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RISK BEHAVIOR ANALYSIS OF SHALLOT FARMER PRODUCTION IN BREBES, CENTRAL JAVA, INDONESIA

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ABSTRACT : The role of shallot as a commodity that has high economic value is faced with farming that has a high risk. The risks faced by farmers will affect the behavior of farmers in dealing with risks. This study aims to: (1) analyze the factors of production that affect productivity, production risks and inefficiencies of farmers, (2) analyze the behavior of farmers in facing production risks and (3) analyze the socio-economic factors that influence the risk behavior of farmers. Data analysis uses a model that has been developed by Kumbhakar. The results showed that female paid labor input and adhesive had a negative effect on productivity while seed had a positive effect on productivity. Male family labor and Adhesive inputs can increase the risk of shallot farming production. ZA fertilizer can reduce technical inefficiencies. Shallot farmers on average in the study location are risk averse in the allocation of the use of production inputs. The number of family members of productive age and extension dummy from the private sector has a positive and significant effect on the probability of farmer risk behavior.

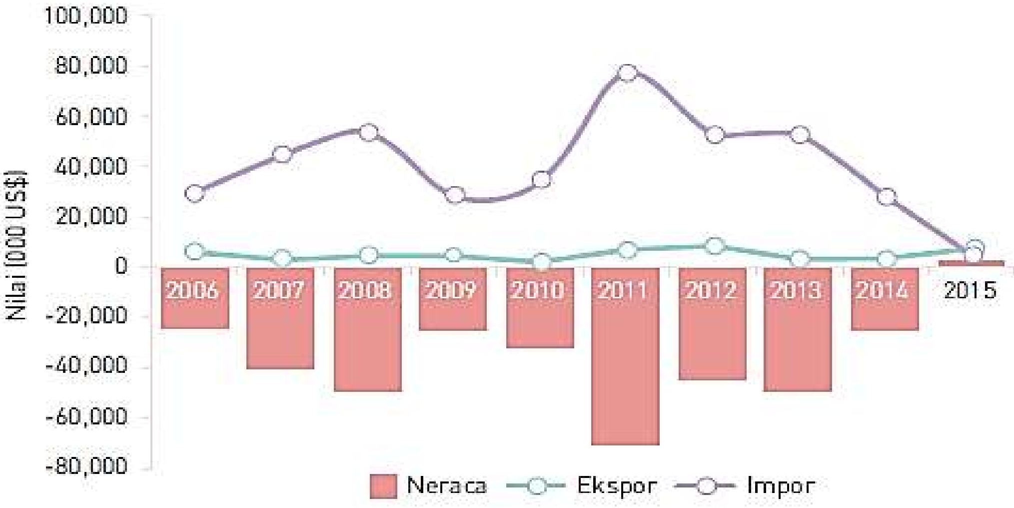
KEYWORDS :*Risk Behavior, Shallots, Productivity, Production Risk, Frontier*

I. INTRODUCTION

Shallot is one of Indonesia's leading vegetable commodities that has many benefits, has high economic value and has been long sought by farmers intensively. Shallots are needed by almost all people who are generally used as cooking spices or traditional medicine. This vegetable commodity is included in the disubstituted spice group which functions as a food seasoning and traditional medicinal ingredients. Thus, shallot is now one of the main commodities in Indonesia whose prices are unstable and are determined as one of the commodities in the important agricultural product group controlling inflation besides chili and garlic in the Ministry of Agriculture's Strategic Plan for 2015 - 2019.

