Optimization of Food Sovereignty Policy in the City of Surabaya Through Multicriteria Evaluation Using the Multipol Method

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Abstract

This research explores the evaluation of food policy in the city of Surabaya using the MULTIPOL model, with a focus on the performance of various policies against different scenarios. The results of the analysis show that the multi-livestock and integrated livestock edutourism policies received the highest scores, with an average of 15.8 and 15.6, respectively, and a standard deviation of 0.2. These two policies show good suitability for both supply-side and demand-side scenarios, supported by actions such as training and technical guidance, sustainable agricultural development, and crop diversification. These findings provide a deeper understanding of policy alternatives that can be taken in food development in the city of Surabaya, highlighting the importance of appropriate action strategies in achieving the goal of food sovereignty.

Keywords: *Policy Evaluation, MULTIPOL, Food Sovereignty, Scenario.*

INTRODUCTION

Food sovereignty is an important concept in maintaining social welfare and the economic and social stability of a country. Food sovereignty itself refers to fulfilling every individual's rights to food that is of good nutritional quality, culturally appropriate, and produced in a sustainable and environmentally friendly manner (Sampson et al., 2021). This includes not only adequate food accessibility for all citizens but also ensuring that the food is produced through an agricultural system that maintains environmental sustainability. In the context of Indonesia, which is a country with fairly high population growth, the challenges of achieving food sovereignty are increasingly complex. As the population increases, the need for food also increases significantly. Malthus's theory about food and population growth reminds us that if food production does not increase in line with population growth, food scarcity problems will arise (Pawlak & Kołodziejczak, 2020). Therefore, the government has a crucial role in ensuring that its people's food needs are met through various effective policies.

The city of Surabaya, the second-largest metropolitan area in Indonesia after Jakarta, faces challenges in terms of food sovereignty. With a limited area and the ongoing conversion of agricultural land to non-agricultural land, efforts to meet people's food needs are becoming increasingly difficult (Dwiartama, et al., 2022). The Surabaya City Government is aware of the importance of this issue and has taken strategic steps to deal with it, one of which is through Surabaya Mayor Regulation (Perwali) Number 78 of 2021 concerning the position, organizational structure, description of duties and functions, and work procedures of the Surabaya City Food Security and Agriculture Service.

This regulation stipulates that one of the areas within the service is the food sector, which is responsible for various aspects of food management in the city (Surabaya Mayor Regulation, 2023). Apart from that, the Surabaya City Government also issued Perwali Number 4 of 2023 concerning the Surabaya City Food and Nutrition Regional Action Plan for 2023-2024. This regulation strengthens the government's commitment to creating a sustainable food system through various programs and activities that involve coordination with various institutions and agencies (Surabaya Mayor Regulation, 2023). The food sector in this service has the

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task of preparing and implementing program plans and technical instructions, coordinating and collaborating with other institutions, as well as supervising and controlling the implementation of food-related programs.

The right to food is also regulated implicitly in the 1945 Constitution, which states that every citizen has the right to work and a living that is worthy of humanity (Article 27 paragraph 2), the right to live and defend his life (Article 28A paragraph 1), and that the poor and neglected children are cared for by the state (Article 34 paragraph 1). These provisions emphasize the state's responsibility to guarantee basic needs, including food, for all its citizens. However, amid these efforts, Surabaya is faced with the reality that agricultural land is increasingly narrowing (Putri, et al., 2024). Medokan Semampir, one of the sub-districts in Sukolilo District, is facing this challenge by involving the community in modern agricultural practices using empty land belonging to the Indonesian Navy (TNI AL) and the Sepuluh Nopember Institute of Technology (ITS). Although these lands may eventually change function, this effort shows local adaptation and innovation in the face of limited agricultural land.

