

Multi-criteria Policy Analysis in Sustainable Development of Dragon Fruit Agribusiness A Case Study in Banyuwangi Regency

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ABSTRACT

Dragon fruit is a leading horticultural commodity that has good prospects for development in Banyuwangi Regency considering that dragon fruit agribusiness is very profitable and market demand is quite high. The problem of limited maintenance management and the weakness of the marketing institutional system has resulted in the non-optimal development of dragon fruit agribusiness. This study aims to analyze and develop a structured policy scenario related to dragon fruit agribusiness. The research method used is a multi-criteria policy method with aspects of scenarios, policies, criteria and actions. The results of the policy analysis of dragon fruit agribusiness development indicate the need for implementing policies from the farmer's point of view, namely (1) developing farmer responses to new technologies and increasing marketing reach, (2) stabilizing selling prices, and (3) diversifying the dragon fruit industry. From the government's point of view, these are (1) increasing the role of agricultural extension centers and improving irrigation networks, (2) increasing cooperation between local governments, PLN and farmer groups, and (3) increasing marketing facilities. The implication is that the development of dragon fruit agribusiness in Banyuwangi Regency through increased participation of farmers and agricultural extension centers will have an impact on increasing the status of sustainability.

Keywords: *Dragon Fruit, Multi-criteria Policy, Sustainable Development.*

1. INTRODUCTION

Dragon fruit harvested area in Banyuwangi Regency shows positive growth in the 2016-2020 period. The dragon fruit harvested area is 1,275.50 Ha (2016), 1,290 Ha (2017), 1,322 Ha (2018), 1,362 Ha (2019) and 4,787.2 Ha (2020). However, in terms of productivity, dragon fruit has fluctuated in the last five years, especially declining greatly in 2019 as production declines [1]. The decline in production is the response of dragon fruit farmers to the decline in prices due to the harvest in the previous year. The decline in prices is also due to a lack of information due to the lack of communication networks among dragon fruit agribusiness actors. In addition, problems that are often experienced by farmers in the development of dragon fruit agribusiness include the less than optimal implementation of dragon fruit cultivation due to a lack

of technical knowledge of dragon fruit cultivation (such as binding, pest eradication and pruning) and the low bargaining position of farmers as dragon fruit producers caused by weak performance of dragon fruit agribusiness output recipient institutions.

Several efforts or movements have been made by the government in collaboration with the private sector, such as the Ministry of Agriculture's efforts to cooperate with the private sector to absorb 150 tons of dragon fruit. [2]. Then efforts to downstream agriculture by processing the resulting commodities. Through downstreaming, farmers will get additional income and improve their welfare [3]. Another effort that will continue to be improved is the application of appropriate technology in the form of using lights in the dragon fruit garden at night [4]. These efforts are still not able to overcome all existing problems, therefore a

holistic, participatory and structured development strategy is needed that involves relevant stakeholders, namely farmers, agricultural extension workers, government and private sector. In this case, it is necessary to develop a policy strategy that compares the various proposed actions (solutions) to a problem according to various criteria (multi-criteria) and policies [5]. The problem in this research is what policies can be formulated to develop dragon fruit agribusiness in Banyuwangi Regency?. This study aims to formulate a policy scenario based on multi-criteria analysis [6] as the basis for policy intervention in the development of dragon fruit agribusiness with a case study in Banyuwangi Regency.

2. LITERATURE REVIEW

Agribusiness is a business related to agricultural production activities, including the exploitation of agricultural inputs, the exploitation of agricultural products or also the exploitation of post-harvest. Agribusiness studies strategies to gain profits by managing aspects of cultivation, supply of raw materials, post-harvest, processing, and marketing. According to [7], agribusiness management practices can be divided into four main functions, namely Marketing management, Financial management, Supply chain management and Human resource management. Ultimately, no matter how big or small the company is, managers have responsibilities in each of these areas. When developing an understanding of agribusiness management, it is important to have a basic understanding of each area.

Dragon fruit, *Hylocereus* spp, originated in America and then spread to subtropical and tropical areas, including Southeast Asia [8]. Called “buah naga” in Indonesia, dragon fruit has been grown and developed since 2000. Since then dragon fruit has gained popularity due to its delicious taste, high nutritional content, and many health benefits [9]. Dragon fruit can grow well in Indonesia, which has a variety of agro-climatic conditions. Consumers really like red-fleshed dragon fruit. Dragon fruit with red flesh is widely cultivated and has high antioxidant activity [10]. The development of dragon fruit in Indonesia is progressing quite rapidly and now it has spread to almost all regions [11].

