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Agro-industrial revitalization policy of cane sugar in jember regency

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Abstract. Sugar is one of the essential basic needs. Sugar self-sufficiency that is expected to be achieved is faced with various challenges in terms of on-farm, off-farm, management, and involving players in the review industry. The development level of strength and readiness for sugar self-sufficiency and competition in the current industry, As well as efforts to overcome these problems, can be carried out in research in the form of agro-industrial revitalization policies for cane sugar in the Jember Regency area. Limitation of this scope, a system approach is needed to build a model that can represent the sugar industry system in East Java, specifically in the Jember Regency area with existing dynamics, to increase the sugar production and income of sugarcane farmers in the Jember Regency. The population in this study is a sugar factory that is still operating. The sample size is determined by the existing conditions: two sugar factories in the Jember Regency area, namely SF Semboro and SF. Jatiroto. The built model is hoped to be simulated to produce appropriate policy recommendations.

1. Introduction

Sugar is one of the essential basic needs. The sugar industry absorbs labor, has a forward and backward linkage, and improves welfare [1], [2]. The per capita sugar consumption of the Indonesian population is 14.5 kg per capita per year. Due to the increase in the population consuming sugar, developing countries need an increase in production by 1.5 times to meet their sugar needs. The highest sugar consumption increase in Asia is 6 percent per year [3], [4]. The need for sugar in the national confectionery system is divided into direct consumption (households) and indirect needs (food, beverage, and pharmaceutical industries). The need for sugar for direct consumption in the community is met by White Crystal Sugar (WCS), and indirect consumption (industry) is met by Refined Crystal Sugar (RCS) [5]. Declining sugarcane production, increasing sugar consumption, and low SF efficiency (compared to other countries) are significant problems for which a solution needs to be sought. The reason is that sugar is an essential food ingredient for the people of Indonesia, and the government is obliged to provide enough sugar. Sugar is also a strategic item, and a staple food ingredient based on the Decree of the Minister of Industry and Trade No. 115/MPP/KEP/2/1998).

The sugar self-sufficiency target cannot be separated from the contribution of sugar-contributing regions in Indonesia. One of the largest sugar producers in Indonesia is East Java Province. As a sugar



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contributor, East Java controls sugar production of 49.22 percent with sugar production in 2011 of 1.05 million tons. While other provinces that are also the largest producers of sugar are Lampung at 29.70 percent, Central Java at 8.57 percent, West Java at 4.25 percent, and other provinces at 8 percent [6]. The central government to achieve national sugar self-sufficiency, issued a policy/program for the Revitalization of the National Sugar Industry (NSIR). The NSIR program is one of the government's flagship programs in the context of national sugar self-sufficiency from 2010-2025. NSIR is expected to increase national sugar production for direct consumption. East Java is the largest sugar producer, supported by 31 SF or as much as 50 percent of SF owned by SOEs is found in East Java. As a sugar production center, East Java is expected to be an area that can contribute to increase sugar production so that it can support the achievement of national sugar self-sufficiency. To achieve sugar self-sufficiency, the central government gave a target for East Java to increase its sugar production to 1.65 million tons.

However, sugar self-sufficiency that is expected to be achieved is faced with various challenges in terms of on-farm, off-farm, management, and involving players in the review industry. Such as the government, sugarcane farmers, and the SF itself. To limit the existing scope, a system approach is needed by building a model that can represent the sugar industry system in East Java, specifically in the Jember Regency area with existing dynamics, to increase the sugar production and income of sugarcane farmers in Jember Regency. It is hoped that the built model can be simulated to produce appropriate policy recommendations. To be able to develop the level of strength and readiness for sugar self-sufficiency, and competition in the current industry, as well as one of the efforts to overcome these problems, a study can be carried out in the form of a policy of agro-industrial revitalization of cane sugar in the Jember Regency area.

2. Literature review

2.1. National sugar industry revitalization policy

The National Sugar Industry Revitalization Policy Program (NSIR) is one of the government's flagship programs in the context of national sugar self-sufficiency in 2014. To support the success of the NSIR program, the implementation of the program needs to get support from various parties. This is because the NSIR program covers various sectors, ranging from the revitalization of the on-farm and off-farm sectors, research, and development of the sugar sector, improvement of human resources (HR) aspects, to consistent policy support, to sugar marketing strategies. The concept of the revitalization of the sugar industry is directed at four main aspect improvements including (1) increasing sugar production by expanding sugarcane planting area and increasing productivity, (2) rehabilitating sugar mills (SF) by amalgamating 12 SF to 4 SF, and increasing milling capacity from a capacity of 126,718 Tons of Cane per Day (TCD) to 175,850 TCD, as well as increasing factory efficiency, and improving the quality of production results, (3) empowering research and development by setting research and development funds at 2.5 percent of the net profit of each sugar SOE, (4) improving the quality of human resources with various training and training programs, to increase HR productivity and Action Plans [7].

In line with the Sugar Industry Cluster Development Roadmap in 2010, according to the Ministry of Industry in general, the problems faced by the sugar industry include on-farm and off-farm. On the on-farm side, the problem that is quite prominent is the low level of sugar productivity and land availability in Java which is displaced by other commodities and land use change. On the off-farm side, many SFs are technically old so there is a decrease in plant efficiency that requires equipment replacement. Many SFs have suboptimal levels of productivity.