Addressing this challenge in a sustainable manner requires a more integrated and holistic approach. Sustainable agriculture, which prioritizes efficient and environmentally friendly resource management, is one of the key strategies (Tian, et al., 2020). This concept not only involves using less energy and minimizing the ecological footprint, but also involves widespread local purchasing, a reduction in processed foods, and an increase in the number of community gardens and home gardens. In a policy context, comprehensive and participatory analysis is essential. The use of policy analysis methods such as MULTIPOL (Multicriteria Policy) can help in identifying and evaluating various scenarios and policy actions that can be taken. MULTIPOL, developed by Godet and his team, allows evaluation based on interactions between actions, policies, and scenarios and involves various stakeholders in the process (Iskandar, 2022). This allows the government to formulate policies that are more targeted and sustainable.

This research aims to identify food sovereignty management problems in Medokan Semampir Subdistrict using MULTIPOL analysis, determine appropriate scenarios and policies, and direct sustainable agricultural activities by utilizing limited land but with maximum and quality results. It is hoped that the use of planting methods using polybags and pots can be a solution to overcome land limitations as well as support food sovereignty in the city of Surabaya. Thus, this research will not only provide an overview of the actual condition of food sovereignty in the city of Surabaya but also offer practical policy solutions that can be implemented to support local and national food security.

Methods of Research

The research method uses a mixed-methods approach involving several important stages that integrate participatory involvement and multicriteria analysis to evaluate alternative scenarios. The first stage is the identification and definition of the main components, which include scenarios, policies, and actions (Rustini, et al., 2023). Scenarios reflect structured future developments, with goals and objectives set to address specific problems. Policy is a strategy designed to achieve goals in a specific planning context, covering political, social, economic, and physical aspects. Action is a concrete way to achieve the goals set by policy through various potential interventions (Adetama, et al., 2022). The second stage is data collection and determining evaluation criteria through a participatory approach such as focus group discussion (FGD). These criteria are used to assess the scenarios, policies, and actions under consideration. Active participation of stakeholders helps in ensuring that the specified criteria are relevant and cover various important aspects such as environmental protection, social cohesion, economic efficiency, and cultural preservation. In the FGD process, weighting is also carried out for each scenario, policy, and action, which gives a priority value to each component based on the assessment of the experts or residents involved.

The final stage is data processing using MULTIPOL software, which processes input scenarios, policies, and actions as well as predetermined criteria and weights. This software generates a hierarchy of best actions based on predefined policies and scenarios, taking into account uncertainty and testing the effectiveness of different policies and actions for the evaluated scenarios (Wijayanto, et al., 2022). These results were then confirmed through the second stage of FGD, which ensured the validity and accuracy of the resulting hierarchy, thereby supporting better and more informed decision-making for policymakers.

