

Chapter

Farmers' Responses to Soybean (*Glycine max* (L.) Merrill) Farming and the Influencing Socio-economic Factors in Jember District, Indonesia

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Abstract

Rapid population growth, shrinking agricultural land, and farmers' weak response to soybean cultivation have increased dependence on imported soybeans. Although soybean productivity in Jember performed better than the provincial average, particularly before 2020, a significant decline occurred in 2020, likely due to external factors such as climate conditions, land-use changes, or input constraints. Despite gradual improvement afterward, productivity has not returned to its 2017 peak. This study aims to (1) identify the characteristics of soybean farmers, (2) analyze the profitability and feasibility of soybean farming, (3) assess farmers' responses to soybean cultivation, and (4) determine the socio-economic factors causing their weak response to cultivating soybeans on controlled land. The research applies a descriptive quantitative and qualitative approach using a survey and summative technique. Samples include farmers who plant and those who do not plant soybeans. Primary and secondary data were analyzed using descriptive analysis, Likert scale scoring, profit analysis, and the R/C ratio. Results indicate that the average farmer age in Jember Regency is 49.26 years (productive age) with 9.42 years of formal education (moderate level). The average household size is 3.26 persons. The average soybean land area is 0.55 hectares, while total controlled paddy land averages 0.36 hectares. Soybean farming generates an average profit of Rp 4,487,125.76 per hectare with an R/C ratio of 1.83, indicating feasibility. However, farmers' overall response remains weak due to lower profitability compared to other commodities and the absence of government price protection.

Keywords: farmer response, soya commodity, profit, business feasibility, socio-economic factors

1. Introduction

The Ministry of Agriculture of the Republic of Indonesia has implemented an important strategy to reposition the agricultural sector as the driving force of national development, especially in rural areas, towards achieving food self-sufficiency including rice, corn and soybean commodities. The soybean commodity is one of the main commodities that contain vegetable protein sources and is used as a food base in agro-industrial sub-sector activities such as tofu, tempeh, soy sauce, tauco, oncom and soy milk. The current problem of soybeans in Indonesia is the decreasing domestic production, so it still relies on imported soybeans. On the one hand, domestic soybean production in 2023 increased to 301,520 tonnes, but the demand reached 2,800,000 tonnes, which has implications for the high dependence on imported soybeans [1].

Hulu's [2] view states that along with the gap between the amount of soybean demand and its production, the import policy must be able to suppress the increase in domestic soybean prices so that the microeconomic growth rate will grow well. This condition has been seriously highlighted by Santosa [3] who conducted a comparative study of the production costs of soybean farming with imports. If the price of imported soybean is IDR 1500 per kilogramme, while the price of local soybean at the farm level is IDR 2500 per kilogramme, the price of local soybean is under pressure. Therefore, these conditions will result in a tendency for farmers to leave soybean cultivation and switch to other commodities slowly.

East Java Province is the province with the largest soybean production in Indonesia in 2022 (27.96%). However, in the same year, the need for soybeans in East Java Province reached 267,000 tons, while local soybean production only reached 70,000 tons (26.22%), and the rest was met by imported soybeans, even in 2020, the need for soybeans was only met by 12.78% of local soybeans. This condition is caused by limited production capacity and losing out to imported soybeans so farmers tend to plant rice and corn, especially since they have not received incentives from the government. When compared to national conditions, it turns out that Indonesia is the 9th largest soybean importer with a total import of 2.65 million tons (USDA 2022 in Satriani et al. [4]). According to Risandi (2022) in Satriani et al. [4] that this condition is caused by factors such as relatively low local soybean productivity, the technology adopted is still traditional, business actors' preferences have different needs, the quality of local soybeans is still low, the price of local soybeans is more expensive than imported soybeans. The average price of imported soybeans in Indonesia is around IDR 14,200 per kg (as of September 2022).

East Java Province is the national soya food barn and a number of its regions are Gresik, Banyuwangi, Madiun, Nganjuk, Jember, Bojonegoro, Kediri, Blitar, Trenggalek and Lamongan. Among these areas, Jember Regency experienced a significant decline in production despite having the fifth highest productivity level in East Java. Along with a soybean planting area of around 7500 hectares, in 2021 Balitbangtan through Balitkabi chose Jember Regency as one of the bases for the development of high productivity soybean cultivation technology innovations. One of the leading technologies disseminated is the planting of superior varieties (Balitkabi 2021 in [5]). Comparing the development trend of total soybean production in East Java Province and Jember District is quite interesting because it has a relatively similar trend, but the average productivity of Jember District exceeds the average in East Java (Figures 1 and 2).

The results of research by Hazmi et al. [6] showed that the growth rate of soybean-based agribusiness in the districts of Jember, Banyuwangi and Pasuruan from 2011 to 2016 decreased on average below 10% at least in terms of the number of business

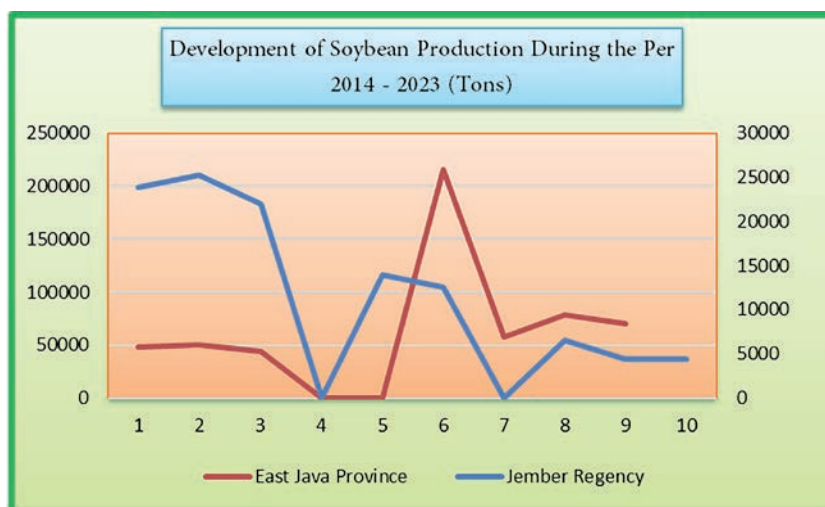


Figure 1.
 Fluctuations in the development of soybean production amounts in East Java province and Jember regency
 (Source: Central Bureau of Statistics (BPS) of East Java Province, 2024).

