

# The Effects of Environmental Factors on Productivity in Sugar Industry: A Qualitative Study

Nadia Anridho, Bambang Tjahjadi, Alfiyatul Qomariyah, Sigit Kurnianto  
Departement of Accounting, Faculty of Economics and Business, Universitas Airlangga  
Surabaya, Indonesia  
{nadia.anridho, Bambang.tjahjadi, Alfiyatul.qomariyah, sigit-k}@feb.unair.ac.id

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Abstract: Due to global warming, the changing of climate and weather cannot be predicted and influence sugar production. The aim of this study is to explore whether environmental factors, such as climate, weather, and geography, influence productivity in Indonesia's sugar industry. This study employed qualitative method. The research data were collected through in-depth interview and observation. The informants were 3 (three) top-level managers of sugar factory. The results showed that environmental factors do influence productivity. To overcome the constantly changing weather and climate, sugar factories have tried to make some innovations on its sugarcane seeds. Choosing the right location of sugarcane fields is also one of the alternative solutions.

## 1 INTRODUCTION

Sugar is one of the most important food commodities in Indonesia, because most Indonesians consume it every day. Indonesia was the second largest sugar exporter in the world after Cuba in the 1930s. However, along with increasing demand for sugar in today's society, national sugar industry cannot keep up with the demand. Furthermore, sugar mills cannot meet the sugar demand due to the decrease of national sugar production which causes an imbalance between sugar supply and demand in Indonesia. In 2016, the total demand for white crystal sugar (WCS) was 3 million tons, but sugar factories in Indonesia were merely able to produce about 2.6 million tons or about 65% of the total demand. To fulfil the rest of the demand, the country imported sugar from other countries. The decline in national sugar production is caused by several factors, such as low quality of sugarcanes, inadequate sugarcane plantations, extreme weather changes, high demands from farmers, employees' lack of productivity, government regulations, and so on. Therefore, it is important for sugar factories to understand and address the factors affecting its productivity.

External factors must be considered by sugar factories if they want to increase their productivity. External factors, such as politics, economy, social,

technology, law, and environment, become the most influential factors for the sustainability of sugar mill business. As Nugraha (2016) explained, poor weather conditions pose some great difficulties for farmers in planting sugarcane and cause low sugarcane yield. Hence, a sugar company might face some troubles in procuring sugarcanes, especially ones with good quality. Another thing related to external factors comes from the development of technology. Rapid technological developments present some convenience for sugar factories in production process. If the company has the latest technology, then its sugar factory can work more effectively and efficiently. In addition, factors like politics and law also need to be considered, because government policies and laws can either hamper or smooth sugar factories business. Based on these issues, it is important to examine how environmental factors, especially natural ones, affect the productivity of sugar mills in Indonesia. The aim of this study is to explore whether environmental factors, such as climate, weather, and geography, influence productivity in sugar industry in Indonesia.

## 2 THEORETICAL BASES

The theory underlying this research was Natural Resource Dependence Theory (NRDT) (Tashman,

2011). This theory was an advanced development of Resource Dependence Theory (RDT) (Pfeffer & Salancik, 1978). RDT disclosed that a company is an open system that continuously exchanges materials and information with its surrounding environment. Hence, resources were related to everything happening in this world which affects the activities or outcomes of the company (Bergmann, Stechemesser, & Guenther, 2016). The sustainability of company's business depends on its transactions with its external environment to obtain the necessary resources (Pfeffer & Salancik, 1978).

In 2011, Tashman developed RDT into NRDT, because RDT did not address natural environment as an important resource for corporate resources (López-Gamero, Molina-Azorín, & Claver-Cortés, 2011). According to Tashman, natural environment was also a part of a company's external environment. Companies, like humans, either directly or indirectly required air, clean water, energy, good climate, and other natural resources (Bergmann, Stechemesser, and Guenther, 2016). Nature was the source of raw material for all physical assets (Winn & Pogutz, 2013). According to NRDT, organizational behavior was not only a part of the social systems, but also a part of the natural environment (Tashman, 2011).

### 3 RESEARCH METHOD

#### 3.1 Research Approach

This study employed qualitative method with exploratory approach. Crewell (2012) in Sugiono (2015) noted that qualitative research was used to deeply explore a phenomenon, not to generalize the findings into a population.

#### 3.2 Data Collection

This research data was collected through interviews, observation, and documentation. This research focused on some sugar factories in East Java. The location was chosen because more than 85% sugar factories located in Java. Interviews were conducted with 3 (three) top-level managers from sugar mills. All interview results were recorded and later transcribed. The questions for interview were as follows: (1) how is the productivity in the sugar factory; (2) do environmental conditions, such as climate, weather, and geography, affect company productivity; (3) how do climate and weather change

affect company productivity; (4) what kind of problems occurred due to weather uncertainty; (5) how does the company handle those problems; (6) What are the solutions of this problem; and (7) How does the company improve its productivity.