Multi-criteria policy (multipol) is a multi-criteria evaluation model used for qualitative information. The goal is to help decision making by compiling simple analytical attributes and developing it into various

actions or solutions to be taken. This method is based on an evaluation of policies and actions that uses a weighted average to consider uncertainty and tests the effectiveness of policies and actions for scenarios [5]. This evaluation model tries to integrate various participatory tools as the core of the framework complemented by the Focus Group Discussion (FGD) methodology [6] involving local governments, extension workers and farmers.

In principle, the use of multipol adheres to the rules of multi-criteria in general, namely the use of scores and weights in determining the hierarchy or the best choice [12]. However, there are several things that distinguish multipol from other multi-criteria methods. First, multipol integrates a participatory approach through stakeholder involvement into a multi-criteria assessment. Second, the evaluation of the choice of actions or program alternatives is not only against the criteria used, but also the interaction of three components, namely Actions, Policy, and Scenario. The interaction of these three components results in two types of evaluation in multipol, namely [13]:

1. Evaluation based on “Actions to Policy”. This evaluation determines what program is right for each policy so as to produce a hierarchy of impacts from the program (Actions) on the policy.
2. Evaluation based on “Policy to Scenario”. This evaluation determines what policies are appropriate for a particular scenario so as to produce a hierarchy of policies and their impacts for each scenario.

3. RESEARCH METHODS

The research was carried out from March to August 2021 with the location in Bangorejo District [14] and Pesanggaran District [15] Banyuwangi Regency with the consideration that the two districts are the largest producers of dragon fruit. The research population is dragon fruit farmers in Banyuwangi Regency. Farmers' sampling method was carried out using the Multistage Stratified Cluster Sampling method.

Data was collected through interviews with several experts who have knowledge about aspects of dragon fruit agribusiness development.

Data processing and analysis is carried out using Multi-criteria Policy (multipol) analysis, not only to evaluate the criteria used, but also to analyze the interaction of three components, namely Actions,

Policy, and Scenario. Multipol in this study is used as a tool to determine the priority attribute hierarchy on the dimensions of sustainability and to design a policy strategy for developing dragon fruit agribusiness in Banyuwangi Regency. The stages of strategy formulation using multipol are as follows:

- a. The dragon fruit agribusiness development policy in Banyuwangi Regency which is inputted in the policy matrix against the criteria is symbolized (A).
- b. Actions/programs for developing dragon fruit agribusiness to support predetermined policies are inputted into the actions against the criteria matrix and symbolized (B).
- c. The criteria/objectives for developing dragon fruit agribusiness in Banyuwangi Regency are symbolized (C).
- d. The 'action against criteria' matrix. The numbers in the matrix are in the range of 0-20. In FGD this score was scaled to 1 to 5 (scaling down) with 4 intervals (1=4, 2=8, 3=12, 4=16, and 5=20).
- e. The 'policy against criteria' matrix. The total value of each policy is 100.
- f. The 'scenario against criteria' matrix. The scenario of developing dragon fruit agribusiness from the demand side emphasizes more on the economic level, while the supply side emphasizes investment, human resources, research and development and capital formation.
- g. Evaluation based on actions and policies that present the results of multipol analysis based on the score for each policy and the average score, as well as the standard deviation obtained. In multipol, the higher the position number, the better the performance of the actions.

4. RESULT AND DISCUSSION

4.1. Description of criteria, policy and action

The criteria for achieving goals for the sustainable development of dragon fruit agribusiness in Banyuwangi Regency are arranged in Table 1 below.

