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THE IMPACT OF CONTRACT FARMING ON THE PRODUCTION RISK OF COFFEE FARMING IN LAMPUNG

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Abstract

Background: One of Indonesia's largest producers of robusta coffee, Lampung Province still faces challenges and risks in coffee productivity. Coffee productivity in Lampung fluctuates and tends to decrease each year. Contract farming is one of the solutions to overcome these issues.
Purpose: This research aims to analyze the impact of contract farming on production and production risk in robusta coffee farming in Lampung Province.
Design/methodology/approach: The data used in this study is secondary data obtained from the Project Cooperation Agreement (PCA). This research uses a sample size of 99 contract farmers and 104 non-contract farmers. The research analysis method uses the OLS estimation approach to estimate the production function and MLE estimation for the production risk function.
Findings/Result: The results showed that contract farming significantly and positively impacts coffee production outcomes. Conversely, contract farming has a significant and positive influence on production risk. Meanwhile, factors that reduce production risk include land area and labor. Contract farming increases production yields, but it also raises production risks. This insight is crucial for farmers considering contract farming, as it underscores the need for comprehensive risk management strategies and productivity enhancements.
Conclusion: Contract farming in Lampung has successfully increased coffee production through input assistance and access to technology. However, it has also increased production risks due to the incomplete implementation of contracts by farmers. To mitigate these risks, attention must be given to factors such as land area and labor, which have been proven to reduce production risks.
Originality/value (State of the art): Contract farming in Lampung has shown great potential in increasing coffee production. However, the incomplete implementation of contracts by farmers has increased production risks. This study emphasizes the importance of risk management in contract farming. To enhance effectiveness, full implementation of contract terms and better risk management are necessary.

Keywords: coffee productivity, contract farming, Lampung Province, production risk, robusta coffee

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INTODUCTION

Coffee is one of the primary commodities that can be relied on to generate income for the country. Coffee has made a significant contribution to increasing foreign exchange. As an export commodity, coffee is expected to increase the value of Indonesian exports. In 2018, the value of coffee exports reached US$ 800 million, or around 23.50% of total agricultural product exports (BPS, 2019). Coffee production in 2022 will reach 793,193 tons, with 79.47% of total production being robusta coffee (Ministry of Agriculture, 2022).

Lampung Province is Indonesia's second-largest robusta coffee producer after South Sumatra, contributing 21.28% of total national production (Ministry of Agriculture, 2022). Coffee productivity in Lampung has fluctuated over the last fifteen years. Even though it contributes significantly to national coffee production, data shows that coffee productivity in Lampung experienced a negative trend of -0.50% between 2007 and 2021. In 2021, the average coffee productivity in Lampung fell to 834 kg/ha from 838 kg /ha in the previous year. This figure is also far below coffee productivity in North Sumatra (1195 kg/ha) and Riau (1185 kg/ha) (BPS, 2021). This problem shows that some challenges and problems must be overcome to increase coffee productivity in the region. The fluctuations in coffee productivity are an indicator of production risk.

Production risks occur when adverse events affect farming activities and the resulting production. Production risks can come from internal factors, such as inappropriate use of inputs and external factors related to things outside the farmer's control (Harwood et al. 1999). To understand production risk, the Just and Pope model divides production risk into two components: the average production function and the variance production function, where the inputs used influence production results and contribute to farmers' production risks. Some inputs can increase production risk (risk-inducing factors), while others can reduce production risk (risk-reducing factors) (Robison and Barry, 1987).

In dealing with the above situation, farmers must take preventive and mitigation measures to reduce production risks and potential losses. One effort to answer this problem is through contract farming (Wang et al. 2011). Contract farming is a significant phenomenon in modern agriculture that can help farmers reduce production risks (Mishra et al. 2019). Contract farming is an agreement between a company and an individual farmer, which sets out responsibilities and rewards for tasks performed, often including product specifications such as volume, quality, and delivery times (Catelo and Costales, 2008). This collaboration can provide farmers with access to training, technology, and production inputs (Eaton and Shepherd, 2001).

The contract farming program in Lampung has been running since 1995 until now (Yoansyah et al. 2020). This collaboration was initiated by private companies such as Nestle, Louis Dreyfus Company, and Olam International. The existence of contract farming encourages the transformation of coffee farming to increase production, quality, and environmental sustainability. The demand for raw materials with the required criteria is one of the factors behind companies entering into contract farming with farmers.