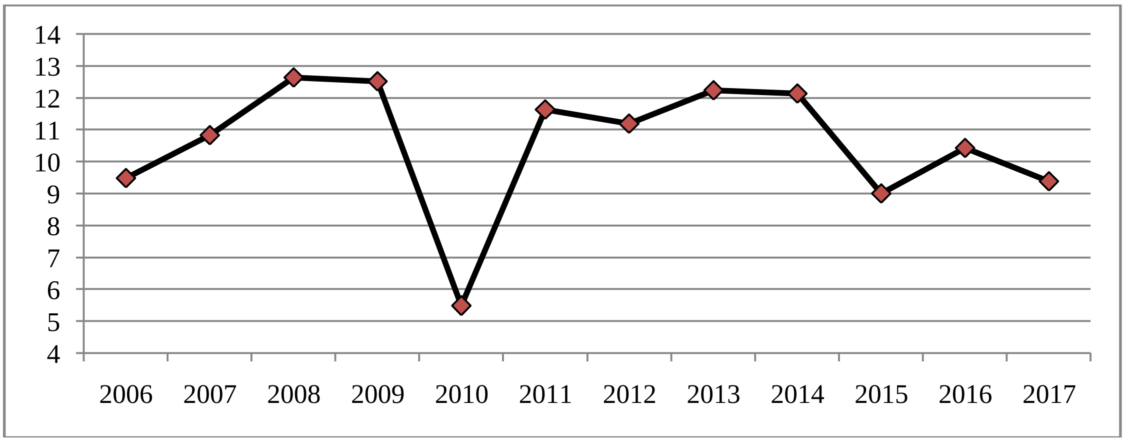
The role of shallot as a commodity that has a high economic value and as one of the basic and important ingredients, is faced with farming that has a high risk, many challenges and obstacles faced in its cultivation, such as the attack of plant pests (OPT) that can thwart the harvest. Low crop productivity with increasing pests and diseases generally occurs in on-season or off-season shallot cultivation. Planting shallots in the rainy season ie from October / December to March / April in normal climatic conditions is usually called off-season plants.

Uneven production of shallots throughout the year and is seasonal has resulted in the government taking a policy to import shallots to meet the supply of shallots in Indonesia with the aim of keeping prices stable. The volume of exports and imports of shallots during the period 2006-2015 shows that the import of shallots is much higher than the volume of exports which causes the export balance of imports of shallots in Indonesia to always be in deficit. However, the import trend of shallots in the last 5 years (2011-2015) continued to decline even in 2015 the volume of imports was only 17.43 tons where there was a decrease of 89.14% compared to import volume in 2011 which amounted to 160.48 thousand tons. The small amount of shallot imports in 2015 made the balance deficit of Indonesia's shallots export-import is getting low, decrease by only 9 thousand tons where there was a decrease of 93.86% compared to 2011 which amounted to 146.67 thousand tons. This is a reflection of the government's commitment to reduce the import of shallots (Ministry of Trade 2016). This shows the shallot has the opportunity to be further developed.



Source : Ministry of Trade (2016)
Figure 1. Balanced development of national shallot import export value in 2006-2015

Shallot productivity in the production center area in Central Java, in 2015 reached 11.05 tons per ha. This productivity is higher than the national productivity of 10.06 tons per ha, but still relatively lower compared to the shallot productivity of other producing countries such as Mainland China, Japan, Turkey, Iraq and Thailand which in 2013 had reached 38.43 each. tons / ha, 22.28 tons / ha, 17.87 tons / ha, 26.36 tons / ha and 12.46 tons / ha (Ministry of Agriculture 2016). Shallot cultivation with the application of standard operating procedures (SOP) technology of good and right shallot cultivation combined with using quality seeds from superior varieties can increase the productivity of shallots in Indonesia that reach 17-20 tons / ha (Bappenas, 2013).



Source : Ministry of Agriculture (2016)
Figure 2. Development of shallot productivity in Brebes

Figure 2 shows that the productivity of shallots in Brebes as one of the production centers experiencing fluctuations indicates the variation between times. The existence of production risk causes the average productivity of shallots to only reach 50 - 59 percent of its potential productivity. Productivity stagnation is also a problem faced in shallot farming. Productivity even tends to decrease, so that there is a need for new technological breakthroughs. Through technological change can significantly improve the welfare of farmers.
The size of the risk faced by shallot farmers will affect the behavior of farmers in dealing with risks. Farmers' behavior in facing production risk can be grouped into three groups, namely risk-averse behavior, risk neutral behavior, and risk taker behavior. Farmers who behave boldly to risk will allocate different inputs from farmers who behave avoid risk so that it can affect the production and productivity achieved. Ellis (2008) argues that most small farmers in most developing countries behave risk averse, causing an inefficient allocation of input use, which in turn affects farm productivity. Farmers who behave as risk averse does not mean that the farmer does not want to take risks, but the farmer must be compensated to take risks in the form of premiums that exceed or are above certain business returns, ie guarantees used to pay for certainty. In general, it can be said