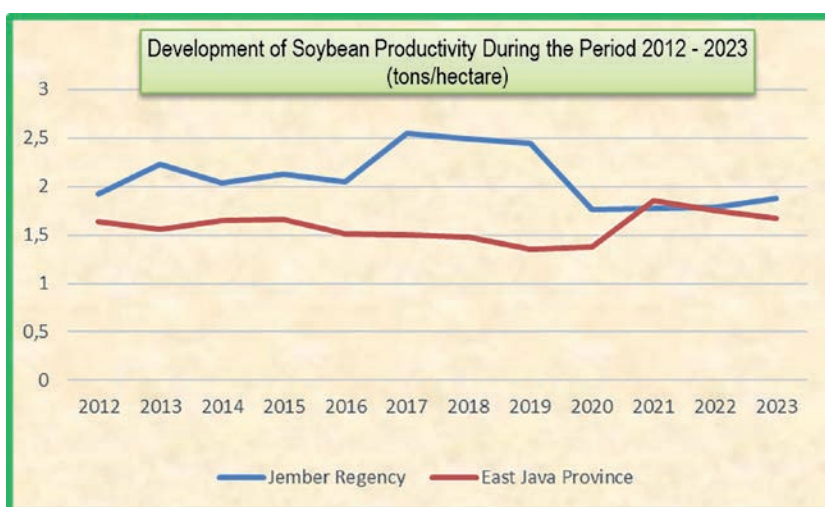


Figure 2.
 Development of soybean productivity in East Java Province and Jember Regency (Source: Central Bureau of Statistics (BPS) of East Java Province, 2024).

units. This is due to the decreasing availability of soybean raw materials and the high price of soybean raw materials (an average increase of 25.99% per kg). This phenomenon is caused by the failure of the implementation of the PUAP Programme, which is indicated by the performance of programme actors from the soybean farming process to the processing of products averaging 44.76%. This shows that the role of Gapoktan in running PUAP is less than optimal in encouraging Poktan members to plant soybeans. In line with the less than optimal role of Gapoktan, this will also result in a weak response from farmers to be interested in planting soybean commodities, which has a further impact on the low participation of farmers to plant them.

The development of the number of soybean production and productivity conditions as shown in **Figures 1** and **2** is disproportionate when compared to the area of paddy fields in Jember Regency which is recorded at 84,328.30 hectares. Similarly, farmer institutions recorded the number of farmer groups has reached 1713 in the working area of 248 Gapoktan, but there are only 110 farmer groups (6.39%) that plant soybean commodities every dry season [7]. Since 2018, farmer groups whose members planted soybean commodities were spread across 22 sub-districts and reduced to 8 sub-districts in 2024. This phenomenon indicates the weak response and participation of farmers to persist in planting soybean commodities [8].

The constellation of unrest is in line with the results of research by Zakaria [9] and Widowati and Alfina [10], which revealed that the level of farmers' participation independently to meet the needs of soybeans is still low (4.21%). This means that the role of farmer groups in influencing their members to plant soybeans is less than optimal, resulting in weaker farmer responses to soybean farming. However, this condition is significantly different from the phenomenon of the results of research by Noermansyah and Dini [11], which revealed that the response of farmers participating in the SL-PTT Soybean Programme in Ciamis Regency is generally in the high category. This means that the potential response and participation of farmers to grow soybeans in any region including in Jember District, East Java Province is very potential. Therefore, it is necessary to mobilise farmers' participation in the form of farmer groups, thus strengthening farmers' participation to plant soybean.

The condition of the decreasing soybean planting area and production in Jember Regency (**Figure 1**) is partly due to the factor of unstable prices due to the flood of imported soybeans with better quality and lower prices. In fact, Jember District, which is part of East Java Province, is one of the soybean food barns along with Banyuwangi, Pasuruan, Lamongan, Sampang and Ponorogo Districts. East Java Province is still a mainstay with a contribution to national production of 42%, with a harvest area reaching 41% in 2024. The facts in the field show that the area planted and the amount of soybean production in several districts such as Blitar, Ponorogo and Lamongan are experiencing a significant decline, while Banyuwangi and Sampang and Bojonegoro are experiencing an increase [12]. Farmers are shifting their efforts to other commodities that are considered more economically prospective, such as citrus and dragon fruit.

Looking back at the previous decades, in an effort to maintain its contribution as the highest food buffer in Indonesia, East Java Province launched the development of soybean and rice areas in Jember District starting in 2013. In 2012 alone, the total soybean planted area in Jember District reached 15,233 hectares or 6.84% of the total planted area in East Java, which reached 222,738 hectares. The soybean planting area in the Jember Regency is fourth after Banyuwangi, Lamongan and Sampang Regencies. However, Jember Regency, over the last 5 years has experienced sharp fluctuations in planted area, although its productivity tends to increase quite well [13].