Several previous studies on the impact of contract farming have been conducted (Bellemare & Lim, 2018; Kumar et al. 2016; Agiesta et al. 2017; Rihi et al. 2014; Sharma, 2014). Contract farming has been shown to influence production increases (Dubbert & Abdulai, 2022; Araouna et al. 2021; Khanal et al. 2020; Wang et al. 2014). Other studies have found that contract farming affects farmers' income risk (Abarghouei et al. 2020). A similar study by Mishra et al. (2019) focused on production risk in seasonal crops and showed that contract farming reduced production risk. However, literature on the impact of contract farming on production risk, especially in perennial crops, is still limited. This study fills this gap by jointly analyzing production outcomes and risks associated with contract farming in coffee cultivation.

Through collaboration in contract farming, farmers and companies can share risks related to production inputs, which farmers often face due to high prices and scarcity of availability. Support from companies, such as access to capital and input assistance, will help farmers overcome these challenges, thereby increasing their production and reducing the risks they face (Yakubu et al. 2022; Fanani et al. 2015). Therefore, this research hypothesizes that contract farming can increase production and reduce risks. Based on this description, this study aims to analyze the impact of contract farming on production and production risks in robusta coffee farming in Lampung Province.

METHODS

The data used in this study are secondary data obtained from a household survey of smallholder coffee farmers in Lampung. This survey was part of the Project Cooperation Agreement (PCA) in 2023 between the team from The Economics of Ecosystem and Biodiversity for Agriculture and Food Initiative Indonesia (TEEBAgrifood) IPB, the United Nations Environment Programme (UNEP), and the National Development Planning Agency (BAPPENAS). The research data is cross-section data regarding one year of coffee production, from June 2022 to June 2023. Sampling uses a multistage sampling method. It starts with the purposive selection of districts and villages, followed by the purposive selection of farmers. This study uses sample size of 99 contract farmers and 104 non-contract farmers. The sample size used in the research is based on available data.

The data analysis in this study uses the model developed by Just and Pope (1979), as this model accounts for risk in the production equation by incorporating the variance of the production equation. The Just and Pope model consists of an average production function and a variance production function. In this model, the inputs used in the production process affect the production obtained and contribute to the production risk farmers face. The model has two elements: the production function and the risk function.

The initial step involved creating a model to estimate the production function transformed into a natural logarithm form. This step was done by incorporating factors presumed to affect production as independent variables, with production itself as the dependent variable. Next, multiple linear regression analysis was employed to estimate the production function using the Ordinary Least Squares (OLS) method. The error values between the actual production function and the previously estimated function were used to analyze production risk. These error values were then squared and used as the dependent variable in a risk function model, with factors presumed to affect risk as the independent variables. Using the Maximum Likelihood Estimation (MLE) method, multiple linear regression analysis was again employed to estimate the production risk function. Mathematically, the production function model equation by Just and Pope incorporating risk can be formulated as follows:

$$q = f(x) + h(x)$$

Where q = total output, f(x) = coffee production function, h(x) = variance function (production risk function), x = production factors used, and ε: error term.

Production function:

$$f(x) = LnYi = \beta_0 + \beta_1 lnX_{1i} + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + \beta_4 lnX_{4i} + \beta_5 lnX_{5i} + \beta_6 lnX_{6i} + \beta_7 lnX_{7i} + \beta_8 D_{1i} + \varepsilon_i$$

Production variants: $\sigma^2 Yi = (Yi - \hat{Y}i)^2$

Production risk (variance) function:

$$h(x) = Ln\sigma^2 Yi = \alpha_0 + \alpha_1 LnX_{1i} + \alpha_2 LnX_{2i} + \alpha_3 LnX_{3i} + \alpha_4 LnX_{4i} + \alpha_5 LnX_{5i} + \alpha_6 LnX_{6i} + \alpha_7 LnX_{7i} + \alpha_8 D_{1i} + \varepsilon_i$$

Where Y_i (actual coffee production (kg)); $\hat{Y}_i$ (estimated coffee production based on model (kg)); $\sigma^2 Y_i$ (production risk value), β_0 and α_0 (constant); β(parameters estimated in the production function); α (parameters estimated in the production risk function); X_1(land area (ha)); X_2 (plant age (years)); X_3 (numbers of labor (HOK)); X_4 (amount of inorganic fertilizer (kg)); X_5 (amount of organic fertilizer (kg)); X_6(amount of pesticide (liter)); X_7 (number of trees (trees)); D_1(dummy of contract farming (1 = contract dan 0 = without contract)), ε (error term).

