RESEARCH ARTICLE

Sustainable Soybean Farming Policy

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ARTICLE INFO	ABSTRACT
	Soybean is a much-needed commodity for the agricultural industry in Indonesia because it is an important industrial raw material, such as tempeh, tofu, and soy milk. The purpose of this study is to analyze the sustainability of soybean farming and formulate sustainable soybean farming policies. This research method uses descriptive explanatory variables. The research was conducted over a period of 3 months, from October to December 2023. The research location is in the subdistricts in Serang Regency, with respondents from the head of the department, agricultural extension workers, and experts in the field of agriculture spread across 6 subdistricts in the Serang Regency area. The analysis tool used in this research was hierarchical process analysis (AHP). The results showed that the sustainability of soybean farming can be realized by improving social aspects with institutional strengthening strategies to improve the sustainability of soybean farming. The policy direction of sustainable soybean farming is prioritized over institutional strengthening, with a program focused on improving nonformal education for both farmers and field extension workers. Institutional strengthening, as the main priority, is to conduct various types of counseling and training. The counseling that is needed by soybean farmers is soybean farming counseling.
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1. INTRODUCTION

The government's soybean development policies, such as in 2006, launched the Bangkit Kedelai program with the goal of increasing national soybean production to 1.2 million tons/year, with a target harvest area of 760 thousand ha. Import tariffs are also a policy carried out by the government to protect domestic soybean producers. The import tariff policy set is an ad valorem tariff with the tariff amount changing every time (Andayanie et al., 2011). The government imposed a zero percent tariff on imported foreign soybeans in 2013 through Minister of Finance Regulation No. 133/PMK.011/2013. The elimination of soybean import tariffs was done not only to maintain the stabilization of domestic soybean prices but also as a form of anticipation of a more severe impact due to the increase in international soybean prices at that time. As an importer country, Indonesia's soybean consumption is largely determined by domestic availability.

Domestic soybean availability tends to present problems because it is not sufficient to meet the needs of the community (Mahdoh and Risyanto, 2018). Soybean availability is the number of soybeans available for consumption derived from the difference in additional production plus imports and deducted by exports, scattered, use of feed and seeds, and the nonfood industry. The large productivity gap provides an opportunity for increased production through increased productivity at the farm level (Atman, 2009). Therefore, this study reveals how the use of soybean production inputs affects soybean seed production. However, soybean production is inseparable from the

behavior of farmers when inputs are used. The behavior of input use involves not only the volume (dose) but also the combination of production inputs (Irwan, 2006). Based on the achievements of soybean production and productivity in Serang Regency in 2022, it is suspected that this is because soybean seed production in 2022 was not optimal.

Farmer behavior is reflected in daily actions in environments such as families, communities, and work environments. Actions that are performed repeatedly and ingrained are called behavior. This habit will take place continuously. This behavior can also affect the way farmers think in the management of farming that has been done since the first (Septiatin, 2012). Farming management has been performed since long ago to meet daily needs. Farmers feel the need; therefore, there is an urge or a kind of motivation that exists within them. Through a set of knowledge, local people interact with their environment. Natural resources that are known and managed provide a pattern of local community behavior in response to the environment (Isnowati, 2014). All of this is based on their perception of the environment and local natural resources (land, water or rivers, forests, mountains, etc.) This high productivity is also expected to have a high level of technical efficiency. In other words, soybean farmers in the Serang Regency are expected to be technically efficient. Based on this description, this research was conducted entitled Optimizing the Use of Production Inputs to Increase Soybean Seed Production Yields, with the hope that Serang Regency can supply food needs in Indonesia. The objectives of this study are to analyze the sustainability of soybean farming and formulate policy directions for sustainable soybean farming.

2. MATERIALS AND METHODS

This research uses descriptive explanations. Explanatory descriptive research explains the relationships among variables that affect the researcher's hypothesis (Sugiyono, 2013).

2.1 Location and time of research

This research was conducted over a period of 3 months from October to December 2023. The research was conducted in 6 subdistricts in Serang Regency, with respondents from the head of the agency, agricultural extension workers, experts, and farmers spread across 6 subdistricts in the Serang Regency area. The method used in this research is an in-depth survey involving observations. The survey method is a type of research that collects various types of information about the symptoms of existing problems through interviews assisted by questionnaires.