There are several problems in the development of soybean commodities, including the current climate/weather, land development specifications, sources and availability of superior seeds, biotic stresses, how to control them and the response of farmers to grow soybean tends to decline. The absence of government protection and guarantee of favourable prices for soybean commodities has implications for the lack of response of farmers to cultivate soybean crops. Whereas soybean production in East Java in 2023 is still in the range of 337 thousand tonnes, while the soybean consumption needs of East Java people are around 420 thousand tonnes per year. Because soybean production is still minus compared to consumption needs, East Java still has to import

from outside [12]. Based on this background, the objectives of this study are (1) to identify the characteristics of soybean farmers, (2) to calculate the profit level and feasibility of soybean farming, (3) to measure farmers' response to soybean farming and (4) to determine the socio-economic factors that cause farmers' response to be weaker to cultivate soybean commodities on the land area controlled.

2. Research methods

2.1 Types and methods

This type of research is descriptive research, which is research that aims to describe events (phenomena) systematically, factually and accurately about the facts, characteristics and relationships between phenomena that occur in the present. Meanwhile, the method used in this research is the *survey* method where this method determines the sample taken from part of the existing population [14]. Meanwhile, to strengthen the first method, other methods are also used in this research, including documentation by studying books and or literature, research results, written records and so on that are relevant to the purpose of this research [15].

2.2 Research location and time

This research has been conducted in several sub-districts that are the centres of soybean production in Jember Regency. The research locations were determined by *purposive sampling* based on the consideration that these sub-districts are the first to fifth largest soybean production centres in Jember Regency in 2023, including the sub-districts of Bangsalsari, Balung, Umbulsari, Puger, Rambipuji. In addition, this research has also been conducted in sub-districts that have been the centre of soybean production before the research year as a control which includes the sub-districts of Jelbuk, Kalisat, Ambulu, Mayang and Tempurejo [7].

2.3 Sampling and data collection techniques

The determination of the sample of respondents was taken by simple random sampling of part of the existing population of both the population of farmers who are still planting soybean commodities and no longer cultivating them. The data collection techniques were carried out by interviewing respondents through *depth interview* and Focuss group discussion (FGD) techniques or other techniques that are easier and more practical to use and complement each other [16].

2.4 Data analysis

In order to identify the characteristics of soybean farmers in this research location, descriptive analysis was used, and the results were presented in the form of figures. As for calculating the level of profit and economic feasibility of soybean farming, each is analysed with the formulation of the profit formula [17] and the formulation of the R/C ratio formula [18] along with the decision-making criteria. If the R/C ratio value is greater than $(1 + \text{bank interest rate})$, then the soybean farm is feasible, and if it is smaller or equal to $(1 + \text{bank interest rate})$, then there is no need to continue. Furthermore, to measure the strengths and weaknesses of farmers' responses

to soybean farming, a *scoring analysis* with a *Likert* scale approach was used. The consideration is based on the development of a scale to measure farmers' attitudes towards a particular aspect known as the Likert scale [14]. Based on the measurement of response indicators, which include perception, motivation, attitude, skills and participation of farmers towards soybean commodity farming as determined as follows: If the total score is between 84 and 100 (very strong farmer response), between 68 and 83 (strong farmer response), between 52 and 67 (less strong farmer response), between 36 and 51 (weak farmer response) and between 20 and 35 (very weak farmer response). Furthermore, in order to inventory the socio-economic factors that cause the weak response of farmers to plant soybean commodities, descriptive analysis was conducted using the frequency table method in units (%).

2.5 Characteristics of soybean farmers

Figure 3 shows that the average age of farmers in Jember District is 49.26 years (classified as productive age), with a range of 22–71 years. This indicates that the farmers are in the productive age (15–64 years) according to the *International Labour Organisation* (ILO) and Sugiana et al. [19]. The age of a person in this group is physically and mentally able to work and do business optimally. It should be noted that according to the 2023 Agricultural Census data from BPS, the average age of farmers in Indonesia is currently above 55 years old. This means that farmers in Jember Regency actually have higher productivity compared to the national average because they have stronger physical conditions and more energy.

Figure 3 also illustrates that more than 90% of farmers have adequate physical strength and mental stability, so they tend to be able to manage their businesses well. At this mature age, farmers are generally able to consider exactly what commodities need to be cultivated on the land they control in order to obtain maximum farm profits and on the other hand to support major national food security programmes such as soybean food. Among farmers in Jember District, those classified as millennial farmers (aged 19–39 years) are 20% and lower than the national average of 6,183,009 people, or 21.93% of total farmers.

Figure 4 shows that the average formal education level of farmers is medium (9.42 years) with a range between 6 and 16 years. When compared to the average level of education of farmers in Indonesia (elementary and junior high school graduates),

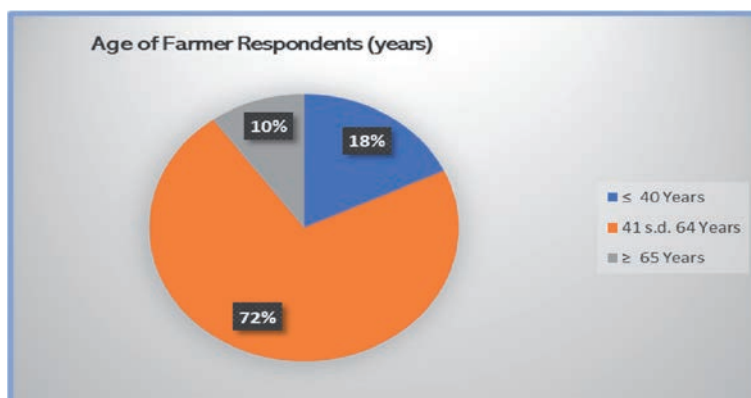


Figure 3.
Distribution of farmers by age in Jember Regency in 2024.

