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Strategic Plan Development For Palm Sugar Agroindustry Using Interpretative Structural Modeling (ISM) and MICMAC Methodology: Case Study in Jember

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Abstract. This study develops a generic conceptual framework for strategic planning development from the coconut sugar agro-industry context in Jember Regency. The concepts and frameworks developed can be a useful resource for regional leaders, especially the Jember Regional Government to accelerate its strategic planning journey, which is essential to be competitive and successful in this developing era. From the exploratory nature of research, the interaction with experts and the findings from ISM and MICMAC hints at the need to evolve and implement strategies for a rapid increase in the overall competitiveness of the palm sugar business through Strategic Planning in creating overall activity programs. The main finding is that the matrix reflects the driving force of factors such as "Formulation of local regulations to support coconut agro-industry development" and "Outlining general zoning plans" (which depend on the leadership of the Local Government Top Management), are at a high level. MICMAC analysis thus proves and strengthens the popular belief that Top Management, in this case, the Regional Government of Jember Regency, plays an important role in initiating any initiatives / determining the future of the coconut sugar agro-industry through the development of sound and appropriate strategic planning. From the strategic aspect needed in the framework of developing strategic planning for coconut sugar agro-industry in Jember Regency, another strategy is "Integration between industrial sectors". The next priority strategy is "Identification of types of agro-industries that are feasible to develop", "development of incentive systems such as taxation and investment credit" and "development of information systems". Last but not least is "improving industrial licensing procedures" and "preparing land use management".

Keyword: ISM, MICMAC, Palm Sugar, Strategic plan, priority



1. Introduction

Coconut (*Cocos Nucifera l.*) Is a plantation crop from the Palmae family, where almost all of its parts can be utilized. The coconut tree is called the tree of life because every part of it has economic value. Efforts to diversify coconut crops are growing. One of the products is coconut sugar made from coconut juice. However, only a small portion of Indonesian coconuts are used as coconut sugar. The export value continues to increase [1].

Jember Regency is one of the big coconut producing districts in East Java, with a total production in 2018 of 14,124 quintals with average productivity of 1.50 quintals per hectare [2]. With a large amount of coconut production, the industrial sector must enter into coconut processing to increase added value and to empower the palm sugar farmers in coconut sugar centers.

The potential for this extraordinary raw material must be utilized optimally to increase the competitiveness of the area which will have a direct impact on Jember Regency, especially on PDRB. However, unfortunately, there are several indicators that the development of the agricultural sector has not been able to contribute to the development of the Jember Regency area, such as the growth rate of GRDP in the agricultural sector, which has decreased from 2.5% in 2017 to -0.04% in 2018 [2], and The agricultural sector has not yet developed towards the industrialization of agricultural or agro-industrial product processing which is a more advanced stage of agricultural sector development, this can be seen from the distribution of PDRB in the manufacturing sector in Jember Regency which contributed 21.34%, relatively smaller than the sector. agriculture, namely 26.89% in 2018 [2].

According to [3] that the reason for the development of the processing industry, especially agro-industry, is because the agricultural sector needs an extractive industry capable of processing all agricultural products and the industrial sector requires raw materials in the processing process. This was added by [4] that agro-industry is the main driving force for the development of the agricultural sector, especially in the future the position of agriculture is a mainstay sector in national development so that the role of agro-industry will be even greater.

It is common everywhere that the agricultural sector in Indonesia is mostly built by farmers with relatively small scale businesses. The situation that is not favorable for the agricultural business actors is increasing every year with a low level of welfare. Likewise for coconut sugar smallholders in Jember Regency, based on preliminary observations in the field, the results show that palm sugar farmers and coconut sugar entrepreneurs have complex problems including limited infrastructure; low productivity; low accessibility to capital, information technology and market information; and low capacity of farmers.

Given that the current sustainable agricultural development cannot be separated from the agribusiness system, the role of agricultural institutions plays an important role in the success of agricultural development, especially from the institutional system of farmers in villages. According to [5] farmer institutions in rural areas contribute to the acceleration of farmers' socio-economic development; accessibility to agricultural information; accessibility to capital, infrastructure and markets; and adoption of agricultural innovations. Also, the existence of a farmer institution will make it easier for the government and other stakeholders to facilitate and provide strengthening to farmers.

The institutional model for agro-industrial development is based on the agribusiness system approach and four institutional dimensions [6] which includes several subsystems, namely: 1) upstream subsystem, 2) farming subsystem, 3) downstream subsystem, 4) agro-industry subsystem, and 5) supporting facilities subsystem.