Table 1. Goal, criteria, and description

Goal	Criteria	Description
Economic Development	Income	Increasing revenue
	Competitiveness	Increasing competitiveness

Social	Employment	Employment
	New Business	New Business Growth
Environment	Pollution	Environmental Pollution Reduction
	Connected	Distribution Network Improvement
Culture	Culturefes	Farmer's Story Culture

Dragon fruit agribusiness in Banyuwangi Regency will be developed with various policies to make it more sustainable. This is reinforced by the Decree of the Head of the Banyuwangi Regency Agriculture and Food Service Number: 188/2377/KEP/429.103/2020 dated May 4, 2020 regarding the implementation of the innovation program on the Use of Lights to Increase Dragon Fruit Production ('puting si naga') and the establishment of a technical team for program implementation [16]. The policies for developing sustainable dragon fruit agribusiness in Banyuwangi Regency include:

1. Cooperation agreement between the Regional Government, the State Electricity Company (PLN), and the Farmer's Group, namely cooperation to facilitate the availability and installation of electricity networks for dragon fruit farmers.
2. Marketing facilities from the government, which means collaborating with all stakeholders including Farmer Groups, Fertilizer Kiosks, Dragon Fruit Traders and Private Investors (expanding the marketing network).
3. Diversification of the dragon fruit processing industry.
4. Increasing the competence of farmers, which means carrying out training to increase the competence of farmers through integrated crop management field schools, good agriculture practices field schools, good handling product field schools and processed dragon fruit products by MSMEs.

The program (action) in the development of dragon fruit agribusiness sustainability in Banyuwangi Regency is obtained from the results of data processing with multidimensional scaling (MDS) techniques. The dominant attributes of each dimension in the MDS analysis are adopted as programs (actions) in the

development of dragon fruit agribusiness sustainability can be seen in Table 2.

Table 2. Symbol and description

Symbol	Description
JR	Improvement of Irrigation Network
JP	Improvement of Marketing Reach
KH	Improvement of Price Stability
SKL	Improvement of Land Ownership Status
RPTB	Improvement and Development of Farmers' Responses to New Technologies
BPP	Improvement and Development of Agricultural Extension Center

4.2. Evaluation and classification of 'actions on government policy'

Table 3 presents the results of the evaluation and classification analysis in the form of ratings of actions and policies in the development of dragon fruit agribusiness sustainability in Banyuwangi Regency.

Table 3. Evaluation and classification analysis of 'action to policy'

	Agreement	Facility	Diversio	Competence	Moy.	Ec. Ty	Number
JR	5.4	4	4.6	6.6	5.2	1	1
JP	11.2	11.8	10.4	9.8	10.8	0.8	4
KH	12.8	10.6	10.4	10.6	11.1	1	5
SKL	8.2	7.8	5.6	10.4	8	1.7	2
RPTB	13.4	14.2	13.8	13	13.6	0.4	6
BPP	9.8	10	8.2	10.8	9.7	0.9	3

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The following are the actions and policies of the Banyuwangi Regency Government on dragon fruit agribusiness:

1. The performance of 'the response of farmers to new technology' to the policy of the Banyuwangi Regency Government on dragon fruit agribusiness has a high average value of 13.6 and a low standard deviation value of 0.4, so the position of this action is in the high position of 6. This shows that the response of farmers to new technology has high performance on the policies of the Banyuwangi Regency Government.
2. The performance of 'price stability' against Banyuwangi Regency Government policies has the second highest average value of 11.1 and a relatively high standard deviation value of 1 and is in a relatively good position, namely 5th position. As long as it is supported by high scores for certain policies, price stability has the second highest performance on the Banyuwangi Regency Government's policies..
3. The performance of 'marketing reach' on the Banyuwangi Regency Government's policy on dragon fruit agribusiness has the third highest average value of 10.7 with a relatively low standard deviation of 0.5, so this action position is in the 4th position. This shows that the marketing reach has the third highest performance on the Banyuwangi Regency Government policy.
4. The performance of the 'Agricultural Extension Center' on the policy of the Banyuwangi Regency Government on dragon fruit agribusiness has the fourth highest average value with a value of 9.7 and a relatively low standard deviation value of 0.9 then the position of this action is in the 3rd position. This shows the performance of the Agricultural Extension Center which is quite high on the policies of the Banyuwangi Regency Government.
5. The performance of 'land ownership status' on the policy of the Banyuwangi Regency Government regarding dragon fruit agribusiness has the fifth highest average value with a value of 8 and a high standard deviation value of 1.7 so that the position of this action is in the position of number 2. This shows a quite high performance on the status of land ownership against the policies of the Banyuwangi Regency Government.
6. The performance of the 'irrigation network' on the policy of the Banyuwangi Regency Government regarding dragon fruit agribusiness has an average value of 5.2 and a relatively high standard deviation value of 1, so the position of this action is in the 1st

position. This shows that with a relatively high standard deviation value and a low score for each policy of the Banyuwangi Regency Government, this action automatically occupies the last position.