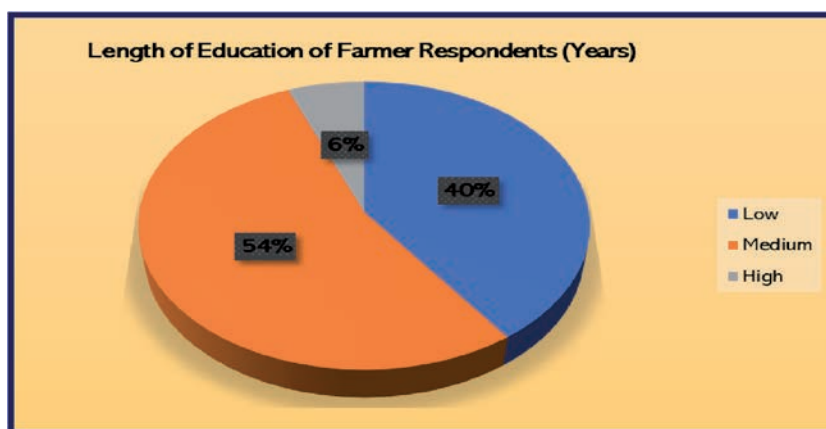


Figure 4.
 Distribution of farmers by years of formal education in Jember regency in 2024.

the average level of education of farmers in Jember Regency is currently slightly higher, namely junior high school to senior high school graduates. Indeed, with this level of education, farmers in the Jember Regency should be more advanced in managing the land they control, at least to encourage a higher level of land productivity compared to the average in other regions. **Figure 4** also shows that the majority (54%) of farmers in Kabupaten Jember have a medium level of education, 40% have a low level of education and only 6% have a high level of education. The condition of this level of education will have implications for the way attitudes and decision-making are determined, especially in determining the commodity to be cultivated in accordance with the appropriate planting season and on consideration of other factors such as past season experience, estimated input and output prices.

The condition of the farmer's education level as described above also reflects a fairly broad mastery of science that has implications for rationality in thinking, decision-making and performance. However, the knowledge does not have to be solely obtained from formal education but can be obtained from non-formal education such as internships, training, seminars and workshops. This is in accordance with Soekartawi's [20] opinion that the level of formal education is one of the factors that influence a person to think in a better and rational direction.

Furthermore, **Figure 5** shows that the average number of farmer household members in Kabupaten Jember is 3.26 people (classified as a medium family), with a range between 1 and 6 people per household. When compared to the average number of dependents in farmer households nationally (around four people), the condition in Kabupaten Jember is still lower. The size of the household will determine the amount of labour that will be allocated to farming activities (own and others' farms) and non-farming activities. However, this labour factor, according to the results of research by Soetrisno et al. [21], has no significant effect on the amount of soybean production in East Java Province.

Furthermore, regarding the number of dependents of farmer households, it can be explained in more detail that most (52.83%) of the dependents of farmer households in Kabupaten Jember are between three and four people, 28.30% are between one and two people and the rest are as many as five people. When compared to the national condition, it can be described that 58% of farmer households have one to two dependents, 40% of farmer households have three to four dependents and 2% have more than five dependents (**Figure 5**).

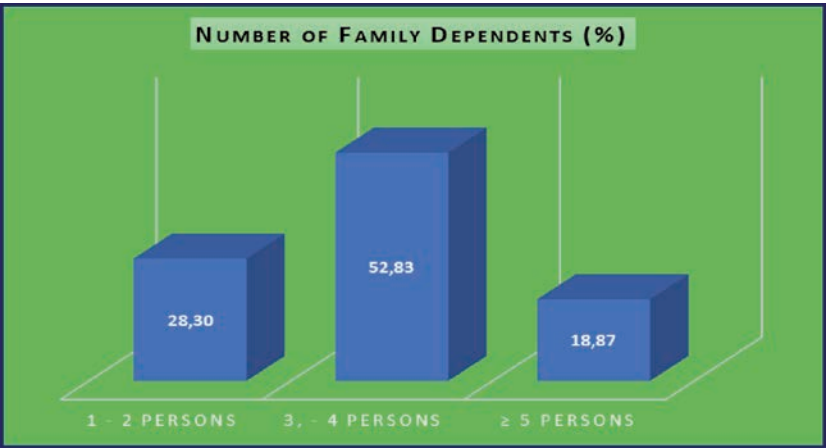


Figure 5.
Distribution of farmers by number of household members in Jember Regency in 2024.

In relation to the number of household dependents, Mantra [22] argues that families with between four and five family members are classified as moderate families. In general, families with more family members tend to affect the motivation to work with the aim of fulfilling and prospering their family members, including the provision of labour to support the business being run. In addition, the number of household dependents will affect the availability of labour and opportunities to work in the agricultural sector. It should be noted that as of August 2024, the agriculture, forestry and fisheries sectors absorbed 28.18% of all Indonesian workers. This condition will also affect farmers' considerations or decisions to determine which commodities are rational to cultivate on the land they control.

Figure 6 also illustrates that the average land area controlled by farmers and planted with soybean commodities is 0.55 hectares with a range of 0.1 to 3 hectares. Most (70%) farmers planted soybeans on land units ≤ 0.5 hectares, some (20%) between 0.6 and 1 hectare and 10% on more than 1 hectare. This condition can be explained by the fact that the area of paddy fields planted with soybean

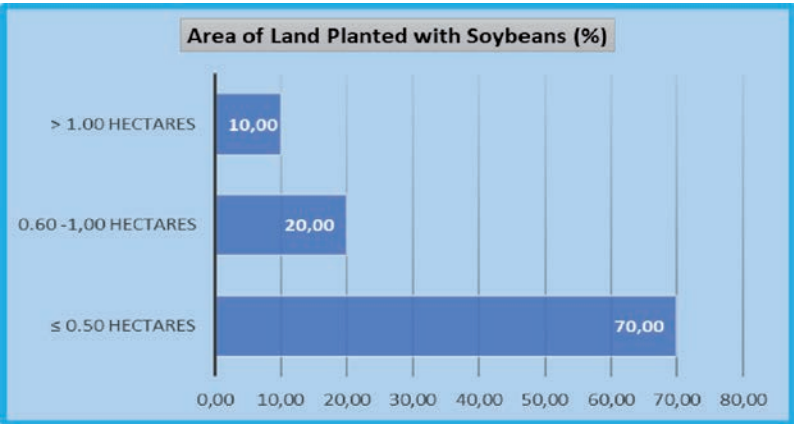


Figure 6.
Distribution of farmers by land area planted with commodities soybean in Jember Regency in 2024.