RESULTS AND DISCUSSION

Components of MULTIPOL Analysis

The results of assessments from experts and focus group discussions that have been confirmed are included in the MULTIPOL program, showing the impact of various programs, policies, and scenarios on success criteria. The visualizations in Figures 1a, 1b, and 1c show how each program, policy, and scenario affects the specified criteria. Programs are evaluated based on their effectiveness in meeting success criteria, policies are viewed for their contribution to achieving various criteria, and scenarios are analyzed for their long-term impact. This MULTIPOL method provides a systematic and comprehensive framework, helping decision-makers choose the best alternative based on data-supported and participatory analysis (Li, et al., 2022).
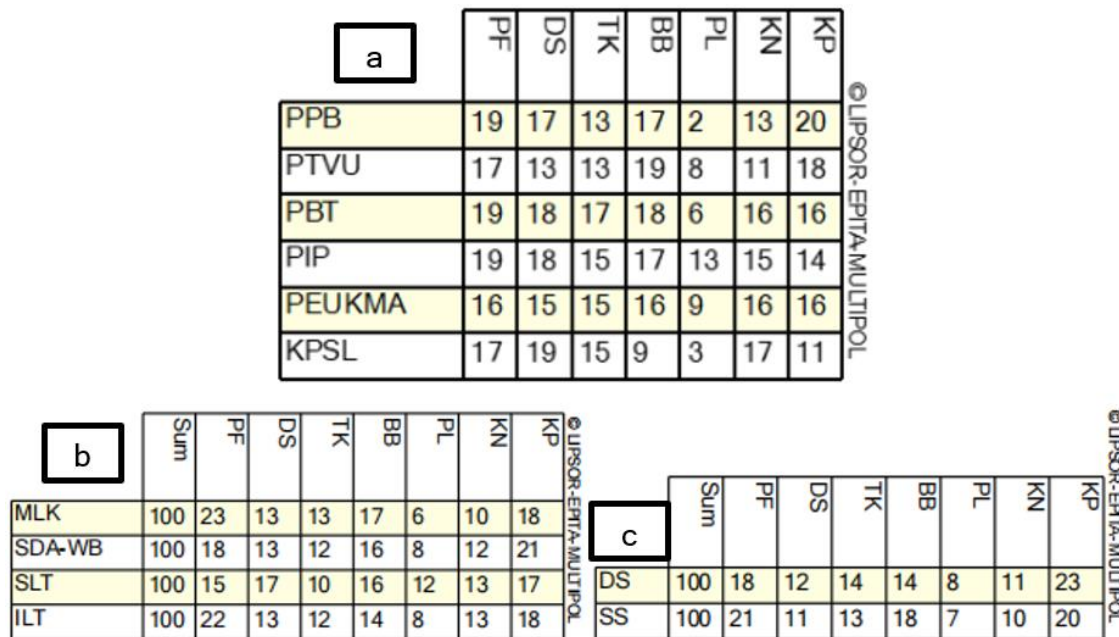
a	PF	DS	TK	BB	PL	KN	KP
PPB	19	17	13	17	2	13	20
PTVU	17	13	13	19	8	11	18
PBT	19	18	17	18	6	16	16
PIP	19	18	15	17	13	15	14
PEUKMA	16	15	15	16	9	16	16
KPSL	17	19	15	9	3	17	11

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b	Sum	PF	DS	TK	BB	PL	KN	KP
MLK	100	23	13	13	17	6	10	18
SDA-WB	100	18	13	12	16	8	12	21
SLT	100	15	17	10	16	12	13	17
ILT	100	22	13	12	14	8	13	18

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c	Sum	PF	DS	TK	BB	PL	KN	KP
DS	100	18	12	14	14	8	11	23
SS	100	21	11	13	18	7	10	20

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Figure 1. Action Against Criteria Matrix.

Policy Matrix Against Criteria.

Scenario Matrix Against Criteria.

The data shown in Figures 1a, 1b, and 1c are processed by the MULTIPOL application to evaluate the performance of actions against policies as well as the performance of policies against scenarios. The results of this evaluation are used as a basis for formulating policy options aimed at achieving the target of strengthening food in the city of Surabaya. The results are displayed in a variety of formats, including score tables, profile maps, sensitivity maps, and proximity maps, providing a comprehensive picture of the effectiveness and relevance of various actions and policies in achieving stated goals.

Results of Multipol Evaluation of Policy Actions

The results of the MULTIPOL analysis for each action are presented in Figure 2, Figure 3, and Figure 4.

	MLK	SDA-WB	SLT	ILT	Moy.	Ec. Ty	Number
PPB	16,2	15,8	15,1	15,8	15,7	0,4	4
PTVU	15,3	15,1	14,6	15	15	0,3	2
PBT	16,8	16,4	16	16,5	16,5	0,3	6
PIP	16,4	16,1	16	16,2	16,2	0,1	5
PEUKMA	15,3	15,2	14,9	15,2	15,1	0,2	3
KPSL	13,7	13,4	13,2	13,7	13,5	0,2	1