The research framework for this study can be seen in Figure 1. The fluctuation in coffee productivity, which tends to decline, is a problem faced by farmers in Lampung. This indicates the presence of production risks caused by both internal and external factors (Sari and Pardian, 2018). One way to address this issue is through contract farming. Through contract farming, the transfer of knowledge and good cultivation techniques can be facilitated, providing farmers with access to necessary resources and technology and helping in risk mitigation (Eaton and Shepherd, 2001; Rehber, 2007). Contract farming can help farmers increase coffee production and minimize risks. Therefore, this study hypothesizes that contract farming can increase production and reduce production risks. The study of coffee production risk uses the Just and Pope model. The impact of contract farming on production is analyzed using multiple linear regression with the ordinary least squares (OLS) method, while the impact

on production risk is analyzed using the maximum likelihood estimation (MLE) method. In-depth research is needed to understand how participation in contract farming affects coffee production and production risks. By conducting this analysis, farmers can more holistically consider the impact of contract farming on their agricultural operations.

RESULTS

Model of Coffee Farming on Coffee Production in Lampung

The contract farming between coffee farmers and the company PT. Nestle has been doing this since 1995 until now. The main objective of this contract farming is to improve the coffee cultivation system and product quality and expand market share. As various global challenges emerge, contract farming's focus is not only limited to coffee production but also covers broader sectors, including a more profitable plantation economy, increasing farmers' food security levels, and sustainable coffee production. This collaboration is not carried out by the company with individual farmers but through farmer groups. Farmers must first join a farmer group if they want to be involved in a contract farming system. Then, the farmer group agreed and registered themselves with the sustainable coffee cultivation program or Common Code for Coffee Community (4C) certification with the Bintang Jaya Joint Business Group (KUB) or Mawar and Company. KUB also agreed with the company through a memorandum of understanding. This agreement includes obligations for the company to coach farmers, provide price information, and offer coffee marketing schemes (Rosanti et al. 2019).

Several parties involved in contract farming have essential roles and contributions to achieve common goals. Farmers or farmer groups play a significant role as owners and managers of agricultural land who are directly involved in coffee crops and livestock production. Farmers are responsible for everything from planting and maintaining to harvesting the coffee. In addition, KUB has a strategic role as the organizer of mentoring, training, and consultation programs for farmers or farmer groups to overcome problems faced in the field. KUB also acts as a coffee supplier or distributor. KUB buys coffee from farmers, collects it, and sends it to the company. Meanwhile, the company functions as the primary buyer and processor. The company buys all coffee products from farmers involved in contract farming and then processes them into various products according to market needs.

