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The fishbone diagram analysis to know the factors that influence the decreasing interest of farmers in the cultivation of soybean

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ABSTRACT Soybean crop productivity in The Pracimantoro District ranked second in Wonogiri Regency in 2021. However, over time the stability of production has decreased. One thing that causes the decline in soybean production in Pracimantoro District is the decreased interest of farmers in cultivating. This study aimed to determine the factors causing the declining interest of farmers in planting soybeans. The research location was conducted in Pracimantoro District, Wonogiri Regency. The data in this study are primary data and secondary data. Primary data is data are taken directly from the research location through direct observation at the location, interviews with relevant stakeholders, and filling out questionnaires. Secondary data is obtained through agencies related to this research, tabulated and descriptive, and literature searches supporting this research. Analysis method of data using the fishbone diagram. The results showed that the factors that influence the decline in farmers' interest in cultivating soybeans are sources of plant pest and disease risks, sources of input risk and soybean production techniques and sources of risk in the business environment. Some pests and diseases that often arise and attack soybean commodities are leaf spot, whitefly, caterpillar/pod caterpillar, leafhopper, stink bug, bacterial wilt and javelin/ladybug. The Risks from nature is that high rainfall and changing climatic conditions also make it difficult for farmers to grow soybeans. The risk from the production input sector is the unstable quality, quantity, and price of seeds, pesticides and fertilizers. Moreover, other influencing factors exist, such as the entry of imported soybeans, price games at middlemen, the absence of a lower price limit for local soybeans, and post-harvest limitations.

1. INTRODUCTION

Soybean is an essential food ingredient in Indonesia, after rice and corn. Besides being used as food, soybeans can also be used as feed ingredients and a driving force for the community's economy (Akmalovna, 2022). The soybean vegetable protein is high enough to make people like to eat them (Grassini et al., 2021). Moreover, processed soy products are cheaper than other protein sources. Soybeans can also be used as a feed source for livestock and poultry. This causes the demand for soybeans in Indonesia to increase yearly.

However, this demand has yet to be fulfilled by local soybean production. One of the soybean centres in Central Java Province is Wonogiri Regency. In 2010 soybean planting area reached 23,091 ha, with production reaching 34,275 tons. Meanwhile, ten years after that, in 2020, the soybean planted area decreased drastically by 992 ha, with a production of only 1,200 tons (Hartono, 2021). Accessed on April 25, 2022. Based on the Wonogiri Regency Smart Book (2020), 25 sub-Districts in Wonogiri Regency, there are only 14 sub-Districts that cultivate soybeans.

Pracimantoro District is the second highest productivity District after Manyaran District. Based on interviews with extension workers in Pracimantoro District, farmers are currently reluctant to plant soybeans because of high production costs, low selling prices at harvest (because they are inferior to imported soybeans) and unable to deal with pests that arise. This is ironic because if you continue to rely on imported soybeans, local soybeans will never achieve self-sufficiency. Therefore, discussions with relevant stakeholders are needed to identify problems in soybean cultivation so that soybean development in Pracimantoro District can run in a better direction and can increase farmers' interest in cultivating soybeans.

2. METHODS

The research will be carried out from May to July 2022. The research was carried out in Pracimantoro District, Wonogiri Regency. The data sources used are primary data from interviews with selected respondents in this study and secondary data collected from various sources such as books, journals, and data from the Central Statistics Agency (BPS). The respondents used were 32 soybean farmers and two agricultural extension workers. The criteria for selecting soybean farmers in this study are farmers who consistently produce for the last three years in cultivated soybeans in

Pracimantoro District. Meanwhile, the agricultural extension workers selected as respondents are extension workers who always assist farmers in cultivating soybeans.

Data analysis using Fishbone Diagram. The fishbone diagram is a graphical technique to show several causes of a particular event (Coccia, 2020). The inventor of the fishbone diagram was Kaoru Ishikawa in 1953, who developed seven quality control (QC) tools in organizations for process solving and improvement (Coccia, 2017).