Figure 2. Evaluation of Actions Against Policy

Based on Figure 2, the performance of each program is known about the policies that will be implemented for the food sovereignty strategy in the city of Surabaya. The Technical Training and Guidance (PBT) program ranked highest with a mean score of 16.5 and a standard deviation of 0.3, making it a priority program. In the second place, the Agricultural Infrastructure Development Program (PIP) has an average value of 16.2 and a standard deviation of 0.1, followed by the Sustainable Agricultural Development Program (PPB) with an average value of 15.7 and a standard deviation of 0.4. These three programs are superior in food development in Surabaya. The Agricultural Small and Medium Enterprises Ecosystem Encouragement Program (PEUKMA) is in third place with an average value of 15.2 and a standard deviation of 0.2. Furthermore, the Crop Diversification and Superior Varieties Program (PTVU) and the Partnership Program with Government, Private Sector, and NGOs (KPSL) are in the lowest ranking, with average values of 15 (standard deviation 0.3) and 13.5 (standard deviation), respectively. standard 0.2), indicating poor performance. A more specific evaluation of each program against policy can be seen in Figure 3, which shows a profile map connecting program scores with policies, and Figure 4, which displays the closeness map between programs and policies.
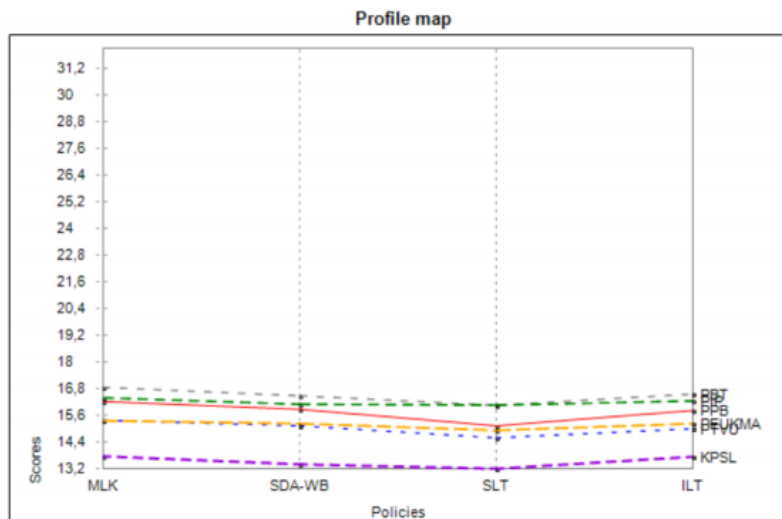

Figure 3. Program Profile Map Against Policy

Figure 3 shows that the leading programs for various policy alternatives in the City of Surabaya are Technical Training and Guidance (PBT), Agricultural Infrastructure Development (PIP), and Sustainable Agricultural Development (PPB). These programs are most effective for Multifunctional Livestock (MLK), Natural Resources and Cultural Tourism (SDA-WB), Smart Livestock Edutourism (SLT), and Integrated Livestock Edutourism (ILT) policies. Programs that are less of a priority for these policies are partnerships with the government, private sector, and NGOs (KPSL).

Complementing the evaluation of program linkages to policy, Figure 4 shows the closeness or suitability of each program to policy. From the proximity map, it is known that the Sustainable Agricultural Development

(PPB), Training and Technical Guidance (PBT), and Diversification of Superior Crops and Varieties (PTVU) programs have high conformity with the Multifunctional Livestock (MLK) and Natural Resources and Cultural Tourism policies (SDA-WB). On the other hand, the Partnership with Government, Private, and NGO (KPSL) program as well as the Agricultural Small and Medium Enterprises (UKM) Ecosystem Encouragement and Agricultural Infrastructure Development (PIP) programs show lower suitability.
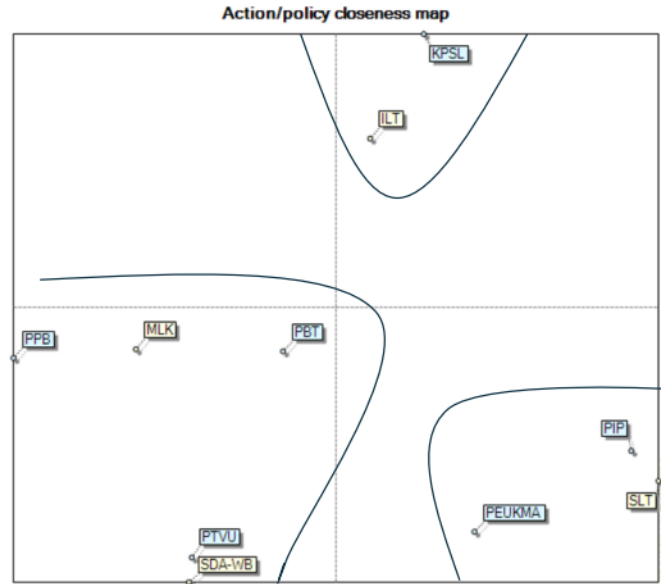