The profile map for action and policy in the development of sustainable dragon fruit agribusiness in Banyuwangi Regency is shown in Figure 1.

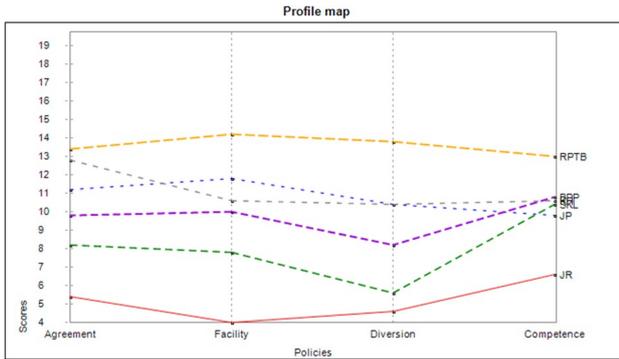


Figure 1 Profile map for action and policy

As shown in Figure 1, the action of 'farmers' response to new technology' excels in four types of dragon fruit agribusiness development policies in Banyuwangi Regency. Meanwhile, for the 'competency improvement' policy, there are 'Agricultural Extension Centers' and 'price stability' which are the actions with higher scores. This can be understood because the increase in the competence of farmers relies heavily on the Agricultural Extension Center which can change the mindset of farmers in introducing the use of organic fertilizers, the introduction of technology to open new markets in order to stabilize prices and be able to motivate other farmers to switch to dragon fruit commodities, so that it can increase the productivity of dragon fruit.

Figure 2 presents multipol results in the form of a closeness map between actions and policies. The results of the closeness map show that the 'price stability' action is closer for the policy of cooperation agreements between the local government, PLN and farmer groups. Actions 'farmers' response to new technology' and 'marketing reach' indicate actions that are closer to the diversification policy of the dragon fruit processing industry or the government's marketing facilitation policy. Actions 'land ownership status', 'Agricultural Extension Center' and 'irrigation network' closer to the policy of increasing the competence of farmers.

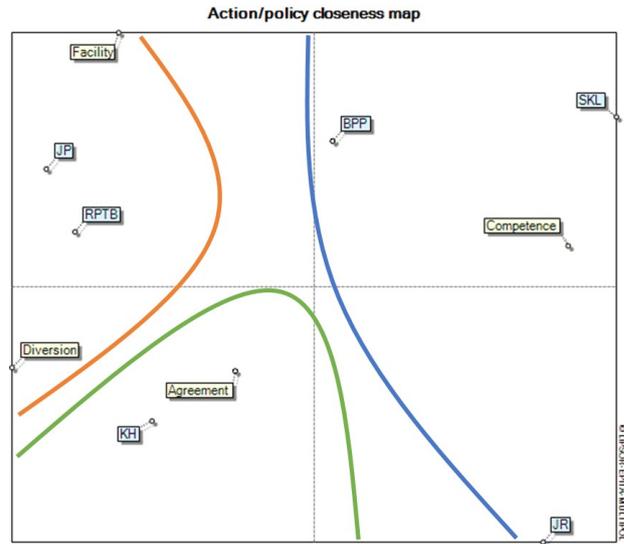


Figure 2 Action and policy linkage (closeness map)

4.3. Evaluation and classification of government policies towards scenarios

Figure 3 shows that the policy of 'marketing facilities from the government' excels in the demand side scenario while the policies of 'increasing the competence of farmers' and 'cooperation agreements between local governments, PLN and farmer groups' score higher than the other two policies in the supply side scenario.

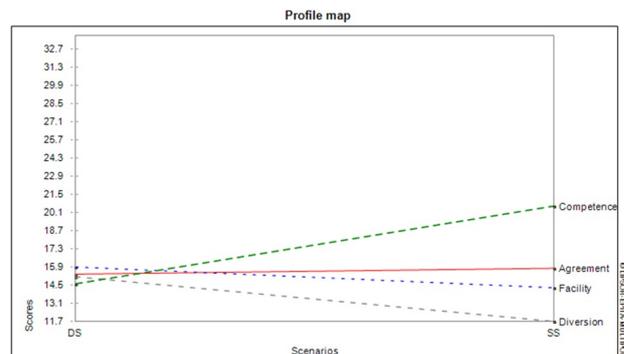


Figure 3 Profile map for policy and scenario

Based on the average value of the two scenarios (Table 4), the best position is achieved by the policy of 'increasing the competence of farmers' followed by the policy of 'cooperation agreement between local government, PLN and farmer groups'.