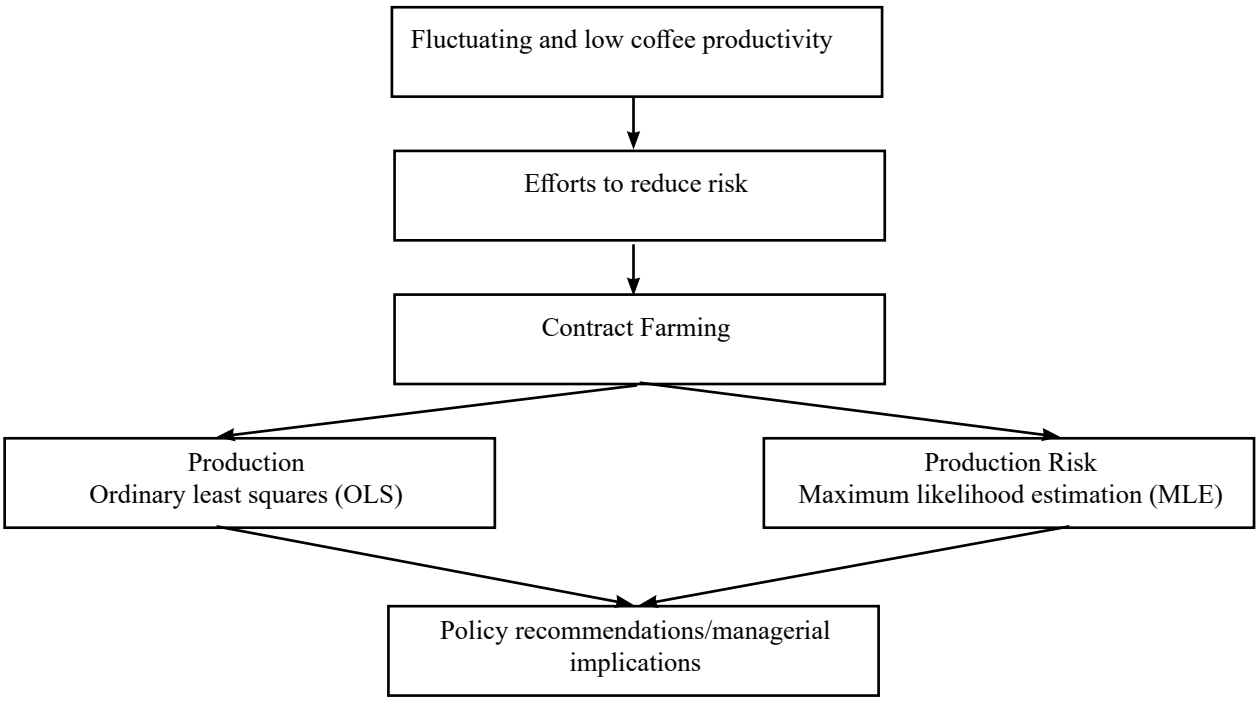

Figure 1. Research framework

Contract farming in Lampung has rules that refer to several terms and conditions that each party must follow. Each party has rights that must be guaranteed. This also applies to other commodities, such as palm oil and sugarcane, where the parties involved in the contact equally share rights and responsibilities (Azmie et al. 2019; Saputra et al. 2017). Farmers have the right to receive guidance or assistance from KUB and companies, assistance with agricultural inputs, coffee seeds, and access to technology. Farmers are also entitled to premium fees and weather insurance. On the other hand, KUB has the right to obtain a profit margin from coffee sales. Meanwhile, the company has the right to obtain coffee beans according to the required standards, determines the volume of coffee bean shipments, and has the right to terminate the contract. Apart from having certain rights, each party in a coffee contract farming also has obligations that must be fulfilled. Farmers are expected to attend field schools, apply sustainable coffee cultivation practices in the garden and home, and keep financial records. KUB is responsible for carrying out coaching or mentoring programs for farmers or farmer groups, which are carried out by the Internal Control System (ICS) at KUB, as well as ensuring that the volume of coffee deliveries meets the standards set by the company. Meanwhile, companies must provide coaching, production input, and regular price information.

In this contract farming, coffee marketing provisions are free; farmers can sell their coffee harvest to any place they wish. Because there are no binding coffee marketing contracts, farmers can look for traders who offer competitive prices. Despite this, the majority of farmers sell to KUB. Coffee beans registered for sustainable coffee cultivation certification that are sold to companies will receive a premium fee. 70 percent of the premium fee is allocated to farmers, while 30 percent is for KUB management (Rosanti et al. 2019). Generally, the premium fee received by farmers is managed by farmer groups to purchase production inputs such as fertilizer and pesticides needed for the following season. This is consistent with the findings of Mustada et al. (2022) that assistance with production facilities from the premium fee greatly helps farmers cultivate and process coffee. The premium fee can be a factor that positively impacts farmers' economies by reducing expenditures on agricultural input costs (Chairawaty, 2012).

Characteristics of Respondent

The characteristics of the research respondents are explained in Table 1. Most farmers who enter into contract farming are, on average, 46 years old, while non-contract farmers are 50 years old; both groups are still of productive age. There are similarities between contract and non-contract farmers, namely in education and household members. On average, both groups have studied for 9 years and have 4 household members. Contract and non-contract farmers, on average, have more than 20 years of experience. Then, the average area of cultivated land owned by contract and non-contract farmers is more than 1 hectare.

Table 1 shows that contract farmers' average coffee productivity is higher than non-contract farmers, each obtaining 660 kg/ha and 540 kg/ha, respectively. Non-contract farmers use more labor than contract farmers. On average, contract farmers use more fertilizer for coffee than non-contract farmers, using both inorganic and organic fertilizers. Contract and non-contract farmers use the same amount of pesticide with an average of 5 liters per hectare. The average age of coffee plants belonging to contract and non-contract farmers is over 20.