One of the big problems in the palm sugar agro-industry is the absence of clear and profitable policies for palm sugar farmers and palm sugar entrepreneurs. What is happening is that the palm sugar industry is running alone without any strategic programs from the Jember regional government, Most of them have little help from the government and many of the palm sugar craftsmen are developing very slowly in terms of their technological capabilities and business management. Based on the background and problem formulation above, the objectives of this study specifically to review the situation with the palm sugar agro-industry and develop a macro-level conceptual framework for the appropriate planning strategy for activities. To this end, we undertake extensive work and use methodologies such as

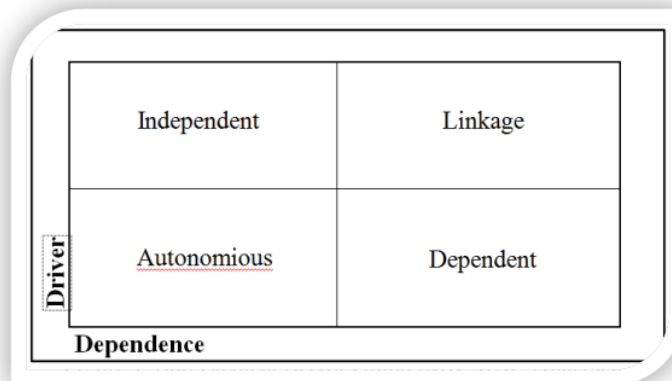


1 Interpretive Structural Modeling (ISM) and MICMAC, as they help identify the linkages, hierarchies, and levels of various palm sugar agro-industry programs and thus provide insight into complex issues.

2. Method

This research will be conducted in Jember Regency, East Java Province. Precisely in the Districts which are centers of coconut fruit production, such as the Districts of Wuluhan and Puger. Data collection was carried out in July-September 2020. Data collection methods were carried out in several ways, namely: (1) literature study, (2) field observations, namely seeing directly the coconut sugar agro-industry, and (3) in-depth interviews with experts conducted to obtain more comprehensive information about the coconut sugar agro-industry with a questionnaire guide. There are 5 experts involved in research on the development of the coconut sugar agro-industry with the consideration of existence, affordability, reputation, and experience in their fields. Interpretive Structural Modeling (ISM) is an analysis tool and decision support tool that facilitates a thorough understanding of complex situations by linking and organizing ideas on a visual map. The ISM process develops subject matter through discussion and analysis. Basic knowledge combined with a structured understanding of a problem is essential in making strong decisions. This knowledge is also needed when communicating a decision to others, including the rationale for the decision making [23]

2 MICMAC (*Matrix of Impact Cross Multiplication Applied to Classification*) analysis. Some of the sub-elements in an element are described in the driver power-dependency matrix [24]. To classify the driver sub-elements the power-dependence matrix is divided into the following four sectors.



1 Based on the driving power and dependence, factors are classified into four clusters, as explained below. This classification helps in better understanding and clarifies the broader issues:

- Sector I: autonomous. Weak drivers and weak dependent variables (point far the origin); a group called autonomous variables. This variable is a factor that is relatively disconnected from the system. This variable has only a few links, although these links can be very strong.
- Sector II: dependent. The driver variable is weak and very dependent. This variable is the main dependent variable.
- Sector III: linkage. Driver variables are strong and highly dependent. These variables should be studied more carefully. This linkage variable is unstable. Any action on these variables will have an impact on the other variables and have a feedback effect on the variable itself to amplify or support the initial pulse.
- Sector IV: independent. The driver variable is strong and the dependent is weak. These variables are leftovers of the system and are called independent variables.



1 Result and Discussion

Modeling Approach Used in this Research

The modeling approach in this research using ISM and MICMAC methodologies consists of nine steps as described in the Table 1.

Table 1. Modelling Approach

| Steps | Description |
|--------|-------------------------------------------------------------------------------------------------------------------------------|
| Step 1 | Identification of factors relevant for palm sugar, with help from literature and expert opinion |
| Step 2 | Establishment a contextual relationships among the elements by which it is possible to establish their pair-wise comparison |
| Step 3 | Developing a structural self interaction metrics (SSIM) of elements using pair-wise relationship |
| Step 4 | Developing a reachability metrics from SSIM and by incorporating transitivity of elements |
| Step 5 | Transitivity is established by the assumption that if element A is related to B and B is related to C, then A is related to C |
| Step 6 | Partitioning reachability metrics into different levels |
| Step 7 | Draw a digraph based on relationships as defined in Step 2 |
| Step 8 | Convert the resultant digraph to final digraph by removing indirect links |
| Step 9 | MICMAC analysis to categorize the factors into various clusters based on their Driving Power and Dependence |

Source: Developed by authors.