Table 4. Evaluation and classification analysis of policies and scenarios

	DS	SS	Moy.	Ec. Ty	Number
Agreement	15.4	15.8	15.6	0.2	3
Facility	15.9	14.3	15.1	0.8	2
Diversion	15.1	11.7	13.4	1.7	1
Competence	14.6	20.6	17.6	3	4

Figure 4 presents a closeness map of the Banyuwangi Regency government's policy on the scenario. The policy of 'cooperation agreement between local government, PLN and farmer groups' and the policy of 'marketing facilities from the government' can be implemented in both demand side scenarios and supply side scenarios. Meanwhile the policy of 'diversification of the dragon fruit processing industry' is only superior in the demand side scenario and the policy of 'increasing the competence of farmers' only excels in the supply side scenario.

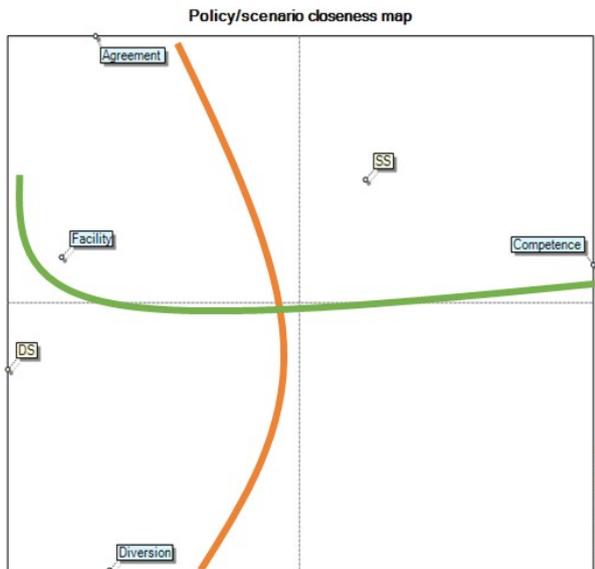


Figure 4 Policy and scenario linkage (closeness map)

The overall multipol results are presented in Figure 5, which is a form of potential policy paths for the Banyuwangi Regency government that can be achieved with appropriate actions for policies and scenarios in the development of dragon fruit agribusiness sustainability in Banyuwangi Regency.



Figure 5 Potential policy path

The policy of 'marketing facilities from the government' and 'cooperation agreements between local governments, PLN and farmer groups' can be implemented well in both the demand side and supply side scenarios. The programs pursued are improving and developing farmer responses to new technologies, increasing marketing reach and increasing price stability. These programs can be considered in developing sustainable dragon fruit agribusiness in Banyuwangi Regency in the future.

A different policy is the diversification of the dragon fruit processing industry and increasing the competence of farmers. The diversification policy of the dragon fruit processing industry is only suitable for the demand side scenario with programs based on 'improvement and development of farmer responses to new technologies' and 'increasing marketing reach'. The policy to increase the competence of farmers is only appropriate in the supply side scenario with programs based on 'improvement of land ownership status', improvement and development of Agricultural Extension Centers' and 'improvement of irrigation networks'.

5. CONCLUSION

The policy scenario for developing dragon fruit agribusiness sustainability in Banyuwangi Regency can be carried out from the demand side and the supply side. From the demand side, the policy scenarios that suit the needs of farmers are: 1) marketing facilities from the government; 2) cooperation agreement between local government, PLN and farmer groups; and 3) diversification of the dragon fruit processing industry. As for the supply side, the policy scenarios that are in line with the government's offer are: 1) increasing the competence of farmers; 2) cooperation agreement between local government, PLN and farmer groups; and 3) marketing facilities from the government.

ACKNOWLEDGMENTS

We would especially like to thank the Department of Agriculture and Food of Banyuwangi Regency, agricultural extension workers, and dragon fruit farmers in Bangorejo and Pesanggaran sub-districts who have supported this research. Thanks are also conveyed to the Politeknik Negeri Jember for providing support for this research.

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