2.2. Sugar self-sufficiency roadmap

Self-sufficiency of a product in a country will be achieved if the net amount of domestic products reaches at least 90 percent of the amount of domestic consumption, both for household consumption needs, industry, and the national sugar trade balance. The national sugar self-sufficiency roadmap is essentially in the form of a series of sustainability blueprints for the national sugar self-sufficiency roadmap that has been prepared previously with a staged framework, namely (1) the short-term stage in 2006-2009 for the target of meeting sugar needs for direct household consumption, (2) the medium-term stage in 2010-2014 to achieve production achievements to meet domestic sugar needs, both household direct consumption, as well as industry and at the same time close the national sugar trade balance, (3) a long-term stage, which leads to competitive sugar self-sufficiency from 2015 to 2025, with a focus on modernizing the cane-based sugar industry through the development of an industry of cane sugar companion products that have added value.

2.3. State of the art

There have been many studies that have studied the agro-industry of cane sugar in each region. It certainly has its characteristics related to the conditions for determining the right strategy. In addition, the focus of the problem studied is that it has not been done much by previous researchers related to the policy of agro-industrial revitalization of cane sugar in the Jember Regency area and is closely related to the achievement of sugar self-sufficiency, and competition in the current sugar industry. The contribution of each of the research journals mentioned earlier is to be material for compiling a state of the art, which is related to a collection of theories, and references whether they support or do not support the research. As for that, everything is done so that the research becomes more solid because it can be used as a reference. From the existence of the state of the art, it can be seen that no one specifically discusses the policy of agro-industrial revitalization of cane sugar in the Jember Regency area. Thus, it can be concluded that this research is relatively new and or has not been done much by previous researchers.

2.4. Causal circumference diagram

The causal circumference diagram illustrates the relationship between actors involved in the system of increasing sugar production and the incomes of sugarcane farmers in East Java (Figure 1). Each of these variables is associated with an arrow. There are intervariable relationships that are marked positively (+) or negatively (-). A positively marked relationship occurs if addition to one variable causes addition to another variable. While relationships are negatively marked, additions to one variable cause a reduction in another variable. The positive feedback structure produces a growth or acceleration behavior (J-curve), while the negative feedback structure produces the target behavior (r-curve) [8], [9].

2.5. Policy simulation

The policy simulation carried out is a simulation to analyze the National Sugar Industry Revitalization (NSIR) policy towards increasing GKP production to meet the GKP production targets by the central government and farmers' incomes. Sterman [10], states the dynamic systems approach requires formal models and simulation methods to test, improve, and create new policies. The first policy simulation was carried out with the following three scenarios (1) scenario 1, an increase in sugarcane acreage by 3.2 percent per year, (2) scenario 2, an increase in sugarcane productivity by 1.6 percent per year, and (3) scenario 3, an increase in yield of 2.41 percent per year. The numbers used in scenarios 1, 2, and 3 are the targets for the revitalization of the state-owned sugar industry. The second policy simulation is aimed at finding alternative policies that are better than the actual conditions and current policies. Alternative scenarios are as follows (4) scenario 4, merging scenarios 1 and 2, increasing acreage and

productivity, (5) scenario 5, merging scenarios 1 and 3, increasing acreage and amendment, (6) scenario 6, merging scenarios 2 and 3, increasing productivity and amendments, and (7) scenario 7, merging scenarios 1, 2, and 3, increasing the acreage of cropping, increased productivity, and increased yields.

3. Methods

This research uses a dynamic system approach [8]. Scenarios used in the simulation of the GKP production improvement model. The model uses the year 2010 as the base year taking into account the start of the NSIR program. Analysis of model behavior until 2025, where 2025 is in accordance with the long-term targets contained in the roadmap for the development of the national sugar industry. Research on the Agro-Industrial Revitalization Policy of Cane Sugar in Jember Regency was carried out in the Jember Regency area. The determination of this location is based on conditions where in Jember Regency there are two old sugar factories that are still operating. The research on the agro-industrial revitalization policy of cane sugar in the Jember Regency area was carried out for 9 (nine) months, namely March to December 2022. In this study, what is meant by the population is a sugar factory that is still operating. Where the size of the sample is determined by the existing conditions, namely 2 sugar factories in the Jember Regency area, namely SF Semboro and SF. Jatiroto. The type and source of data used is secondary data. The data was obtained from various sources such as documents and reports from the Ministry of Agriculture of the Republic of Indonesia, the Central Statistics Agency (BPS) of East Java and Jember Regency, the Indonesian Sugar Council (ISC), the East Java Plantation Office and Jember Regency, the Sugar Factory (SF) in Jember Regency. The analysis techniques used are with a causal circumference diagram and policy simulation. The causal circumference diagram illustrates the relationship between actors involved in the system of increasing sugar production and income of sugarcane farmers in the Jember Regency area. The policy simulation carried out is a simulation to analyze the National Sugar Industry Revitalization (NSIR) policy towards increasing GKP production in order to meet the GKP production targets by the central government and farmers' incomes.