2.2 Population and sample

The population in this study included soybean farmers who plant Anjasmoro varieties of soybeans in Serang Regency, Banten Province, with locations in 6 subdistricts, namely, Padarincang, Cinangka, Anyer, Mancak, Pabuaran, and Ciomas. The reason for choosing the research location is that, agronomically, the land in the location has the potential for soybean cultivation, and in the subdistricts, the contingency of farmers toward soybean cultivation is high.

The sampling in this research was carried out purposively based on data that could intentionally represent the population. The number of samples used was 12 respondents, consisting of 1 regent, 1 head of the Agricultural Service, 6 agricultural instructors, and 4 farmers.

2.3 Data collection

Data collection was carried out through questionnaires, in-depth interviews and focus group discussions. The questionnaire is a data collection method that makes a list of questions or statements accompanied by alternative answers and then distributes them directly to respondents so that the results of completing them will be clearer and more accurate. The questionnaire is a closed-ended question in which each question or statement contained in the questionnaire has an alternative answer determined so that respondents cannot provide answers freely. In-depth interviews involve conducting direct questions and answers by asking questions to related parties, such as farmers and associated stakeholders, to obtain data or information related to the problem studied. The focus group discussion (FGD) aims to identify alternative strategies based on the root causes of the development of soybean farming activities in the Serang Regency with stakeholders, namely, the regent, head of the agricultural service, agricultural extension workers and farmers.

2.4 Data analysis

To determine the optimization policy of soybean seeds, a hierarchical analysis process involving business actors in agribusiness was used. The AHP method is useful for determining the effect of an element on a problem. This determination is made through a fundamental comparison scale of individual abilities, which are compared in pairs against several elements. Furthermore, the AHP is useful for solving problems with explicit logical analysis; there are three principles, namely, compiling hierarchies, setting priorities, and logical consistency. The main objective of AHP analysis is to select and prioritize sustainable soybean farming efforts.

2.5 Theoretical framework

This study used the AHP framework, which assists decision makers in the hierarchical and methodical organization and analysis of complex problems (Saaty, 1987). The application of the AHP theory is extensive and has many uses, including in the areas of human resources, economics, transportation management, agriculture, and sustainability in energy systems. When a possible course of action or alternative needs to be given a numerical value, the AHP method is essential. It is a useful method that yields better results for both the tangible and intangible aspects of a decision.

Soybean is one of the most valuable crops in the world. This is because of its many applications as an affordable source of protein, healthy unsaturated fats, and carbohydrates for human diets, as well as feed for livestock and aquaculture and biofuel (Islam et al., 2022). It is grown mainly for oil and high-quality, low-cost proteins worldwide. It is a very nutrient-dense food item that is inexpensive, low in cholesterol, and a good alternative to animal protein because it contains the essential amino acids needed for human nutrition. In terms of the economic aspects of sustainable soybean farming based on price stability, producer-level soybean prices highly fluctuate. However, there is hope for the sustainability of soybean farming because of the amount of profit that can be made and its relatively high contribution to household income (Roessali et al., 2019).

3. RESULTS

3.1 Prioritization of sustainable soybean farming development in serang regency based on sustainable strategy development criteria

Based on the Focus Group Discussion (FGD) with stakeholders, there are four alternative strategies for developing soybean farming in the Serang Regency: (1) strengthening institutions, (2) developing facilities and infrastructure, (3) achieving environmental balance, and (4) implementing policies. This means that the three criteria for developing soybean farming in Serang Regency, including social, economic and environmental criteria, require strategic direction in strengthening institutions, developing facilities and infrastructure, environmental balance and policy.

Strengthening the independence of sustainable soybean farming in the Serang Regency determines the main variables of sustainable soybean farming. In the criteria dimension, there are three variables: environmental, economic and social. For the alternative strategy dimension, there are four variables: institutional strengthening, development of facilities and infrastructure, and environmental and policy balance. For institutional strengthening, the important variables are education, institutions, health and information. For the development of facilities and infrastructure, the important variables are production input, price, labor, and production facilities. For environmental balance, the important variables are seeds, water resources and land resources. For policy, the important variables are the Minister of Agriculture regulations, market price policies and product protection.