commodities on the average total area of paddy fields controlled by farmers (= 0.96 hectares) is only 29.33%. This is because farmers tend to reduce the risk of decreasing soybean farming profits due to various factors such as the level of land productivity, the availability of plenty of irrigation water, the agro-climate that is not suitable for soybean cultivation, the absence of economic incentives from the government and the estimated selling price of soybean production. However, there are 40% of farmers who plant soybeans on the entire land area controlled due to agro-climatic factors suitable for planting rice and being a pioneer for other farmer members.

The narrowness of the overall average size of paddy fields controlled by farmers in Kabupaten Jember, which is 0.36 hectares, is in line with the high rate of population growth in the agricultural sector. Therefore, the average unit area owned by farmer households becomes narrower along with the average number of dependents or household members. This condition is in line with the national phenomenon, where data from BPS shows that in 2023, 68.10% of agricultural businesses in Indonesia were categorised as small-scale farmers or the land area controlled was ≤ 0.5 hectares [23]. Thus, according to Soekartawi [17], the average farmer in Java is classified as a smallholder with a cultivated land area of < 0.5 ha. The implication is that along with the narrow land area controlled by farmers, it will further result in the opportunity to plant soybean commodities tends to decrease, especially if some other inhibiting factors are still a *constraint* in encouraging farmers to participate in planting soybean commodities during the season.

Meanwhile, in the context of the length of experience in soybean farming, the average experience of farmers in Jember Regency in soybean farming has lasted more than 25 years. The length of time of experience is relatively long for a person's existence in running his business. This business experience greatly determines the success of a person in running or managing his business because the longer a person's experience, the stronger the level of skill. In fact, no less than 23% of farmers have not cultivated their land by planting soybean commodities for an average of 5 years, with a range of 5–10 years.

This condition is in line with farmers in Banyuwangi Regency in the Southern part of East Java Province. As many as 50% of farmers in the area have not planted soybean commodities on rice fields, yards and moorlands. Farmers have shifted their land management to other commodities such as dragon fruit, citrus, tobacco and other horticultural commodities. Furthermore, the average scale of soybean farming both in respondents who still persist in planting soybeans is 0.49 ha, planting citrus fruits is 1.1 ha and the average planting of dragon fruit is 4.68 ha, consisting of paddy fields, moorlands and yards. Even as many as 28.95% of respondents of citrus and dragon fruit farmers are forced to rent land owned by others with the intention of expansion. In addition, not all land owned by respondents is planted with soya, given the uncertain climate, falling soya output prices and the trauma of the previous season [6].

The results of research by Hazmi et al. [6] also revealed that the average orange and dragon farmers in the Southern District of Banyuwangi have left soybean farming since 13 years ago. They began to look at other commodities (citrus fruits and dragons) after soybean commodities were no longer attractive to cultivate due to factors of fluctuations in output prices and farmers often lost money as well as economically prospective factors for citrus fruits and dragons by looking at the number of demands for both commodities increasing from time to time with very tempting prices.

2.6 Soybean farming analysis

2.6.1 Cost structure of soybean farming

The results revealed that the average total fixed costs in soybean farming in the study area reached 45.56% of the overall farming costs. The high allocation of fixed costs is due to the fact that all land cultivated by soybean crops is calculated as rent, so the allocation for rental costs in soybean farming in the study area reaches 37.45%. Details of the structure of soybean farming costs per hectare in the study area are presented in **Table 1**.

Table 1 shows that the allocation of variable costs in soybean farming in the study area reached 54.44%, of which most (37.44%) were labour costs. The use of labour is actually still below the recommendation (90–100 MWD) according to the Directorate of Cultivation of Beans and Tubers – Directorate General of Food Crops, Ministry of Agriculture of the Republic of Indonesia [24]. This condition is due to the fact that the cultivation techniques applied are still far from the recommendation, so the use of labour only reaches 70.13 MWD per hectare. The relatively low labour allocation in

No.	Cost description	Number of respondents (people)	Unit	Volume	Rp/Unit	Value (Rp)	Percentage (%)
A	Variable costs:						
1	Means of production:						
	a. Seeds	50	Kg	44.16	10,012.00	442,128.80	7.89
	b. Urea fertiliser	19	Ku	0.16	300,000.00	48,100.00	0.86
	c. TSP	11	Ku	0.10	216,363.64	21,982.55	0.39
	d. NPK	28	Ku	1.02	216,666.67	221,372.04	3.95
	e. Medicines	27	Ls	3.15	25,777.78	81,261.38	1.45
2	Labour	50	MWD	70.13	29,917.68	2,098,013.47	37.44
	<i>Sub Total</i>					2,912,858.22	54.44
B	Fixed Costs:						0
1	Tool depreciation cost	50	Ls	1.00	237,601.83	237,601.83	4.44
2	Land tax	36	Season	1.00	127,833.89	127,833.89	2.39
3	Land rent	50	Season	1.00	2,003,588.24	2,003,588.24	37.45
4	Irrigation fee	19	Season	1.00	17,126.61	17,126.61	0.32
5	Group dues	21	Ls	1.00	51,242.86	51,242.86	0.96
	<i>Sub total</i>					2,437,393.43	45.56
	<i>Total</i>					5,350,251.66	100

MWD, men's working day; Ls, and lump sum. Source: Primary Data Processed in 2024.