Figure 4. Relationship between Policy and Program

Figure 4 presents a program sensitivity map, where the (X) axis refers to the standard deviation and the (Y) axis refers to the average value of a program, depicting program performance about policy. Actions that show low standard deviations and high mean values indicate good performance for various policies. In contrast, actions with a high standard deviation are more specific to a particular policy, and their performance depends on their average value. Based on this proposition, Figure 4 can be explained as follows:

Training and Technical Guidance (PBT), Agricultural Infrastructure Development (PIP), and Sustainable Agricultural Development (PPB) actions show the highest performance with low standard deviations for almost all policies.

Crop Diversification and Superior Varieties (PTVU) Action and Ecosystem Encouragement for Small and Medium Enterprises (SMEs) Agriculture has moderate performance with a low standard deviation, which is suitable for certain policies.

Partnership actions with the government, private sector, and NGOs (KPSL) are in a lower position in the performance hierarchy with the highest standard deviation, indicating that these actions are less appropriate or have limited suitability even for certain policies.

Results of the Multipol Policy Evaluation of Scenarios

This evaluation aims to measure the performance of policy alternatives against various scenarios. The evaluation process uses the overall average value of each policy as well as a standard deviation value, which reflects the policy's sensitivity to the scenario (Zepharovich, et al., 2021). The best-performing policies are indicated by a combination of high mean values and low standard deviations. These two indicators together determine the policy position in the hierarchy. The results of the Multipol analysis for each policy are shown in Figure 5, Figure 6, Figure 7, and Figure 8.

	DS	SS	Moy.	Ec.Ty	Number
MLK	15,6	16	15,8	0,2	4
SDA-WB	15,5	15,6	15,6	0,1	3
SLT	14,7	14,7	14,7	0	1
ILT	15,4	15,6	15,5	0,1	2

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Figure 5. Evaluasi Kebijakan Terhadap Skenario

The multi-livestock policy is the most superior policy, with an average value (Moy) of 15.8 and a standard deviation (Ec.Ty) of 0.2. In second place is the Cultural Tourism Natural Resources Policy, followed by the Integrated Livestock Tourism Policy in third place, and finally the Smart Livestock Tourism Policy.

In the SS (supply side) scenario, the best policy is Multi Livestock, followed by the Cultural Tourism Natural Resources Policy and the Integrated Livestock Tourism Policy, which have the same score. These findings indicate that these two policies can be implemented simultaneously. In the SS scenario, the Smart Livestock Tourism Policy is in last place.

In the DS (demand side) scenario, the multi-livestock policy is again the best, followed by the cultural tourism natural resources policy.
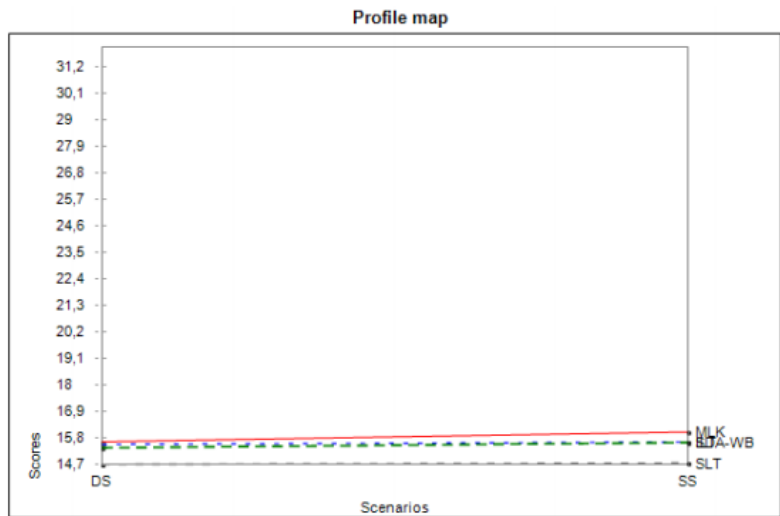