The prioritization of soybean farming development in Serang Regency based on development criteria is weighted through the AHP. The results of the AHP analysis revealed that the development of a soybean farming strategy could be approached by criteria, as shown in Figure 1.
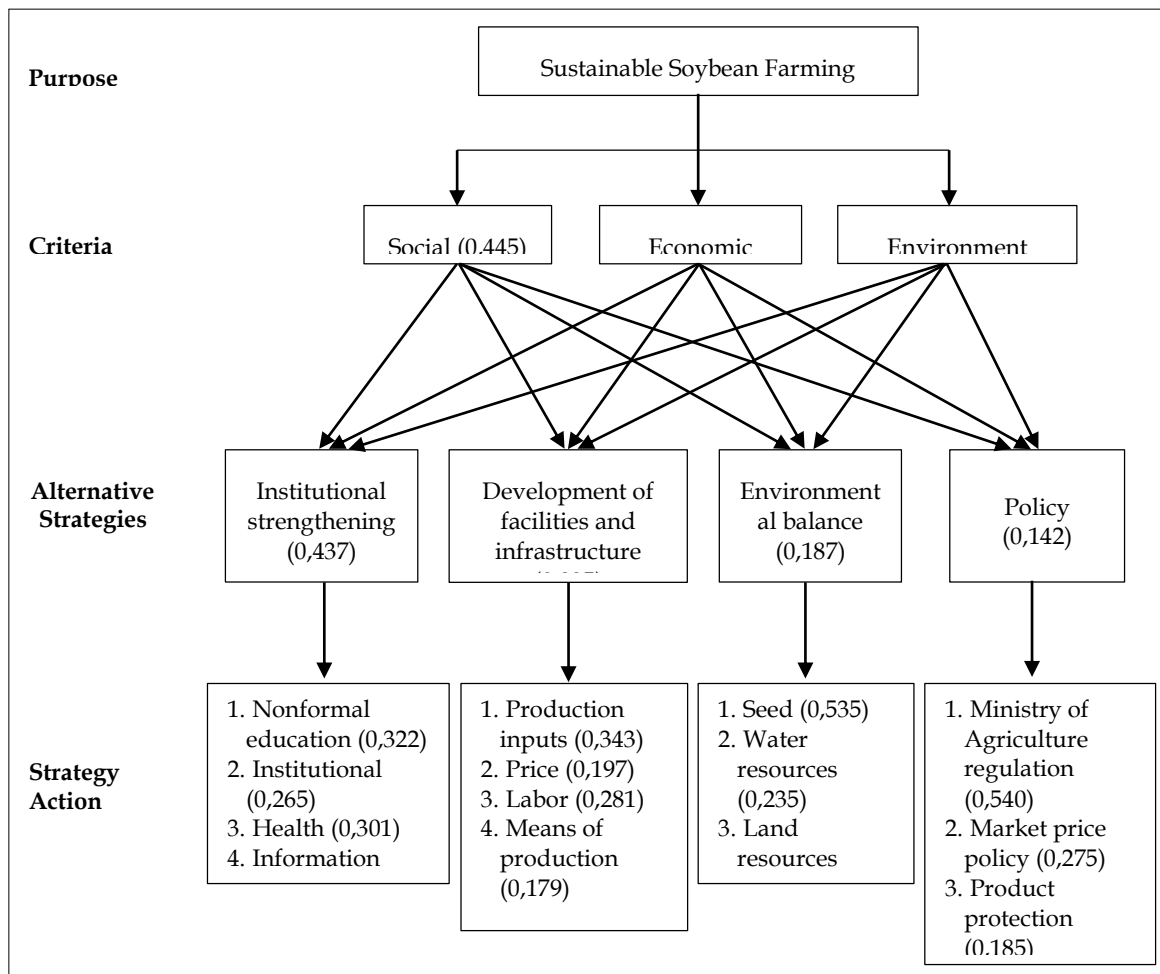
Figure 1: Building a sustainable soybean farming strategy