Table 1.
Structure of soybean farming costs per hectare in Jember regency in 2024.

this case can be shown as only 38% of respondents used urea fertiliser, 22% of respondents used TSP fertiliser, 52% of respondents used drugs such as biosem, rempit and gundasil at a dose of between 1.14 litres/cc per hectare. The rest did not spray because they did not see any symptoms of pest and disease attack.

Furthermore, the consideration of farmers not to spray soybean farming plants in addition to limited capital is also in accordance with the recommendations in the 2013 Technical Guidelines for Soybean Production Management issued by the Directorate of Bean and Tuber Cultivation – Directorate General of Food Crops of the Ministry of Agriculture of the Republic of Indonesia that the application of effective insecticides is adjusted to the needs, namely according to the intensity of the attack or pest population based on observations or if it has reached the economic threshold, then spraying with insecticides is carried out. However, the total cost of soybean farming in 2024 is between IDR 4,500,000 and IDR 9,800,000 per hectare. The largest component of the production cost of soybean farming is for land rental expenditure of 40.34% (although owned land is counted as rent) of the total cost. Meanwhile, the use of soybean seeds on the farm is in accordance with the recommendation (40–50 kg/ha), which is 44.16 kg per hectare, but the average use of soybean seeds in East Java Province exceeds the recommendation [21].

In addition to the above reasons for the lack of labour use, some farmers (54%) applied No-Tillage (TOT) because the previous season was planted with rice. Therefore, land preparation work is only carried out to clean up rice waste/straw, make small manholes for irrigation water drainage and clean the rice field bunds. In addition to limited capital, another factor is the scarcity of labour in rural areas, making it difficult to find labour when activities in soybean farming are needed. Farmer respondents partly use labour within the family and are counted as non-cash expenses in the cost analysis. This condition is in line with the results of Widotono and Arifin's [25] research in East Java Province that the amount of labour in soybean farming in the research area is mostly sourced from within the family only, on the one hand, and on the other hand, aggravated by the scarcity of labour in the agricultural sector.

2.6.2 Soybean farming profits

The level of productivity of soybean farming in Jember District reached 1.38 tonnes per hectare, while the average productivity in East Java reached in 2023 a fixed figure of 14.56 quintals/hectare. However, it is expected that in 2024 it will increase to 1.7–2 tonnes per hectare. This means that the productivity of soybean farming in Jember Regency is still below the average in East Java Province and when viewed from the national target with a soybean farming productivity level of 2.1 tonnes/ha, the productivity achievements in Jember Regency still need to be re-evaluated. According to the national standards set by the Directorate of Cultivation of Various Beans and Tuber – Directorate of Food Crops - Ministry of Agriculture of the Republic of Indonesia in 2023, the level of productivity of soybean farming above 2 tonnes/ha is classified as high, between 1.5 and 2 tonnes/ha and less than 1.5 tonnes/ha is classified as low/low.

Table 2 shows that the average price of soybean in the study area was IDR 7136 per kg with a range of IDR 6000 to IDR 9000 per kg and the average production was 1380.28 kg per hectare with a range of 1167–1520 kg. Furthermore, the average total cost of production is IDR 5,352,377 per hectare, with an average soybean farming revenue of IDR 9,839,502.41 per hectare, so that the average profit reaches IDR 4,487,125.76 per hectare. This average level of profit is relatively not high when compared to the cost sacrifices incurred by farmer respondents. This is because the

No.	Description	Unit	Value (IDR)
1	Production	Kg	1380.28
2	Variable costs	IDR	2,942,437.06
3	Fixed costs	IDR	2,437,393.43
4	Production price	IDR/Kg	7136.00
5	Production value	IDR	9,839,502.41
6	Advantages	IDR	4,487,125.76
7	ROI (rate of return on capital)	%	83.41

Source: Primary data processed in 2024.

Table 2.
Soybean farming profits per hectare in Jember regency in 2024.

level of production per hectare is still relatively low and has not been supported by adequate prices. The government has not set a *floor price*, so the selling price at the farm level is relatively low because the price of soybean commodities is determined by traders. The low level of profit is also supported by data from the Department of Food Crops, Horticulture and Plantations (DTPHP) of Jember Regency [23] which informs that the range of farm profit levels in Jember Regency ranges from IDR 4,000,000 to IDR 15,000,000 per hectare.

2.7 Economic feasibility analysis of soybean farming

In order to determine the extent to which soybean farming is economically feasible or not, a cost-efficiency analysis tool can be used by comparing the revenue with the costs sacrificed. **Table 3** illustrates that the average R/C ratio in the research area per cultivated land area and per hectare is 2.38 and 1.83, respectively. This means that every cost incurred, as much as IDR 1, will generate revenue of IDR 1.83 per hectare. This indicates that soybean farming is economically feasible to be implemented or continued. Although the average R/C ratio is only 1.83, as many as 46% of farmer respondents have reached the R/C ratio level above 2. Regarding the results of the analysis of the economic feasibility or cost efficiency of soybean farming with the R/C ratio analysis approach in the research area can be seen in **Table 3**.

The average value of R/C ratio in the research area is still higher when compared to the results of research by Feriady in 2013 in Bengkulu and Zakaria et al. in 2010 [26] in three provinces in Indonesia, each of which only reached 1.49. Furthermore, the R/C ratio value of soybean farming in the research area is relatively the same as the

No.	Description	Per unit area	Per hectare
1	Production value (IDR)	3,769,570.00	9,839,502.41
2	Production cost (IDR)	1,587,149.86	5,379,830.49
3	R/C Ratio	2.38	1.83

Source: Primary data processed in 2024.