that in a business that has a high risk; it must offer an expected return high enough to compensate the risk averse farmers to accept the risk (Robinson and Barry 1987). Therefore this study aims to: (1) analyze the factors of production that affect productivity, production risk and inefficiency of shallot farmers, (2) analyze the behavior of shallot farmers in the face of production risk and (3) analyze the factors of social economy that influences the risk behavior of shallot farmers. There is a hope that the results of this study can be used as a consideration to reduce the level of risk of shallot farming.

II. RESEARCH METHODS

2.1. Location and Research Data

The location selection was done intentionally (purposive), namely in Brebes Regency, Central Java Province as the biggest center of shallot production. This research was conducted using secondary data from research conducted by the collaboration of a team of researchers from the Bogor Agricultural Institute, the Horticultural Research and Development Center of the Ministry of Agriculture and the University of Adelaide. In addition, other secondary data in the form of data that are relevant to this research are also needed, obtained from government agencies and services related to research such as the Agriculture Service of Central Java Province and Brebes Regency, Central Java Statistics Agency and Brebes Regency, and other agencies related to this research.

2.2. Data analysis method

Goals 1 and 2 are answered by using a model developed by Kumbhakar (2002) adopted to analyze the impact of input allocation on productivity, the impact of input allocation on productivity risks and technical inefficiencies, as well as farmers' behavior towards shallot productivity risks. Furthermore, the translog production function is used with the following considerations: (1) this functional form has been widely used in empirical research, particularly farm research on various agricultural commodities both in developing and developed countries; (2) the form of the function is flexible, (3) theoretically the translog production function can explain at various stages in the production function, (4) less retriction on the elasticity of production and substitution elasticity, and (5) has included the contribution of interactions between factors of production.

To analyze the efficiency and risk behavior of farmers, a model developed by Kumbhakar (2002) was used. The functional form:

$$Lny_i = \alpha_0 \sum_{j=1}^{19} x_{ji}{}^{\alpha_j} + \beta_0 \sum_{j=1}^{19} x_{ji}{}^{\beta_j} e^{\varepsilon_i} - \gamma_0 \sum_{j=1}^{19} x_{ji}{}^{\gamma_j} e^{u_i} \qquad (1)$$

Where:

$\alpha_0 \sum_{j=1}^{19} x_{ji}{}^{\alpha_j}$ is a production function

$\beta_0 \sum_{j=1}^{19} x_{ji}{}^{\beta_j} e^{v_i}$ is a function of production risk

$\gamma_0 \sum_{j=1}^{19} x_{ji}{}^{\gamma_j} e^{u_i}$ is a function that explains technical inefficiency

y is production,

x is a vector of input variables

ε_i is an error term indicating production uncertainty, assumed i.i.d (0, σ_ε)2

u_i is an error term indicating uncertainty of technical inefficiency with the assumption that i.i.d (0, σ_ε)2 and u > 0, is independent of ε_i

Function of Production:

$$f(x) = Lny_i = \alpha_0 + \sum_{j=1}^{19} \alpha_j \, Lnx_{ji} + \frac{1}{2}\sum_{j\leq}^{19}\sum_{k=1}^{19} \beta_{jk} \, Lnx_{ji} \, Lnx_{ki} + \varepsilon \qquad (2)$$

Hypothesis for production functions: $\alpha_1 - \alpha_{19} > 0$.