4. DISCUSSION

Sustainable soybean farming is the development of social aspects, followed by the development of economic aspects and the development of environmental aspects. The social weight value is 0.445, and the complete weights and priorities of the criteria based on development criteria are shown in Figure 2.
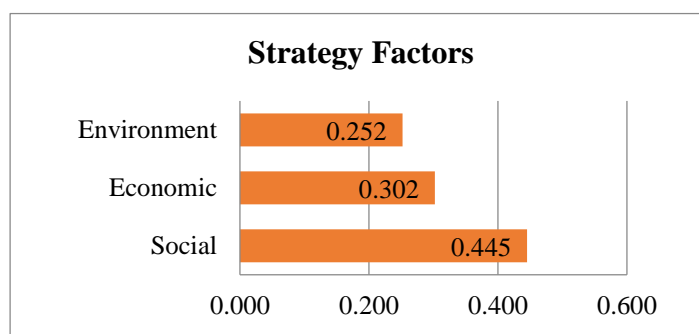

Figure 2: Weight and priority of criteria based on criteria sustainability strategy development

The social aspects of soybean farming development are prioritized because, based on the results of calculations with a consistency value of 0.005 (0.5%), which is smaller than 10%, the calculation requirements have been met with the highest weight value of 0.445. This implies that, in terms of social aspects, the farming institution is the main concern so that the sustainability of the farming system can be guaranteed. Institutional strengthening, especially service institutions, has a strategic role in efforts to empower agribusiness actors, especially in the provision of technology, market

information, counseling, improvement of human and financial resources, and farm sustainability (Sofia, 2007).

The optimal role of service and extension institutions will empower agribusiness actors and the sustainability of farming to minimize the constraints faced due to small business assets and improve the quality of actors in utilizing technology and managing important variables of resources because the condition of education and training is a determining factor in the length of adoption of cultivation technology. Effectiveness in communicating new technology information in the utilization of production facilities (fertilizers, seeds, and postharvest processing equipment), capital, and marketing for the sustainability of the farming system requires appropriate communication mechanisms and tools or media.

After the social aspect is improved, the economic aspect of soybean farming is improved again, and the economic aspect becomes the second priority. The economic aspect that needs to be the main concern so that the sustainability of farming can be guaranteed is the development of facilities and infrastructure, especially the use of production inputs and the level of production of commodities cultivated. This can be understood because the level of production of a particular commodity is directly proportional to the level of income of farmers. If farmers' income increases, farming activities will be economically sustainable.

The last priority is the development of environmental aspects. The soybean crops in the Serang Regency can still be maintained because of the suitability of the environmental aspects in the Serang Regency. From the perspective of sustainable development, cultivated seeds need to pay attention to environmental conservation values so that farming activities do not cause a decrease in environmental quality, and the utilization of water resources in soybean farming needs attention, as well as the land resources owned by farmers, which must be maintained for fertility (Sitorus and Sri Ayuni, 2020).

4.1 Prioritization of development strategies

Based on the results of previous FGDs, four alternative strategies have been produced, namely, (1) institutional strengthening; (2) strengthening infrastructure facilities; (3) strengthening the environmental balance of the provision of facilities and infrastructure; and (4) policies for the three criteria for the sustainable development of soybean farming. The purpose of this alternative strategy selection is to prioritize strategies for the development of soybean farming in the Serang Regency in a sustainable manner, both for social, economic, and environmental aspects.

4.2 Prioritization of soybean farming development strategies in terms of social aspects

The strategy of prioritizing soybean farming development from a social perspective can be identified through AHP, as seen in the figure below. The calculation is reinforced by the consistency value of 0.044 (4.4%), which is smaller than 10%, indicating that the calculation requirements have been met.
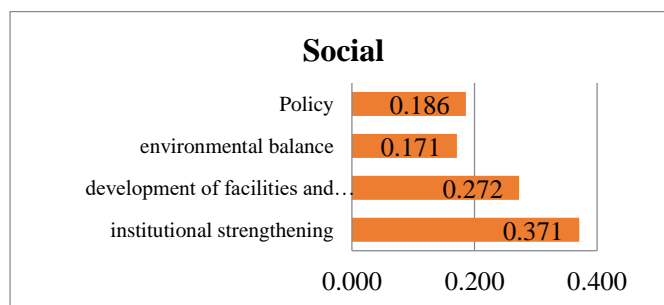

Figure 3: Weight and priority of strategies for sustainable soybean farming in terms of social aspects

Figure 3 shows that institutional strengthening is the priority in the development of sustainable soybean farming. This finding is highly relevant to field conditions because the existence of agricultural institutions, namely, the Agricultural Extension Center (Balai Penyuluhan Pertanian, BPP), supports soybean farming in the Serang Regency. The existence of BPP institutions is a place of consultation, discussion, and practice for farmers in Serang Regency. In the Serang Regency, seven institutions influence the sustainability of farming activities, namely:

1. The Agricultural Extension Center (BPP) and Field Agricultural Extension Workers (PPLs) are government institutions in the field of agriculture that conduct various types of counseling, education, and training to improve the knowledge and skills of farmers.
2. Kiosks of agricultural production facilities are private business institutions that sell various production facilities, such as fertilizers, pesticides, seeds, and others.
3. Farmer Group is one of the farmer organizations established by the government to carry out farming engineering (improving the ability of farmers in farming), especially in terms of production.
4. The village unit cooperative is one of the economic actors at the village level whose members are the village community concerned with performing economic functions to prosper.
5. The market is one of the most important farming institutions. The markets include traditional markets (at the village, subdistrict, and district levels) and intermediary traders.
6. Village and subdistrict governments are the lowest institutions in the government structure that perform the functions of guidance, security, administration, and others at the village/subdistrict level.
7. Bank Rakyat Indonesia (the BRI Unit) is one of the banking financial institutions at the subdistrict level that provides savings and loan facilities for the community.

4.3 Prioritization of sustainable soybean farming development strategies in terms of economic aspects

The prioritized economic aspects of soybean farming development strategies can be identified through AHP analysis, as shown in Figure 4. The calculation is reinforced by the consistency value of 0.035 (3.5%), which is smaller than 10% indicating that the calculation requirements have been met.
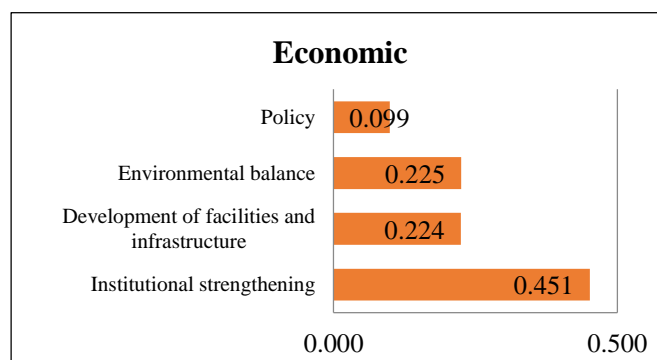

Figure 4: Weight and priority of strategies for soybean farming development from an economic perspective

The development of economic aspects is a priority because it is related to the development of existing resources, and institutional strengthening in the agricultural sector supports the improvement of soybean farming in Serang Regency. The availability of soybean farming facilities and infrastructure and the use of environmentally appropriate seeds as well as policies from the Ministry of Agriculture, support the sustainability of soybean farming from an economic perspective.

4.4 Prioritization of sustainable soybean farming development strategies in terms of environmental aspects

The prioritized environmental aspects of soybean farming development strategies can be identified through AHP analysis, as shown in Figure 5. The calculation is reinforced by a consistency value of

0.049 (4.9%), which is smaller than 10%, indicating that the calculation requirements have been met. The following are the weights and priorities of environmental development.
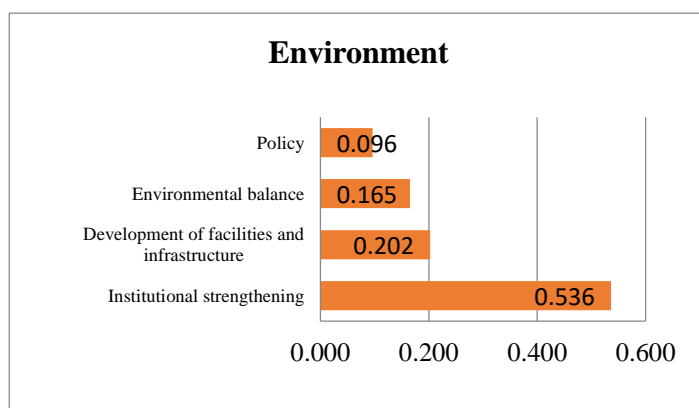

Figure 5: Weight and priority of strategies for soybean farming development from environmental aspects

The development of soybean farming by maintaining environmental balance is necessary for sustainable agriculture, and farmers can preserve the environment by using environmentally friendly seeds and organic fertilizers so that the fertility of the soil can be restored. Institutional development at the BPP level can be achieved by training and counseling soybean farmers regarding good postharvest methods due to better harvest and postharvest methods. Good crop quality is an important part of farming. Harvest and postharvest handling for soybean farming also have an impact on business returns, as soybeans are in high demand, especially for processed foods.