Respondents in this study are interested people who will jointly contribute to exploring the causes related to the declining interest in planting soybeans in Pracimantoro District, Wonogiri Regency. The root causes can be identified clearly and in detail in a logical pattern, namely the pattern of cause-and-effect relationships. Four Factors will be identified: input, resources, environment and technology. Input variables include seeds, fertilizers and pesticides; resource variables, namely land, human and capital; environmental factors are climate and weather; while the technical factor is the technical application in soybean cultivation (Rakhmawati et al., 2020).

3. RESULTS AND DISCUSSION

3.1 Respondent's Education Level

Education, especially formal education, is essential to improve the quality of human resources in the Pracimantoro District. The results showed that 60% of farmer respondents had an elementary school education, 30% had a high school education, and 10% were junior high school graduates. This is in the spotlight, and it is necessary to improve education to advance and increase regional competitiveness in an increasingly advanced and competitive era today. Meanwhile, this research also involves the role of officers from the Agricultural Extension Center (BPP) Pracimantoro District, as many as two people with an education level of S1 graduates and high school graduates.

3.2 Identification of Priority Risk Sources for Soybean Handling

Sources of soybean production risk were identified using the Fishbone diagram. This diagram identifies problems and shows a collection of groups of causes and effects called factors and effects called quality characteristics. The purpose of this cause-and-effect diagram is to find the factors that are the cause of a problem. If a process is stable, the diagram will provide clues on the causes to be examined for process improvement. The principle used in making this Fishbone diagram is brainstorming.

The factors that reduce farmers' interest in cultivating soybeans in Pracimantoro District will be identified with the help of Fishbone diagrams. Based on interviews with respondents, it was found that 17 factors caused the declining interest of farmers in cultivating soybean commodities which were the priority for handling. These factors are the fluctuating quality of seed prices, availability of seeds, quality and quantity of fertilizer prices, quality and quantity of pesticide prices, caterpillar attacks/caterpillar pods, whitefly attacks, javelin/ladybug attacks, leafhopper attacks, pest attacks, disease leaf spot, bacterial wilt disease, the entry of imported soybeans, fluctuations in the selling price of local soybeans in the market, the length of the supply chain, price games at middlemen, no upper and lower limit prices for soybeans, and not optimal post-harvest handling.

Next, the causative factors are grouped based on categories with the appropriate group's characteristics. This is done to facilitate the identification process, as seen in Table 1. Table 1. Grouping of Factors Causing the Declining Interest of Farmers in Cultivating Soybeans in Pracimantoro District

Table 1. Description of Research Respondents

No	Group of Factors Causing the Declining Interest of Farmers in Cultivating Soybeans	Source of Priority Factors
1	Pests and Plant Diseases	• Caterpillar attacks / caterpillar pods • Whitefly attacks • Javelin / ladybug attacks • Leafhopper attacks • Pest attacks • Disease leaf spot • Bacterial wilt disease
2	Input and Production Technical	• Seed price fluctuations • Seed Availability • Quality and quantity of fertilizer price • Quality and quantity of Pesticide price
3	Business Environment	• The entry of imported soybeans • Fluctuations in the selling price of local soybeans in the market • The length of the supply chain • Price games at middlemen • No upper and lower limit prices for soybeans • Not optimal post-harvest handling

Table 1 shows that the grouping of the factors causing the declining interest of farmers in cultivating soybeans in the Pracimantoro District is divided into three groups: the pest and disease group, the input and production process group, and the business environment group. These three groups will be analyzed with the help of Fishbone diagram analysis tools.