An extensive study of literature was carried out and expert opinion was taken to identify the various factors for developing the conceptual framework. The expert's view (a senior lecturer, a government employees and the head of village) was assimilated for this purpose. The various factors identified through literature review and expert opinion are listed and elaborated below:

- Elaborating (General Regional Planning) into detailed plans and regional development programs,
- Identifying types of agro-industries that are often developed in coconut-producing areas,
- Coordination between industrial sectors and other sectors as an effort to ensure the integration of the raw material supply system, production implementation, and marketing systems,
- Formulation of regional regulations to support the development of coconut agro-industries in coconut-producing areas,
- Development of incentive systems such as taxation and investment credit,
- Improvement of industrial licensing procedures in the regions accompanied by the development of a more transparent information system,
- Developing an information system covering information technology, industrial business, marketing of industrial products, business and investment opportunities as well as other important industry information,
- Preparing land use for growing coconut-producing areas.

These factors are thought to have a very vital role in the development of strategic planning for the coconut sugar agro-industry in Jember Regency. For clarity, the factors are described as in-depth as below:

3.1. Describe the general zoning plan (A1)

Efforts to balance the use of natural resources and the environment are through spatial planning based on achieving the sustainability of environmental functions. According to [25] The carrying capacity of the environment is the most important consideration in spatial planning, both in the preparation of the Regional Spatial Plan (RTRW) and in the evaluation of spatial use. The Regional Spatial Plan prioritizes commodity potentials in the study area. This plan implements an integration of several aspects, including



natural resources owned, technology to be used, readiness of human resources, economy, socio-culture, and institutions, which are a very priority synergy relationship.

3.2. *Identification of the types of agro-industries that are feasible to develop (A2)*

This stage is very important because it will record the types of coconut processing in various regions, mapping is also useful in strategic planning. A statement from [26] that several types of coconut products that cannot be replaced by oil palm include coconut milk, sugar, fresh coconut water, sticks, coconut leaves, and coconut meat. Also, there are other products produced from coconut plants such as activated charcoal, coir, and the handicraft industry.

3.3. *Integration between industrial sectors (A3)*

Coordination between industrial sectors and other sectors as an effort to ensure the integrity of the raw material supply system, production implementation and marketing system, the existing coordination, especially in the case of information exchange, must run well and be carried out continuously, complete information availability, raw material supply, implementation production, and marketing systems will have a significant impact on industry performance [27]

3.4. *Formulation of regional regulations to support the development of the coconut agro-industry (A4)*

The formulation of regional regulations to support the development of coconut agro-industries in coconut-producing areas is useful in curbing and providing certain legal certainty for coconut processing business owners. So that entrepreneurs feel safe and comfortable in investing and building their industry, according to [28] in good agro-industrial planning, local government support is also needed which regulates clear laws and regulations for small industries.

3.5. *Development of an incentive system such as taxation and credit for investment (A5)*

One way for the government is the existence of a tax incentive policy that is expected to attract investment interest, [29] underlined that before investing, investors usually evaluate in two stages. The first stage is to select an area based on the size of the market, access to raw materials, availability of labor, and so on. If the first stage meets all the criteria, the second stage is to evaluate the tax rates, guarantees, and various incentives that will be obtained.

3.6. *Refinement of industrial licensing procedures (A6)*

The improvement of industrial licensing procedures in the regions accompanied by the development of a more transparent information system will greatly stimulate the rise of the palm sugar agro-industry. The Jember Regency Government is currently trying to foster an investment climate by providing ease of doing business. One of the strategies undertaken by the government is to facilitate bureaucracy and digitization of licensing services to start a business. [30] added that facilitate bureaucracy and digitization encourage the emergence of new businesses and create a better business climate.

3.7. *information system development (A7)*

The development of information systems that includes information technology, industrial products, marketing of industrial products, business and investment opportunities as well as other important information is a form of industrial revolution 4.0, which is currently unavoidable from human life. According to [31] there are many problems in business that can be resolved with an information system, the benefits of internal information and consumer behavior can be seen and recorded so that business actors can continue to develop service systems that are closer to the needs and desires of consumers.