4.5 Prioritization of action plans for soybean farming development in serang regency

Action plans are activities to realize the objectives of the development strategy. From each alternative strategy, several strategic actions can be carried out. However, from several existing action plans, which priorities must be carried out must be chosen. To determine the priority of action plans for each development strategy, AHP analysis is carried out through weighting.

4.6 Prioritization of action plans for the institutional strengthening strategy

The calculation is strengthened by the consistency value of 0.025 (2.5%), which is smaller than 10%, indicating that the calculation requirements have been met.
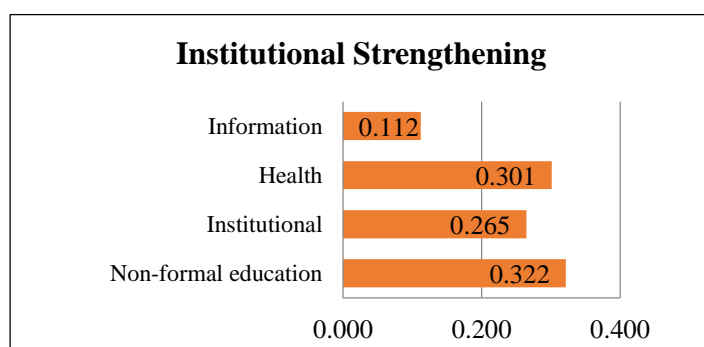

Figure 6: Weight and prioritization of action plans for strategic institutional strengthening

Education is a priority action because, based on the results of field surveys, farmers carry out soybean cultivation and postharvest techniques that are still simple, and the education generally carried out by farmers is nonformal. In addition to farmers, extension workers must increase their knowledge, especially with respect to environmentally friendly soybean cultivation. Thus, farmers have a place to ask questions about soybean farming. Extension workers must increase their knowledge so that they can better foster farmers. Sometimes extension workers cannot answer or solve problems in the field due to limited knowledge. By attending nonformal education in the field of soybean farming with resource persons from experts who have the competence to suit the needs of farmers and

extension workers, their insights and skills can be added. Currently, nonformal education, such as extension and training, is needed by farmers in soybean farming in the Serang Regency.

4.7 Prioritization of action plans for the strategy development of facilities and infrastructure

The calculation is reinforced by a consistency value of 0.060 (6.0%), which is smaller than 10%, indicating that the calculation requirements have been met.
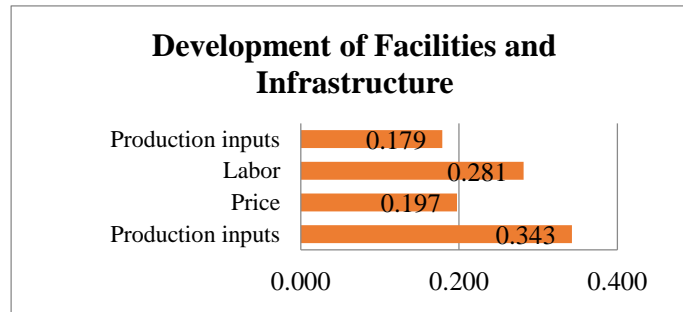

Development of Facilities and Infrastructure

Production inputs	0.179
Labor	0.281
Price	0.197
Production inputs	0.343

Figure 7: Weights and priorities of action plans for infrastructure development strategies

The development of soybean farming facilities and infrastructure is a priority because farmers need production facilities. The provision of production facilities is a priority because production facilities are a very basic factor for production efficiency, and the achievement of productivity levels and product quality is influenced by the availability of production facilities that can be reached by farmers at any time needed and the optimization of use. According to Nur Mahdi and Suharno (2019), to achieve the efficiency of input production facilities, there must be an organization in the application of production facilities, namely, the application of the right amount, time, place, cost and quality. The results of the field survey show that to obtain production facilities, soybean farmers in the Serang Regency do not experience problems because, in all villages, there are shops that provide production facilities. The scarcity of subsidized fertilizer from the government is the greatest problem, especially given the requirement for subsidized fertilizer disbursement through eRDKK input, making it difficult for farmers to obtain subsidized fertilizer. Not all fertilizers requested by farmers are fulfilled by the government, so farmers must buy their own fertilizers at nonsubsidized prices.