#### 3.3 Data Type and Source

The type of data used in this study was qualitative data. Primary and secondary data were both used in this study. Primary data referred to the data obtained directly from the field or place of research (Nasution, 2012). Primary data were obtained through in-depth interviews with the managers of sugar factories in Indonesia, especially Java. The information needed was related to the relationship between the external factors surrounding the sugar factory and its productivity.

Meanwhile, the secondary data were obtained from reading sources and other sources consisting of personal letters, diaries, meeting notes, and official documents from various government agencies and sugar factories. They were also obtained from magazines, newsletters, publications from sugar mills, attachments from official bodies such as ministries, study results, theses, survey results, historical studies, and so on. This study used the secondary data to strengthen the findings and supplement the information gathered through direct interviews with managers.

#### 3.4 Data Analysis

The analysis method used was content analysis. This method was a part of the textual methods (Satori and Komariah, 2014: 202). Content analysis was used to analyze data from the recorded and transcribed interviews. The data analysis performed were data reduction, data display, and conclusion drawing/verification; all were done interactively and continuously until the existing data were thoroughly saturated (Miles and Huberman in Satori and Komariah, 2014: 218). Data analysis in this research went through editing, coding, and meaning-interpretation (Musfiqon, 2012).

## 4 RESEARCH RESULT

This research data was obtained from several in-depth interviews with 3 (three) top-level managers from the existing sugar mills in East Java.

Due to erratic global warming, climate change, and weather transformation, the final products of sugarcane, as the raw materials of sugar products, began to change as well. This finding was in line with Bergmann, Stechemesser, and Guenther's (2016) study. Their study noted that climate change impacted business performance and organizations whose business seriously suffered from the impacts of extreme climate change, hence they cannot generate positive sales growth. Informant # 2 confirmed it, *"Last year there was a sugar mill that did not mill, because of the lack of sugarcane."*

When sugarcane yields are not good, the productivity of the sugar factory automatically decline to the extent it cannot operate at all. Therefore, sugar mills should strive to overcome the difficulty of obtaining raw materials.

According to informant # 1, *"We cannot overcome weather conditions. [During] some experiments of drought-resistant varieties, yet it was [suddenly] raining] and resulting in wet drought season. During the drought [season], there are drought-resistant sugarcane varieties. Hence, to create such varieties, the harvest management has to follow suit...to decide the harvest time. The theory is like that. The question is how we set the planting time. We can certainly predict, for example, next year after la Nina, there will be the dry season. [So] we can decide what to do in this dry season. It should be anticipated, [as it is] in fact, the only possible treatment for post-harvest...to save the potential yield of the sugarcanees."*

Bui and de Villiers's (2017) findings also revealed that organization's strategies change in respond to climate change. Since sugar factories cannot cope with the climate and weather, the solution is to develop new varieties of cane that resist drought, rain, or wet drought. Using the existing cane varieties may be amplifying the threat of crop failure. In addition to creating new varieties of sugarcane, harvest management also needs to consider harvest time, plant organization, and so forth.

Informant # 3 further elaborated, *"Plants cannot lie. If [they are] not fertilized, they will be yellowing and withering. If [they are] given good nutrition, they will thrive. Therefore, the maintenance factors came from surveillance and climate, which affect the production of sugarcane itself."*

Climate maintenance and monitoring factors need to be addressed. As plants cannot lie, thus, if they are not fertilized, they will be yellowing and withering. Yet when they are adequately fertilized, they will automatically thrive.

Furthermore, the location is also an important factor which affects sugarcane yield. As asserted by Informant # 2, *"East Java is a contradictory place. On one hand, there are excess of sugarcane in Lumajang and Malang. On another hand, there are shortages elsewhere. The spread of sugarcane plantations is uneven."*

Distribution of sugarcane locations becomes an obstacle for some sugar factories. Sugar factories nearby strategic locations do not experience production constraints. In contrast, sugar mills which are not close to raw materials tend to experience production constraints.

## 5 CONCLUSIONS

This study aims to determine how environmental factors affect the productivity of sugar mills in Indonesia. The findings confirmed Natural Resource Dependence Theory (Tashman, 2011) which stated that like humans, companies either directly or indirectly require air, clean water, energy, good climate, and other natural resources. Hence, climate and weather also affect the productivity of sugarcane mills.

Based on several in-depth interviews with three sugar mill managers in East Java, several conclusions can be drawn. First, sugarcane quality affects the productivity of sugar mills. When sugarcane yields are poor, the productivity of sugar mills decreases. Second, weather changes cannot be avoided. What needs to be done is to develop new varieties of sugarcane seeds. Third, selecting the right location for sugarcane plantation is also essential.

In this study, there are limitations affecting the results of research. One of which is the narrow focus on environment as the only external factor affecting sugar productivity. Future research can conduct another research by examining the influence of other external factors, such as politics, economics, socio-culture, law, and technology.

The results of this study are expected to provide a reference and expand knowledge about the influence of the natural environment on the sustainability of a company's business.

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