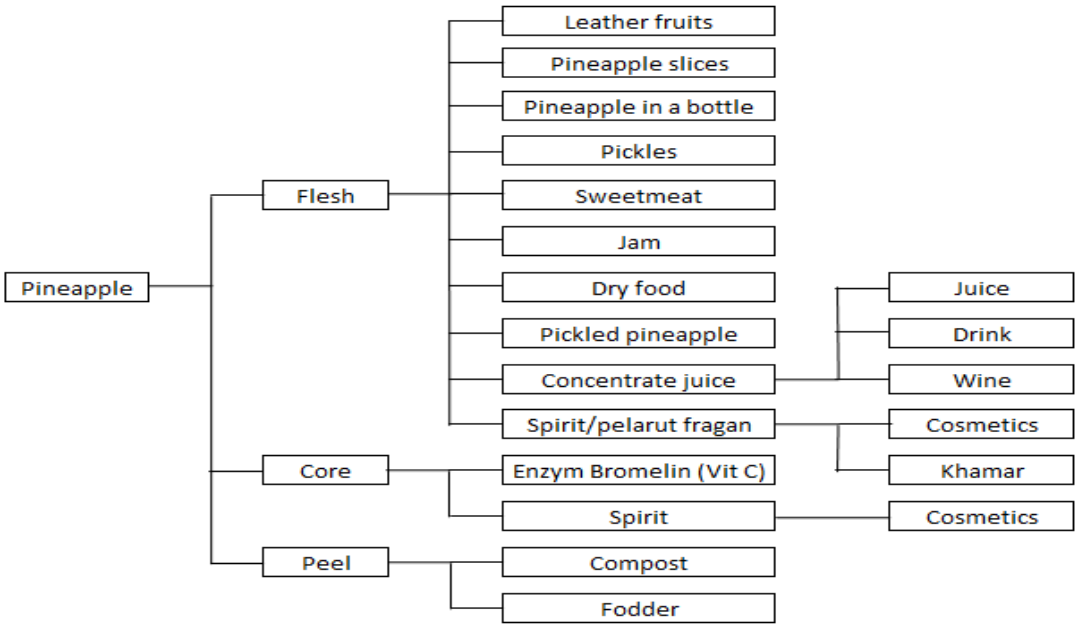


Figure 4. Pineapple industrial tree.

In the implementation of the development of pineapple-based products, it needs to be supported in terms of guidance and loan funds to pineapple farmers. Guidance by government agencies or the private sector that is carried out on an ongoing basis will greatly affect the progress of small and medium industries that process pineapple-based products such as the dissemination and technical guidance of appropriate technology for efficient and effective production activities. The quality of pineapple is one of the most concerning things in industry. The proposed system is promising to be applied to predict the internal quality of pineapples non-invasively [8]. Other studies have also concluded that pineapple bark waste can be used as liquid fertilizer. Liquid Organic Fertilizer from pineapple bark waste contains nutrients such as Phosphate, Potassium, Nitrogen, Calcium, Magnesium, Sodium, Iron, Manganese, Cu, Zn and Carbon [9]. Pineapple weevil can be used as a natural disinfectant because it has antibacterial compounds [13].

3.4. Pineapple processing industry in Indonesia

In Indonesia, there are several industries that produce various kinds of processed pineapple products. Some industries that produce processed pineapple products are shown in table 1.

Table 1. Companies producing processed pineapple.

Company name	Product	Location
PT. Great Giant Pineapple	Pineapple slices	Lampung
PT. Riau Sakti United Plantations	Pineapple slices	Riau
Pina Pineapple	Juice	Jawa Barat

One of the companies is PT. Great Giant Pineapple which is an agro-industrial company engaged in plantation and canning pineapple. Products produced by PT. GGP include canned pineapple, juice, and pineapple concentrates and other fresh fruits that have been marketed to more than 60 export destination countries. From this information, it can be explained that the potential of the pineapple commodity downstream industry is very promising and can improve the economy of the community, especially pineapple farmers.

3.5. Downstream industry challenges

The results of a study explain that there are several problems in developing the pineapple processing industry including [5]:

1) Farm Business Management
2) Land Ownership
3) Capital / Capital Money
4) Farmer Culture
5) Unbalanced Fertilization
6) Limited Market Access

The needs to be solved by all relevant parties so that efforts in increasing downstream pineapple derivative products can run more optimally. The pineapple marketing system is also a challenge for farmers. the results of research [10] showed that there are eight channels formed. In general, all of the marketing channels of Bogorinarian Pineapples had not been efficient. The major marketing channel is farmers-rural collectors-retailers-consumers which has low farmer's share and the price at the farm level [10]. One of the problems in pineapple cultivation in Indonesia is there are no seed producers that can provide quality seeds large quantities, in a short time [27]. This problem needs special attention from the government.

4. Conclusion

Based on the analysis, it can be concluded that the downstream pineapple processing industry has enormous potential. With so many types of pineapple derivative products, the community or farmers have many choices to carry out pineapple-based production activities and have the opportunity to gain global market share. Pineapple production experiences a positive trend, namely

an increase from 2016 to 2018. This increase is proportional to the increase in exports of pineapple commodities to all export destination countries. The increase in pineapple exports shows that the demand for pineapple-based products in importing countries has increased. In increasing downstream pineapple derivative products, seriousness from the government and business entrepreneurs is needed in solving problems that often occur such as farm management, land ownership, capital / money capital, farmers' culture, unbalanced fertilization, and limited market access.

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