Figure 6. Map Profile between Policies and Scenarios

Knowing the suitability of each policy for the scenario can be seen in the picture above. From this picture, it is known that the Cultural Tourism Natural Resources Policy is by both scenarios, namely SS (supply side) and DS (demand side). Meanwhile, the Multi Livestock, Smart Livestock, and Integrated Livestock policies are more suitable for the SS (supply side) scenario, and there are no policies that are suitable for the DS (demand side) scenario.
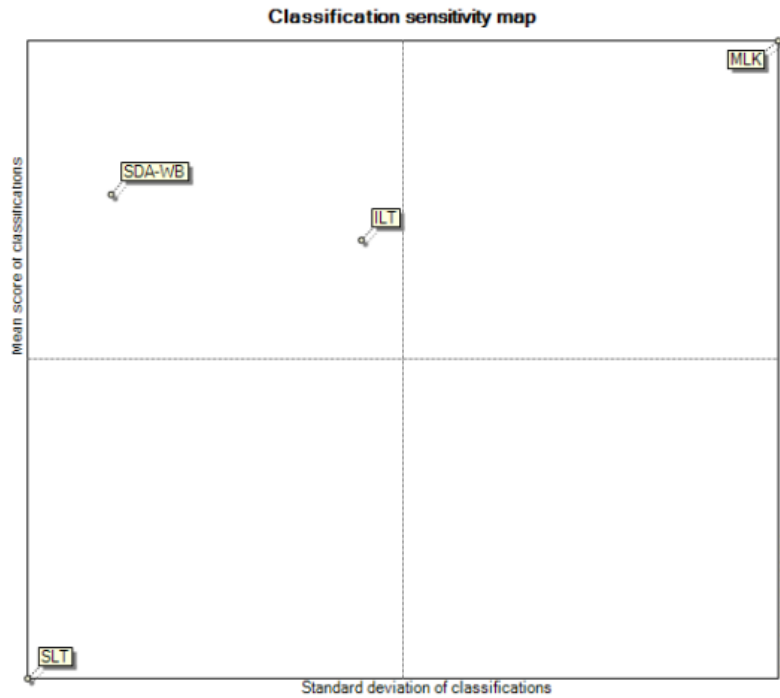
Classification sensitivity map

Figure 7. Sensitivity Between Policies and Scenarios

Based on this proposition, the Cultural Tourism Natural Resources Policy and the Integrated Livestock Policy are the best, most appropriate, and most stable. This policy is suitable for supply-side and demand-side scenarios. The multi-livestock policy is also quite stable, while the smart-livestock policy is considered quite unstable. There are no policies in quadrant IV, which indicates the highest instability. These findings again confirm that the Cultural Tourism Natural Resources Policy is the most appropriate to implement in the food sovereignty strategy in the era of regional autonomy in the city of Surabaya.

Policy/scenario closeness map
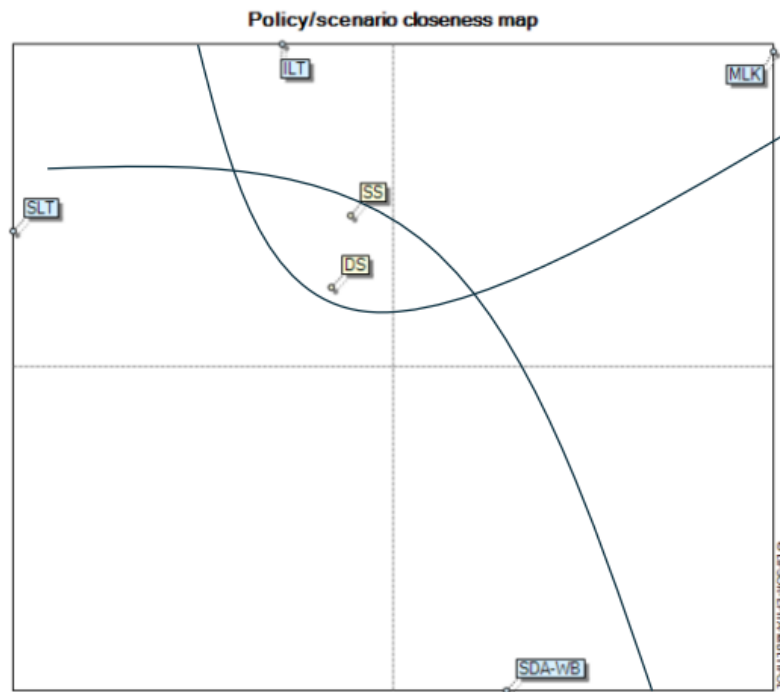
Figure 8. The Relationship Between Policies and Scenarios