The Effect of Contract Farming on Coffee Production

A multiple linear regression model using the Ordinary Least Square (OLS) method is used to estimate the effect of contract farming on coffee production. The analysis results show that the F probability value is greater than the significance level (α) of 5 percent, indicating that the model can be used in predictions. In addition, the model's ability to predict can be seen from the R-square value of 0.71, which shows that the variables in the model can explain 71 percent of the variation in coffee production. Factors outside the model explain the remaining 29 percent.

The land area variable in the estimation results shows a positive and significant influence (Table 2). The land area coefficient value obtained is 0.666, meaning that every additional 1 percent of the land area will increase coffee production by 0.666 percent. Farmers' coffee land is well managed. Farmers fertilize to maintain soil fertility and sanitize the land from pest plants so that the land remains productive. Gebeyehu (2016) states that land area is essential in increasing coffee production. The research results of Minh (2016) and

Shan and Wang (2015) state that land area is closely related to the production output. According to Wibowo (2019), coffee is a plantation crop that requires a large area of land. Land availability is essential in increasing production (Wambua et al. 2021). The average coffee production of farmers in this study was around 598 kg/ha, while robusta coffee production could reach 900-1,300 kg/ha. In this way, farmers can reach the maximum coffee production limit by increasing their land area.

Labor in coffee farming has a positive and significant effect on coffee production. Then, the labor coefficient value is 0.127, where every one percent increase in labor will increase production by 0.127 percent. Farmers have extensive experience in coffee farming since they were young, so they have adequate knowledge in managing this business. The average experience of farmers is more than 10 years, which is likely to cause an increase in production because the addition of labor is positively related. In addition, agricultural activities are traditional economic activities and require much labor, so production results are very dependent on the availability of labor (Kebede, 2001).

Table 1. Variable definition and summary statistics of coffee farmers in Lampung Province

Variables	Contract	Non-contract	Total Sample
	Mean	Mean	Mean
Characteristics of respondent:			
Farmer's age (years)	46	50	48
Education (years)	9	9	9
Number of household members (people)	4	4	4
Experience (years)	22	24	23
Planted area (ha)	1,4	1,2	1,3
Characteristics of farming:			
Productivity (kg/ha)	660	540	598
Labor (HOK/ha)	152	131	141
Inorganic fertilizer (kg/ha)	217	186	201
Organic fertilizer (kg/ha)	2337	822	1561
Pesticide (liter/ha)	5	5	5
Number of trees (tree/ha)	3469	2753	3102
Plant age (years)	23	26	25

Table 2. Factors influencing coffee production in Lampung Province

Variables	Coef.	Std. Err.	t
Const.	3.547***	0.7737	4.58
Ln land area	0.666***	0.0690	9.65
Ln plant age	0.320	0.0443	0.72
Ln labor	0.127**	0.0592	2.16
Ln inorganic fertilizer	0.012	0.0083	1.45
Ln organic fertilizer	0.013**	0.0058	2.25
Ln pesticide	0.031**	0.0157	2.01
Ln number of trees	0.265***	0.1004	2.64
Dummy of contract farming	0.185***	0.0507	3.66
R-Squared	0.714		
Prob > F	0.000		

Note: ***Significant at α=1%; **Significant at α=5%; *Significant at α=10%

Organic fertilizer has a significant positive effect on coffee production. The coefficient value of 0.013 shows that for every one percent increase in organic fertilizer, coffee production increases by 0.013 percent. Farmers can quickly get organic fertilizer because they also raise livestock, such as cows and goats. Livestock manure is collected and brought to the garden by farmers. The use of organic fertilizer by farmers aims to offset the continuous use of chemical fertilizers and reduce the negative impacts they cause. Providing organic fertilizer plays a vital role in improving the soil's physical, chemical, and biological properties and increasing the availability of nutrients in the soil to increase coffee growth and production. Winarni et al. (2013) stated that organic fertilizer is one of the suitable fertilizers to increase coffee growth.

Pesticides positively and significantly influence coffee production at an efficiency value of 0.031. The value means that if there is a one percent increase in pesticide use, coffee production will increase by 0.031 percent. Farmers use pesticides to control coffee plant pests' attacks, minimize potential losses, and increase production. According to Mahfud (2012), low coffee productivity in Indonesia is caused by pest attacks, so one strategy to overcome and increase coffee production is to use pesticides.