Table 3.
Level of R/C ratio of soybean farming in Jember regency in 2024.

results of research by Sulastri et al. in 2011 in Sukorejo District, Ponorogo Regency and higher than the results of research by Meryanti [27] in Ciranjang District, Cianjur Regency with R/C ratio values of 1.82 and 1.35, respectively. However, when compared to the results of a study by the Aceh Food Security and Agricultural Extension Service in collaboration with the NAD Agricultural Technology Assessment Center in 2008 that analysed soybean farming of the anjasmoro variety in paddy fields which revealed that the R/C ratio of soybean farming reached 3.23, the R/C ratio of soybean farming in this research area is still far below.

The condition of economic feasibility is caused by several factors, among others: (1) the soybean seed assistance programme of superior varieties in the research area is uneven; (2) assistance by field officers is not optimal so that the process of implementing soybean cultivation is not intensive and far from the recommendations and (3) farmer respondents conduct soybean farming only driven by tradition or culture of planting in the dry season or Second Rainy Season regardless of the guarantee of output prices and availability of inputs that are uncertain and do not seem to have a strong motivation to be able to do business optimally due to government attention and protection felt very low.

Although the level of profit and the level of R/C ratio of soybean farming in the study area are not yet optimal, it is still economically feasible to continue considering the broad market prospects. This is because the development trend of the amount of production and consumption of soybean commodities in Indonesia in recent years has experienced a deficit of up to 1,301,000 tonnes in 2023 and the development of the amount of soybean production in East Java for the period 2015–2024 has decreased by 6.67%. In addition, the potential is supported by the national phenomenon that in the same period, there is a downward trend in soybean consumption much lower than the decline in production.

The implication of the soybean commodity deficit phenomenon is that without a strategy to increase soybean production, Indonesia will face an increasing deficit. This opportunity is also supported by the results of research by Feriady in Bengkulu that the investment in soybean farming under normal circumstances (as projected) has a positive NPV value of Rp 4,908,380.02, Net B/C = 2.78 and IRR = 73.82% which is far above the percentage of loan interest (24% per year). This implies that the project is very feasible to implement. The sensitivity analysis results show that the project is highly sensitive to a 10% drop in revenue and a one-year production delay. This situation can be seen from the negative NPV, net B/C < 1 and IRR < 24% or less than the percentage of loan interest (24% per annum).

2.8 Farmer response and the socio-economic factors that influence it

Farmers' response to soybean farming in Jember Regency has a tendency to weaken, so that the level of participation of farmers to plant soybean commodities also tends to be lower. This is supported by the results of the study which revealed the average total score of the four response indicators which include perception, motivation, knowledge and attitude is 63.72. This average score is classified as a less strong or weak response group that has a score between 52 and 67 based on predetermined decision criteria with a maximum total score of 110. The complete distribution of the average score of farmers' responses to soybean commodity farming is presented in **Table 4**.

Table 4 illustrates that from the total average score of farmer responses (63.72), it turns out that the highest average score is in the aspect of farmer perception (29.02), which has a score interval between 9 and 45. This means that for the perception

No.	Farmer response description	Average total score
1	Farmer perception	29.02
2	Farmer motivation	10.46
3	Farmer knowledge	13.06
4	Farmer attitudes	11.18
Total Average Score		63.72

Source: Primary Data Processed in 2024.

Table 4.
Respondents of soybean commodity farmers in Jember regency in 2024.

aspect, the average farmer in the Jember Regency still has a positive perception of soybean farming. This is proven by the fact that there are still farmers in the area who continue to plant soybean commodities even though some other farmers have switched their farming to other commodities. This is in line with the results of research by Rani et al. [28] in Simpang Village, Berbak District, East Tanjung Jabung Regency, which revealed that most farmer respondents perceived that soybean farming was considered easy to do.

Meanwhile, from the total average score of farmer responses as a whole (63.72), some include the aspect of farmer motivation with an average score of 10.46 with a score range between 3 and 15. This condition indicates that the motivation of farmers to plant soybean commodities on their land is still quite strong. Various factors can influence farmers' motivation in planting soybeans, including factors of experience, education, family responsibilities, land area and agroecosystem simultaneously influence the motivation of soybean farmers. While partially, the ones that have a significant influence are education, experience and family responsibilities, while the variables of land area and agroecosystem do not affect the motivation of soybean farmers [29]. The motivational aspect is a problem related to socio-psychology and is considered an important factor that influences human behaviour and performance. Motivation can influence farmers' adoption decisions and reflect the goals and objectives that farmers want to achieve in the long term, so that this motivational aspect will able to become better-performing farmers (Pannell et al., 2006, Farmar-Bowers and Lane, 2009 in Nurain et al. [29]).

Likewise, in terms of farmer knowledge of several important factors related to soybean commodities, the average score is 13.06 from a score interval of 5–25. The condition in this aspect is very severe; farmers do not have much knowledge about soybean farming, especially regarding government regulations, the amount of demand and supply of soybean commodities, developments in output prices and others. This aspect is very important in relation to the attitudes and skills of farmers in cultivating agricultural commodities. The low level of farmer knowledge about soybean cultivation causes the response to soybean cultivation to be quite low. According to Yuswandi et al. [30] that quality farmer knowledge is an absolute prerequisite for the success of agricultural development. Knowledge is the initial stage of perception, which then influences attitudes and in turn gives birth to actions or actions (skills). With good farmer insight into something, it will encourage attitudes, which in turn encourage changes in behaviour. Based on the results of his research in Pamboang District, Majene Regency, he revealed that the aspect of farmer knowledge has a positive effect on increasing farmer production, including soybean commodity

production. This condition can be interpreted that if the knowledge of farmers in this research area becomes broader, especially regarding soybean cultivation and its economic aspects, then the response will be directly proportional.