4.8 Prioritization of action plans for the   environmental balance strategy

Actions for strategies to realize environmental balance that are prioritized can be identified through AHP analysis, as shown in Figure 8. The calculation is reinforced by a consistency value of 0.095 (9.5%), which is smaller than 10%, indicating that the calculation requirements have been met.
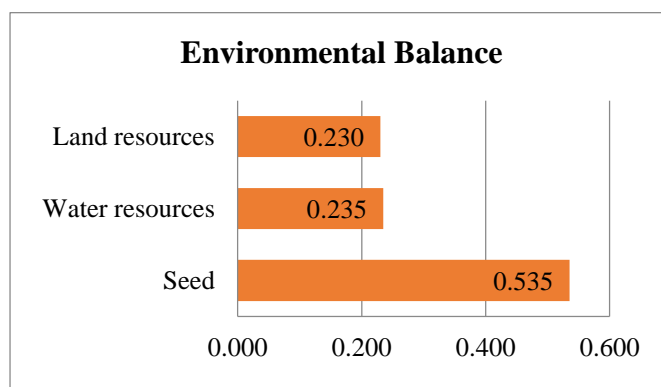

Environmental Balance

Land resources	0.230
Water resources	0.235
Seed	0.535

Figure 8: Weight and prioritization of action plans for environmental balance

Environmental balance is a priority because environmentally friendly soybean seeds, water resources, and land resources are needed in soybean farming in the Serang Regency.

4.9 Prioritization of Action Plans for Policy   Strengthening Strategies

The calculation is strengthened by the consistency value of 0.083 (8.3%), which is smaller than 10%, indicating that the calculation requirements have been met. The policy is based on the Regulation of

the Minister of Agriculture of the Republic of Indonesia No. 06/Permentan/OT.140/2/2015, which states that the development of farming is based on the provision of production facilities, cultivation aspects, marketing and processing aspects, and supporting institutional aspects.
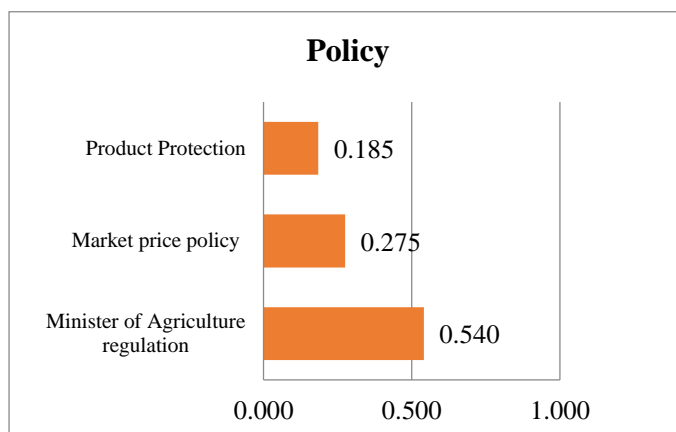

Figure 9: Weight and prioritization of action plans for policy strengthening strategies

Based on the Regulation of the Minister of Agriculture of the Republic of Indonesia, the sustainable development of soybean farming in the Serang Regency must be supported by local regulations. Protection of domestic products, especially soybean seeds, and price policies that favor soybean farmers are efforts to realize the sustainability of soybean farming in the Serang Regency.

5. CONCLUSIONS

1. The results of the AHP analysis of sustainable soybean farming development strategies revealed social aspects with a priority weight value of 0.445. In the development of soybean farming, the main alternative strategy is institutional strengthening with a weight of 0.437. The institutional strengthening of farmers is very important for improving the sustainability of soybean farming.
2. The policy direction of sustainable soybean farming is prioritized over institutional, social, economic, and environmental strengthening, with a focus on increasing nonformal education for both farmers and field extension workers. Institutional strengthening, the main priority, is to conduct various types of counseling and training. The training that is needed by soybean farmers in the Serang Regency is soybean farming training.

Authors' contributions: YS performed the study and wrote the manuscript, A and TS participated in designing the study and helped in writing the manuscript, AM conceived the idea, designed the project and contributed to writing the manuscript.

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