This information shows the suitability of each policy to the scenario, where the Integrated Livestock and Multi Livestock policies are suitable for Supply Side (SS) and Demand Side (DS) scenarios, while the Smart Livestock policy and Socio-Cultural Natural Resources Policy are only suitable for Demand Side scenarios (DS).
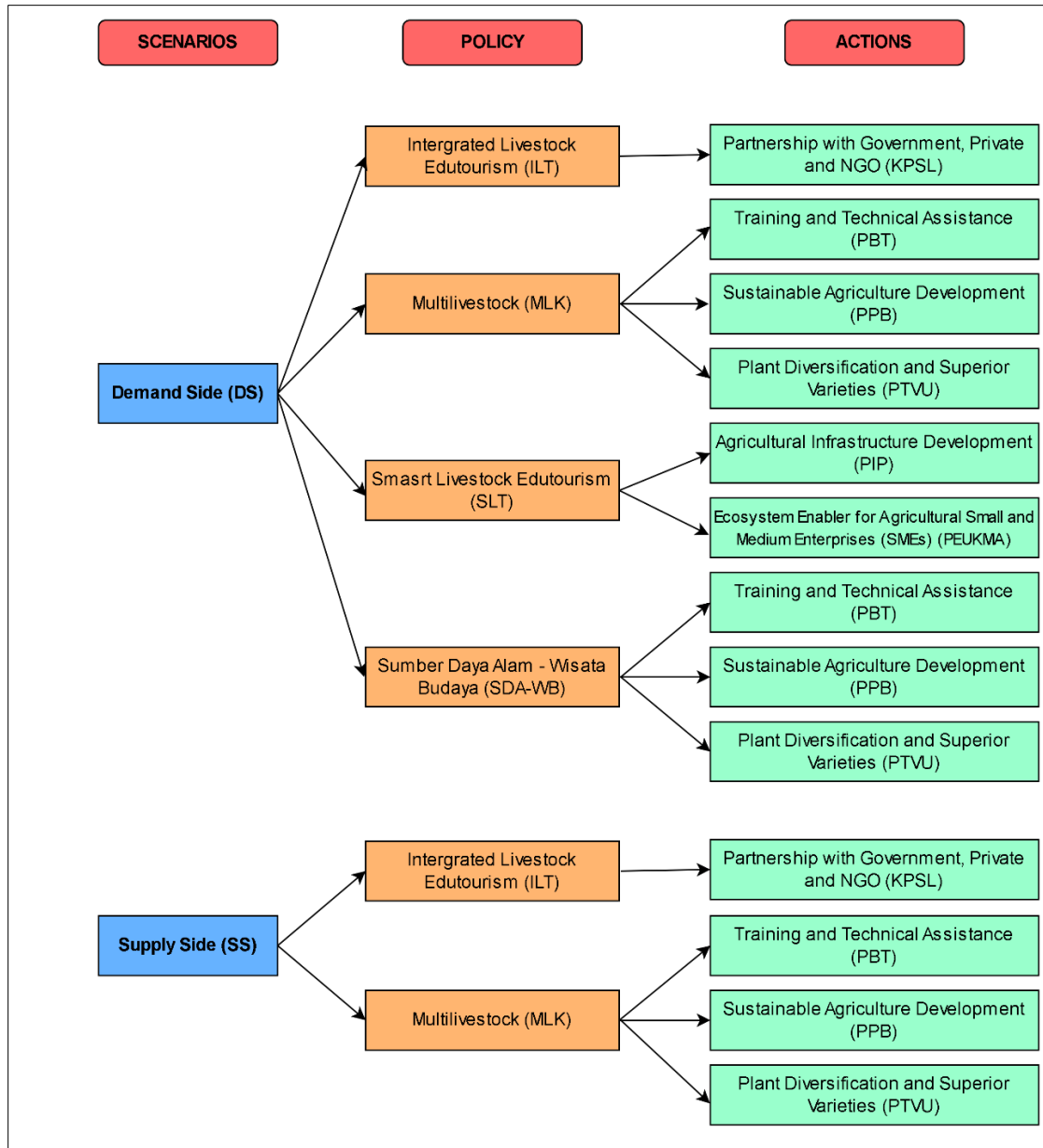
DISCUSSION