3.8. *Prepare land stewardship (A8)*

Preparing land use for coconut-producing areas that have high fertility feasibility, this is very necessary to limit land that is getting narrower by the presence of office buildings and housing, so that

the conversion of coconut land does not occur massively and causes loss of coconut center areas in Jember Regency.

1 Conceptual Framework Developed Using ISM

Using the Interpretative structural modeling methodology, a conceptual framework has been developed for the strategic planning development of the coconut sugar agro-industry (Figure 5). The framework developed provides the linkages, hierarchy, and level of factors identified for the coconut sugar agro-industry. This macro-level framework, although deceptively simple, provides invaluable insights into the context of the strategic planning of the coconut sugar agro-industry in Kabupaten Jember.

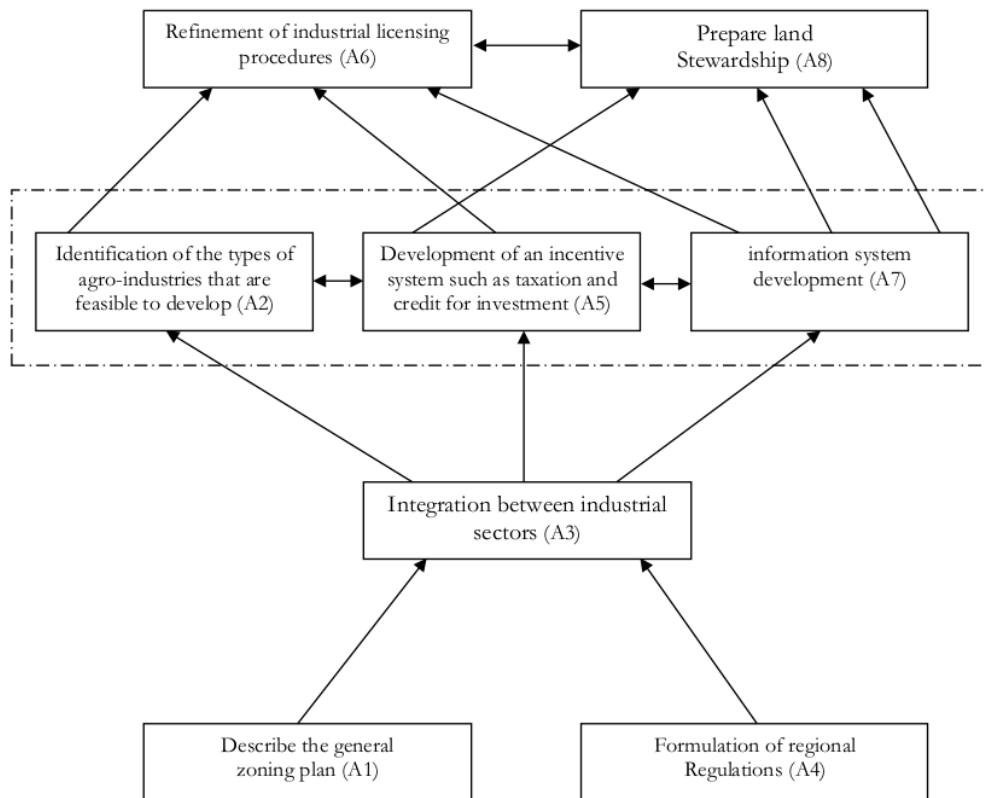


Figure 2. Conceptual Framework for Strategic Planning Development

The conceptual framework identifies “Outlining general zoning plans” and “Formulating regional regulations to support the development of the coconut agro-industry” as the main drivers of “Integration between industrial sectors”. It also identifies “types of agro-industries that are feasible to develop” as a way to develop a good coconut sugar agro-industry planning, in addition to “development of incentive systems such as taxation and credit for investment” and “development of information systems”. Another important point to note is that the “improving industrial licensing procedures” program is at the same level as “preparing land-use stewardship”. This can be explained by the fact that in the context of the coconut sugar agro-industry, there is a long process period for translating good planning. Based on the



developed framework, it is suggested that the development of strategic planning for the coconut sugar agro-industry can be carried out as follows: Local governments need to develop integration between industrial sectors based on general regional planning and formulation of regional regulations.

Group sub elements with MICMAC

In this study, a MICMAC analysis was carried out and it was observed that the ratings of locomotion and dependence of factors for strategic planning development for the coconut sugar agro-industry were analyzed. The main results of the MICMAC study are shown in Figure 3.