4. Result and discussion

Overview of the central government to achieve national sugar self-sufficiency issued a policy/program for the Revitalization of the National Sugar Industry (NSIR). The NSIR program is one of the government's flagship programs in the context of national sugar self-sufficiency from 2010-2025. NSIR is expected to increase national sugar production for direct consumption. East Java is the largest sugar producer, supported by 31 PG or as much as 50 percent of PG owned by SOEs is found in East Java. As a sugar production center, East Java is expected to be an area that can contribute to increase sugar production so that it can support the achievement of national sugar self-sufficiency.

4.1. Model validation

A model's performance validity test is performed to assess whether the model's performance can represent a system that exists in the real world. The results of the performance validity test of the model of increasing sugar production and income of sugarcane farmers in East Java are presented in Table 1. The results of processing data on the validity of performance/output of the model using RMSPE, AME, and AVE, in Table 1 each variable shows a number of no more than the maximum limit of 5 percent so that the model is declared valid.

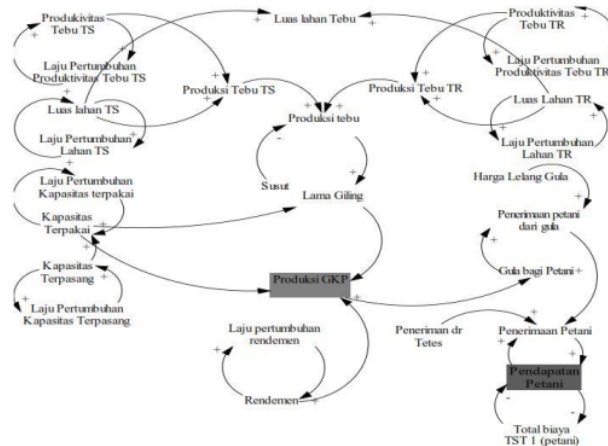


Figure 1. Cause-and-effect circumference flowchart

Table 1. Performance validation test of the model of increasing sugar production and income of sugarcane farmers

No	Criteria	Variable	
		GKP Production (%)	Luas Areal (%)
1	RSMPE (Root Mean Square Percentage Error)	0.133	0.533
2	AME (Absolute Mean Error)	0.087	0.346
3	AVE (Absolute Variance Error)	0.095	0.286

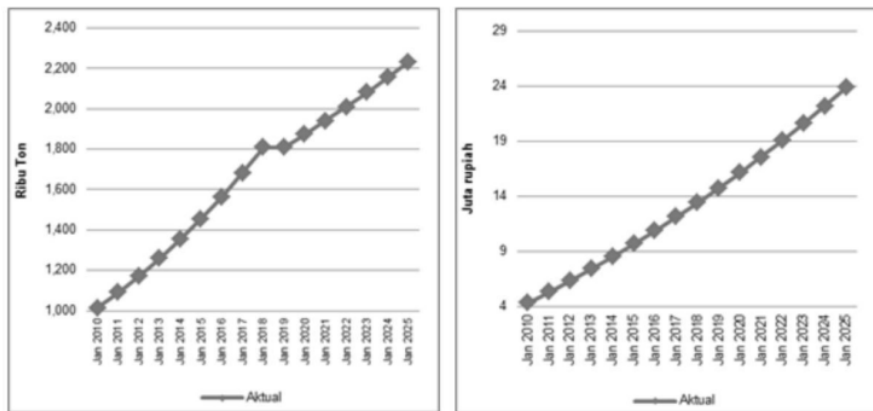


Figure 2. GKP production & income of east java sugarcane farmers per Ha actual conditions in 2010-2025

4.2. GKP production model and sugarcane farmers' Income in actual conditions

The GKP production model (Figure 2) shows an increase in GKP production during the simulation period. In actual conditions (business as usual) GKP production in 2010 amounted to 1.01 million tons and increased in 2025 by 2.23 million tons. In 2015 east Java's GKP production amounted to 1.45 million tons. In general, it can be seen that in 2015 the GKP production target set by the central government was not achieved. This is in line with the research of Suryani et al. [11], that sugar self-sufficiency is difficult to achieve. Yunitasari [12], states that sugar self-sufficiency is not realized if there is no change in policy. The income dynamics of sugarcane farmers show an increase in the income of East Java sugarcane farmers per hectare (ha). The income of sugarcane farmers in actual conditions increased in 2010 by IDR 4.33 million and in 2025 by IDR 23.89 million. In 2010, the income of sugarcane farmers was higher than the per capita income of the plantation sector of Rp1.71

5. Conclusion

The results on the actual conditions show that the sugar self-sufficiency target set by the central government on the production of east Java GKP will not be realized without the NSIR policy. This is shown by the production of East Java GKP which did not meet the target in 2015. The income of sugarcane farmers showed an increase in actual conditions greater than the per capita income of the plantation sector. The East Java government needs to focus its policy on increasing acreage expansion, productivity, and increasing amendments. Especially in the increase in amendments, considering that the area of sugarcane is also experiencing land conversion and experiencing limitations along with the increasing population.

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