Figure 9. Potential Policy Map

From the policy framework presented in Figure 9, it can be concluded that strengthening the food sector in the city of Surabaya requires a comprehensive and targeted approach. Evaluation using the MULTIPOL model provides an overview of the future potential of food strengthening along with the direction of relevant policies and programs (Greengard, O'Neil, Rachh, & Vico, 2021). In this context, the multi-livestock policy appears to be the best and most suitable for both supply-side and demand-side scenarios (Martin et al., 2020). This shows that this policy has the potential to effectively strengthen the food sector in the city of Surabaya from various points of view. Furthermore, there are other policies, such as integrated livestock edutourism, that are also suitable for both scenarios, although with slightly lower performance compared to multi-livestock. However,

this policy still has significant added value in efforts to strengthen the food sector, especially if supported by building partnerships with the government, private sector, and NGOs.

In the demand-side scenario, two additional policy alternatives emerge, namely smart livestock edutourism and natural resources and cultural tourism. Although both fit this scenario, smart livestock edutourism shows lower performance projections compared to natural resources and cultural tourism (Ansori et al., 2023). However, both still have an important role in strengthening the food sector, especially if supported by actions such as developing agricultural infrastructure, encouraging the Agricultural Small and Medium Enterprises (SME) ecosystem, training and technical guidance, as well as diversifying superior crops and varieties.

Overall, this discussion emphasizes that strengthening the food sector in the city of Surabaya requires synergy between various policies and programs that are by existing alternative policies and scenarios. Thus, the implementation of the policy framework depicted in Figure 9 can become a solid foundation for achieving the success criteria targets that have been set.

CONCLUSION

In the context of food sector development in the city of Surabaya, evaluation using the MULTIPOL model provides in-depth insight into potential policies and programs that can be implemented. From the results of this evaluation, several conclusions can be drawn:

The Multi Livestock Policy (MLK), with an average value (Moy) of 15.8 and a standard deviation (Ec.Ty) of 0.2, stands out as the main choice (rank 1) for strengthening the food sector. This policy has good suitability for various scenarios (SS and DS), as well as high-performance projections, making it a very relevant option in the context of increasing food sovereignty.

Implementation of the Integrated Livestock Edutourism (ILT) policy requires building strong partnerships between the government, the private sector, and NGOs. This collaboration is the key to achieving success in developing a sustainable food sector (rank 3).

The importance of diversifying policies and supporting programs. Focusing on improving agricultural infrastructure, training, and technical guidance, as well as developing superior plant varieties, are strategic steps in facing challenges in achieving food sovereignty.

The MULTIPOL evaluation provides a comprehensive view of the relationship between relevant policies, scenarios, and programs in the context of food sector development in the city of Surabaya.

This approach provides a strong foundation for sustainable and informed decision-making.

Thus, the implementation of policies and programs selected based on the results of the MULTIPOL evaluation is expected to be an effective first step towards achieving the targets set for strengthening the food sector of the City of Surabaya.

Acknowledgements

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