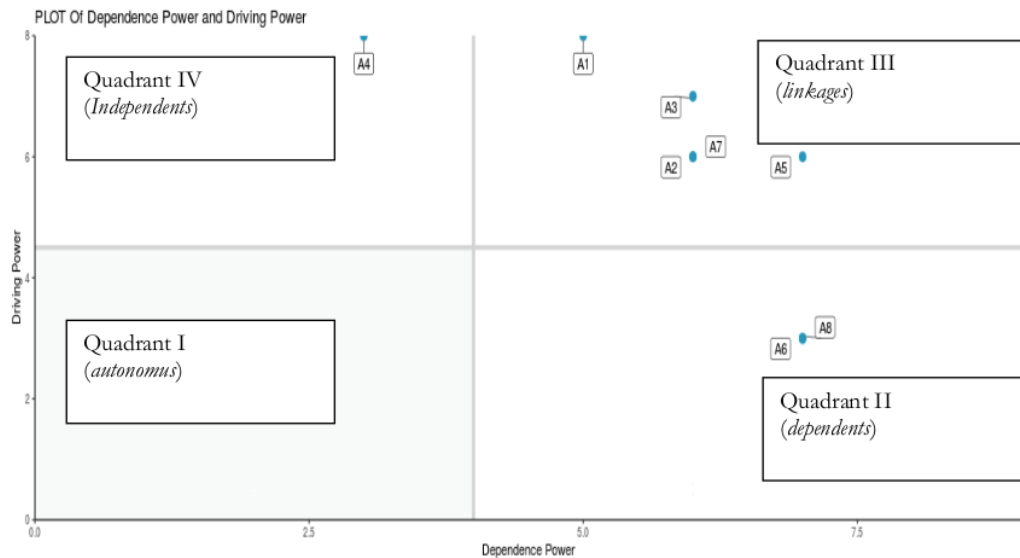


Figure 3. Driving Power and Dependence of Factors

The main finding is that the matrix reflects the driving force of factors such as “Formulation of local regulations to support coconut agro-industry development” and “Outlining general zoning plan” (which depend on the leadership of the Local Government Top Management), are at a high level. MICMAC analysis thus proves and strengthens the popular belief that Top Management, in this case, the Regional Government of Jember Regency, plays an important role in initiating any initiatives / determining the future of the coconut sugar agro-industry through the development of sound and appropriate strategic planning.

From the strategic aspect needed in the framework of developing strategic planning for coconut sugar agro-industry in Jember Regency, another strategy is "Integration between industrial sectors". The next priority strategy is "Identification of types of agro-industries that are feasible to develop", "development of incentive systems such as taxation and investment credit" and "development of information systems". Last but not least is "improving industrial licensing procedures" and "preparing land use management".

Using the FSM methodology, a conceptual framework has been developed for palm sugar development. The framework developed provides the linkages, hierarchies and levels of the identified factors for palm sugar. This macro level framework, though appear simplistic innature, provide very valuable insights in the context of palm sugar in Indonesia.



The complete results of the driving force - dependency matrix for the required activity elements are presented in Table 2.

Table 2. The driving force-dependency benchmark-program success matrix

| No | Sector | Variables |
|----|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Autonomous (I) | - |
| 2 | Dependent (II) | (A6) improvement of industrial licensing procedures in regions accompanied by development of a more transparent information system. And (A8) prepare land stewardship for coconut producing areas that have fast growth |
| 3 | Linkage (III) | (1) Describe RUTW (General Regional Planning) into detailed plans and regional development programs, (2) Identification of the types of agro-industry that are feasible to develop in coconut-producing areas, (3) Coordination between industrial sectors and other sectors as an effort to ensure the integrity of the raw material supply system. implementation of production and marketing systems, (5) development of an incentive system such as taxation and credit for investment, (7) development of information systems covering industrial business technology information. marketing of industrial results for business and investment opportunities as well as other important industry information. |
| 4 | Independent (IV) | (A4) Decision of regional regulations to support the development of coconut agro-industry in coconut producing areas. |

4. Conclusion

This study develops a generic conceptual framework for strategic planning development from the coconut sugar agro-industry context in Jember Regency. The concepts and frameworks developed can be a useful resource for regional leaders, especially the Jember Regional Government to accelerate its strategic planning journey, which is essential to be competitive and successful in this developing era. From the exploratory nature of research, the interaction with experts and the findings from ISM and MICMAC hints at the need to evolve and implement strategies for a rapid increase in the overall competitiveness of the palm sugar business through Strategic Planning in creating overall activity programs.

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