The number of coffee plants in the production function estimation results obtained a significance value of 0.00, smaller than 0.01 (α). It can be said that the number of coffee plants has a positive and significant influence on coffee production. The coefficient value of 0.265 shows that every one percent increase in the number of coffee plants will cause an increase in coffee production of 0.265 percent. The number of coffee trees owned by farmers in the new research reached an average of 3 thousand per hectare. Netsere et al. (2015) stated that the increase in coffee production was related to the increase in coffee population density to reach 8 thousand trees per hectare. Therefore, farmers still have the opportunity to increase coffee yields by increasing coffee density.

The results of the analysis show that contract farming has a positive and significant impact on coffee production. Similar findings were also obtained by Fanani et al. (2015) that contract farming has a significant impact on production. Other evidence is provided by Akbar et al. (2022) that contract farming has a significant and substantial impact on increasing production. Contract farming brings several great benefits to coffee farmers in Lampung, especially in increasing coffee production. Farmers receive input support such as fertilizer, which is often difficult to obtain due to costs or limited availability. Findings are reinforced by the study results of Champika and Abeywickrama (2015) that the interaction of service packages provided by buyers, such as inputs and extension services, positively and significantly affects the production achieved by contract farmers. Farmers are also given access to new technology, such as superior coffee seeds, which make it possible to replace no longer productive plants. Farmers also learn about coffee cultivation techniques, from planting to optimal harvesting techniques. Farmers involved in contract farming are also advised to use an agroforestry system (shade plants) in coffee cultivation to control pests and sustain the availability of nutrients. As mentioned by Murthy et al. (2017), agroforestry indeed has many positive impacts. These include increasing biodiversity, improving soil fertility, conserving water resources, enhancing air quality and windbreak effects, and boosting land productivity and farmers' income potential. The research by Coulibaly et al. (2017) proves that agroforestry can increase production. This assistance allows farmers to cultivate coffee optimally, thus having an impact on increasing coffee yields. Therefore, contract farming is an essential factor in increasing coffee production.

The Effect of Contract Farming on Coffee Production Risk

The effect of contract farming on production risk is seen through the production risk function as a dummy variable because contract farming is a farmer's managerial decision related to socio-economic factors that can influence farmers in managing their farming business due to contract farming.

Based on Table 3, land area has a negative coefficient value. In other words, land area reduces production risk (risk-reducing factor). The larger the land owned by coffee farmers, the fewer production risks farmers face. Land management by farmers is thought to be the causal factor. Farmers have sufficient resources to manage land effectively. Farmers use various methods to maintain soil fertility, such as providing organic fertilizer to increase soil fertility, planting shade plants to prevent erosion, and reducing the use of chemicals

to maintain soil fertility and health. These factors are thought to keep farmers' land productive so that production risks can be reduced by increasing land area.

The age of the coffee plant significantly affects the results of the production risk function estimation. The plant age variable positively influences production risk (risk-inducing factor). Farmers' coffee plants are still from their ancestors and must be replaced because the average coffee plant owned by farmers is 25 years old, which is already old age or past its productive period. Therefore, the age of the coffee plant increases the risk. According to research by Evizal et al. (2010), in order for coffee plants in Lampung to be more than 18 years old to be productive again, specific treatments/ engineering are needed.

Labor in the production risk estimation results shows a real influence. Labor has a negative effect on the risk of coffee production (risk-reducing factor). As previously explained, coffee farmers in the research area have sufficient knowledge to conduct coffee farming activities. Farmers have been involved in coffee farming for a long time. In addition, most farmers have upper secondary education, indicating that they are skilled in making decisions.

The results of the production risk function analysis show that inorganic fertilizers have a real or significant effect. The inorganic fertilizer variable has a positive influence on the risk of coffee production or it can be said that inorganic fertilizer is a risk-inducing factor. The use of inorganic fertilizers by farmers is still low, namely, an average of 200 kg/ha/year. In contras, according to Aggita et al. (2018), the need for inorganic fertilizer for coffee plants is 600 kg/ha/year. Therefore, farmers' use of inorganic fertilizers differs from recommendations, increasing the risk.

Organic fertilizer also has a real influence at the 1 percent significance level. Using organic fertilizer in coffee farming in Lampung positively affects production risk (risk-inducing factor). The average use of organic fertilizer by farmers is 1561 kg/ha. This organic fertilizer comes from animal waste from farmers' livestock, which is given directly to coffee plants without a fermentation process first. However, there are concerns that organic fertilizer can harm plants. As is known, manure contains methane, which, if applied directly, can cause plants to wilt. Manure without a complete composting process can be toxic to plants because it contains copper and zinc (Sentana, 2010).