Table 4 also illustrates that the response of farmers, especially in the aspect of attitude towards soybean farming in Jember Regency, is known that the average number of scores is 11.18 from the interval score of 3 to 15. This means that based on

No.	Socio-economic factors	Number of respondents (people)	Percentage (%)
1	Farmer perception:		
	a. Soybean farming is economically less profitable	27	54
	b. Technically, soya farming is not easy to do	3	6
	c. Climatologically, there is no guarantee of a definite season	9	18
	d. By regulation, the government does not protect soybean farmers	11	22
	Total	50	100
2	Farmer motivation:		
	a. Follows other farmers who are not interested in growing soybeans	8	16
	b. Still traumatised by past experiences	17	34
	c. Lack of encouragement from the government to engage in soya farming	5	10
	d. No policy and protection from the government	9	18
	e. No <i>floor</i> price for soya production	11	22
	Total	50	100
3	Farmer knowledge:		
	a. Lack of knowledge about the risks of soybean farming	7	14
	b. Unknown amount of market demand for soya commodities	15	30
	c. Lack of knowledge of the development of soybean commodity prices	18	36
	d. Not aware of the government's policy on soya commodities	10	20
	Total	50	100
4	Farmer attitudes:		
	a. Interested in staying in soybean farming	10	20
	b. Quite interested in soya farming	15	30
	c. Not interested in soya farming	25	50
	Total	50	100

Source: Primary data processed year 2024.

Table 5.
Socio-economic factors affecting farmers’ response to soybean farming in Jember regency in 2024.

the other three aspects, the attitude of farmers firmly states that they will continue to plant soybean commodities and also firmly states to leave soybean farming. Although the phenomenon leads to a weaker response of farmers to plant soybean commodities. This phenomenon also occurs in the Southern part of Banyuwangi Regency where no less than 50% of soybean farmers switch to other commodities such as citrus fruits, dragon fruits and other types of horticultural crops. The other part still persists to plant soybean commodities in the season until there are farmers who have to do land rental for soybean farming both on rice fields, yards and moorlands [6]. In contrast to the research results of Noormansyah and Dini [11] that the response of farmers in Ciamis Regency is classified as high at various scales of business. Regarding the socio-economic factors that influence the weaker response of farmers to cultivate soybean commodities can be seen in **Table 5**.

Table 5 explains that most (54%) farmer respondents have the perception that soybean farming is economically less profitable than other commodities. The motivation of farmer respondents who are not interested in planting soybeans is mostly (34%) due to the fact that they are still traumatised by past conditions and some others are due to following other farmers who are no longer interested in cultivating their land planted with soybeans. On the other hand, despite the lack of encouragement from the government to cultivate soybeans, no policies and protection from the government and no *floor* price for soybean production, 50% of respondents continue to plant soybean commodities. This is because they still have hope that soybean commodities are still the main food ingredient as a source of protein for humans where the amount of consumption is still more than the existing stock.

Table 5 also reveals that farmers' level of knowledge about the amount of market demand for soybean commodities, government policies on soybean commodities and the development of soybean commodity prices is relatively low. Lack of government attention is the main cause of the farmers' low knowledge. As a result of the above phenomenon, as many as 50% of farmer respondents took a firm stance not to be interested in cultivating soybean commodities again. This condition is in line with Haryono's opinion in Tempo that there are three factors hindering the increase in soybean production in the past year. First, there is no market guarantee for the price of local farmers' soybeans. Farmers are also unsettled by the invasion of imported soybeans that can be cheaper than local soybeans. This has caused farmers' lack of interest in planting soybeans. Secondly, the socialisation and distribution of superior seeds produced by the Research and Development Agency have not gone well. Farmers have not had enough access to use these varieties in their production fields. Third, there is a lack of government protection for local soybean farmers. This is indicated by the implementation of a zero per cent tariff policy on soybean imports. Soybean farmers have suffered losses because the price of their soybean production is lower than the price of imported soybeans.

Indeed, the potential of soybean farming in Jember Regency is very prospective, and this is in line with the results of research by Firdaus which revealed that soybean commodities in Jember Regency have a competitive advantage because the value of the *Private Cost Ratio* (PCR) is less than one, which is 0.8733, which means that to produce one unit of value-added output at private prices requires the sacrifice of domestic resource factors of 0.8733 units or to produce one unit of output can be saved by 0.1267 units. The prospective economic potential of soybean farming is not excessive because the results of research by Soetriono et al. [31] using the calculation of *Location Quotient* (LQ) analysis concluded that one of the bases of soybean crops in East Java Province is in Jember Regency. The results of Soetriono et al. [21] are in

accordance with the results of the economic study of soybean farming conducted by Feriady which concluded that soybean farming is an attractive business opportunity to do both in terms of technical cultivation that is relatively easy to do, as well as market opportunities that are still very broad and economically still profitable financially very feasible to do.

3. Conclusions

1. The average age of farmers in Jember District is 49.26 years (classified as productive age), the average level of formal education of farmers is classified as moderate (9.42 years), the average number of household members of farmers in Jember District is 3.26 people (classified as a medium family), average land area controlled by farmers and planted with soybean commodities is 0.55 hectares (classified as quite large) and the average area of rice fields controlled by farmers as a whole in Jember District is 0.36 hectares (classified as narrow land area).
2. The average profit level of soybean farming is IDR 4,487,125.76 per hectare compared to the range of farm profit levels in Jember Regency which is low and the average R/C Ratio level of soybean farming reaches 1.83 and when compared to the results of previous research is also low but the tendency has the potential to increase.
3. The average response of farmers to soybean farming in the study area is classified as less strong or weak (score 63.72).
4. Socio-economic factors causing the weak response of farmers to plant soybean commodities are the factor that soybean farming is less profitable than other commodities and the absence of product price protection from the government.

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