Based on the picture 1, the decreasing interest of farmers in cultivating soybeans in Pracimantoro District is caused by 4 main groups of factors, including: natural conditions, production inputs, soybean plant pests and diseases, and other factors. The group of factors caused by natural conditions is high rainfall and a changing climate. The group of production input factors is caused by the low quality of seeds and high prices of seeds, high prices of pesticides, and small quantities of fertilizers. The group of

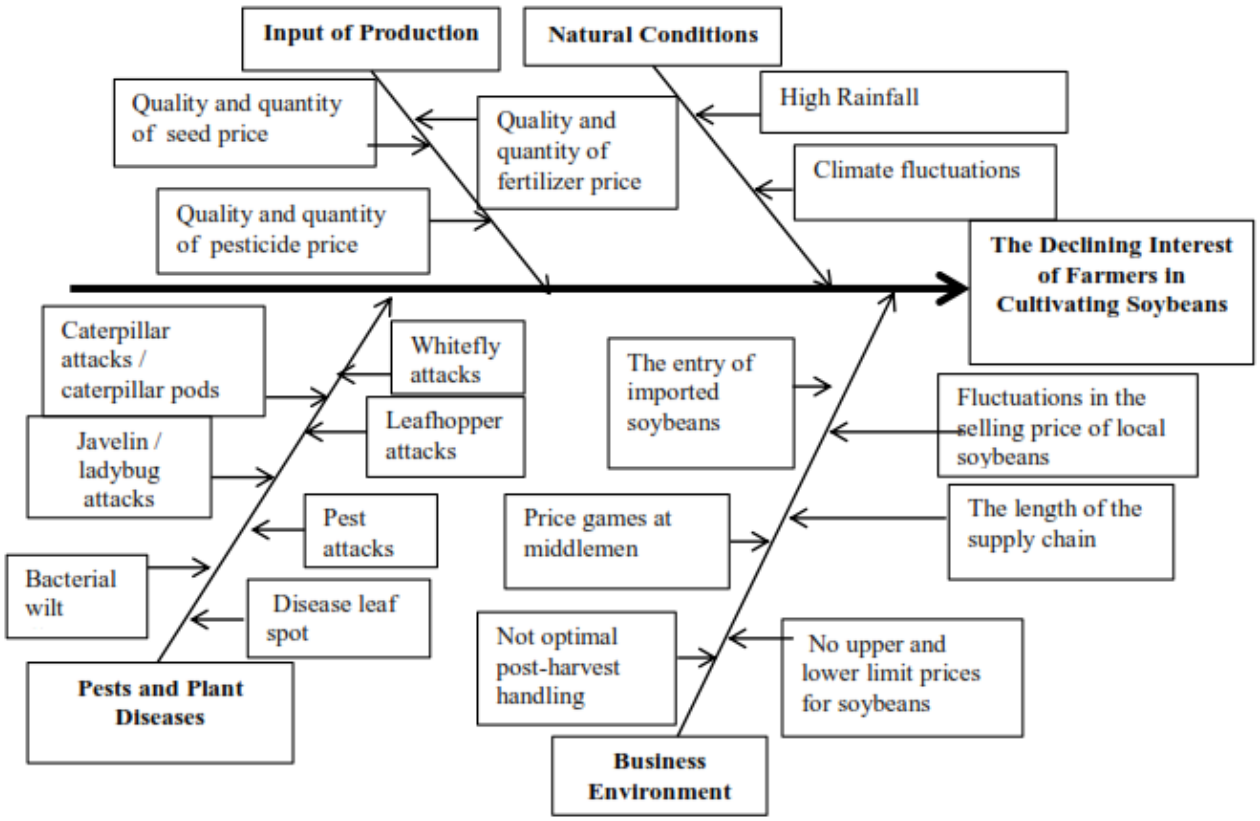

Figure 1. Fishbone Diagram Results, The Declining Interest of Farmers in Cultivating Soybeans in Pracimantoro District, Wonogiri Regency

pest and disease factors caused by fruit caterpillars, walang sangit pests, javelin, whitefly, leafhoppers, leaf spot disease and bakeri wilt disease. The other group of factors that caused the entry of imported soybeans, fluctuations in soybean prices, middlemen's price games, long supply chains, low prices, no upper and lower price limits, and post-harvest complications.

4. CONCLUSION

The factors that reduce farmers' interest in cultivating soybeans in Pracimantoro District were analyzed using the fishbone diagram method. The identified problems are grouped into sources of plant pest and disease risks, sources of input risk and soybean production techniques and sources of risk in the business environment.

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