Pesticides have a positive and real influence on the risk of coffee production (risk-inducing factor). In other words, increasing the use of pesticides will result in higher production risks. Coffee plants are vulnerable to pest attacks, so farmers often use pesticides as an effective control method. However, pesticide use by farmers reaches an average of 5 liters per hectare, often exceeding the prescribed dose. This case has the potential to poison coffee plants. Chrisdiyanti and Yuliawati (2019) found similar results, stating pesticides have a significant and positive effect on production risk.

Table 3. Factors influencing the risk of coffee production in Lampung Province

Variables	Coef.	Std. Err.	z
Ln land area	-0.484***	0.0004	-1102
Ln plant age	0.477***	0.0018	255
Ln labor	-0.032***	0.0002	-127
Ln inorganic fertilizer	0.045***	0.0001	327
Ln organic fertilizer	0.037***	0.0000	846
Ln pesticide	0.123***	0.0002	494
Ln number of trees	1.433***	0.0006	2071
Dummy of contract farming	0.039***	0.0005	76

Note: ***Significant at α=1%; **Significant at α=5%; *Significant at α=10%

Estimating the production risk function on the number of trees variable also shows a real and positive influence on production risk (risk-inducing factor). The increasing number of trees will increase the opportunity for pests and diseases to spread. Plant spacing in farmers' coffee plantations in the study area is irregular, which can cause problems in crop management and positively influence production risks. The Robusta coffee plants cultivated by farmers were derivative plants or ancestral heritage that did not pay attention to planting distances (Ndiwa et al. 2022).

Furthermore, the results of estimating the production risk function show that contract farming positively and significantly affects production risk (risk-inducing factor). Although contract farming offers several benefits in coffee cultivation, their potential has yet to be fully realized because some requirements are still tricky for farmers to fulfill. One example is preserving gardens and reducing chemicals such as pesticides and chemical fertilizers. Although farmers are encouraged to reduce their use of the material, many still see it as a quick fix to solve problems and increase production. Farm hygiene problems also arise from waste from other farmers being dumped near partner farmers' farms, causing possible contamination. The difficulty of meeting these specific requirements can be an obstacle to running a contract farming effectively, although it provides an opportunity to reduce production risks. Research by Tuyen et al. (2022) and Xena et al. (2021) shows that risks in contract farming are often caused by farmers' non-compliance with contract provisions and lack of appropriate input assistance from the company. In addition, excessive use of pesticides on neighboring non-contract farmers' gardens also impacts contract farmers' gardens, making contract farming that should reduce risks increase them.

Managerial Implications

The managerial implications of these findings are that Nestle, or similar companies, need to expand their contract farming programs as this can result in increased coffee production, thus ensuring the availability of their raw materials. Joint Business Group (KUB) is also advised to be more intensive in accompanying farmers in implementing good coffee cultivation practices by the provisions in the contract farming. Meanwhile, the farmers must join this contract farming program to enhance production. However, they must adhere to all the applicable terms and standard operating procedures (SOPs) within the contract farming. Then, the government needs to support the contract farming system to increase coffee production by promoting this program, providing policies and incentives that support further development in the coffee sector, and regulating to mitigate production risks related to contract relationships between farmers and contracting parties.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Contract farming positively and significantly affects coffee production in Lampung, providing farmers with input assistance and access to technology. However, contract farming also positively affects production risk because the terms of contract farming are only partially implemented by farmers. Other factors that influence production improvement include land area, labor, organic fertilizer, pesticides, and the number of coffee trees. Factors that reduce production risk are land area and labor.

Recommendations

Based on the research findings, the recommendation is that farmers need to pay attention to factors that positively influence production, such as optimizing the use of land area, efficient use of labor, and appropriate use of organic fertilizers and pesticides. Farmers must also consider factors that can reduce risks, such as proper land area management and effective labor management. Then, stakeholders need to evaluate the existence of a contract farming program further so that it can have a better impact on coffee farming, especially in reducing production risks. This study is limited to contract farming in coffee agriculture, and its findings may not apply to contract farming in other commodities or sectors. A suggestion for further research is to expand the scope to include various types of contract farming beyond coffee to test the generalizability of findings across different agricultural sectors and commodities.

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