Production Risk Function:

$$g(x) = |v_i| = \beta_0 + \sum_{j=1}^{19} \beta_j \, Lnx_{ji} + \frac{1}{2}\sum_{j\leq}^{19}\sum_{k=1}^{19} \beta_{jk} \, Lnx_{ji} \, Lnx_{ki} + \varepsilon \; (3)$$

Hypothesis for Risk function: β_5 , β_{15} - $\beta_{19} < 0$; β_1 - β_4 , β_6 - $\beta_{14} > 0$

The stages of analysis carried out for the production function, risk function and technical inefficiency models are as follows:

1. Estimating parameters in the function $g(x)$ dan σ_u^2 in a way:

a. using the OLS method where $\Psi(x) = f(x) - a.g(x)$, $u^* = u - a$, and $v = g(x)\{\varepsilon - u^*\}$ to get residual value v.

b. Look for the value α_u^2 by using the formula:

$\sigma_u^2 = \left\{r - 1 + \frac{2}{\pi}\right\}^{-1}$ where $r = \left\{\left(\frac{m_2^{3/2}}{m_3}\right)\left(\sqrt{\frac{2}{\pi}}\right)\left(1 - \frac{4}{\pi}\right)\right\}$ and m is central moment of residual value v.

The central moment is analogous to the moment which is a generalization of the average value, then the central moment is a generalization of the value of the variance, so that the variance is the central moment of degree 2. Moment level one (m1) is a measure of centering such as the median or average, moment level 2 (m2) is the variant (σ2) is a measure of diversity of the distribution, and moment level three (m3) is a measure of dispersion and skwenes.

c. If the value σ_u^2 already obtained, so the value a, b and c can be obtained using the formulas of : $a = \sqrt{\frac{2}{\pi}}\sigma_u$; $b^2 = \frac{(\pi-2)}{\pi}\sigma_u^2$; and

$$c = \sqrt{\frac{2}{\pi}}\left(\frac{4}{\pi} - 1\right)\sigma_u^3$$

d. Regress $|\hat{v}| = g(x).\sqrt{1+b^2} + \omega = g^*(x) + \omega$ by using the method OLS where $g^*(x) = g(x).\sqrt{1+b^2}$ to get the parameter $g(x)$.

2. Estimating the production function of f (x) to obtain the parameters λ and θ.

a. Calculates the utility function $U(\mu_\Pi) = \log(\mu_\Pi)$ where $\mu_\Pi = f(x) - w.x.$

b. Calculates $AR = -U''(\mu_\Pi)/U'(\mu_\Pi)$and $DR = U'''(\mu_\Pi)/U'(\mu_\Pi)$.

c. Estimating parameters contained in θ dan λ by using the formulas: $\theta = \left\{\frac{-AR.g(Xi)-DR.g(Xi).q(Xi).a}{1+AR.q(Xi).a+\frac{1}{2}DR.g^2(Xi)+q^2(a^2+b^2)}\right\}$;

$$\lambda = \frac{\{a + AR.q(Xi).(b^2+a^2) + \frac{1}{2}DR.\{q^2(Xi).(c+3a^2b+a^2)]\}}{\{1 + AR.q(Xi).a + \frac{1}{2}DR.[g^2(Xi) + q^2(Xi)(a^2+b^2)]\}}$$

Farmer risk behavior can be explained by the value of θandλ. Technical inefficiency and risk uncertainty affect the allocation of inputs through the risk behavior function θand λ. . This risk behavior analysis is divided into two, namely the risk behavior per individual farmer in the allocation of inputs they use as a whole and the overall behavior of the farmers in the allocation per input used.

Farmers' risk choice criteria are:

(a). If θ = 0 and λ = 0, then the farmer is risk neutral towards risk

(b). If θ <0 and λ> 0 then the farmer is risk averse to risk

(c). If the farmer is in full efficiency (u = 0) then the farmer's risk behavior is determined by θ.

(d). If θ> 0 and λ> 0, farmers are risk takers

Analysis with the logit function approach is used in this study to answer goal number 3, namely to analyze the factors that influence the opportunities for farmers' risk behavior. Estimation of parameters is done by the Maximum Likelihood Estimation (MLE) method. In the cumulative logit distribution model is based on logistic distribution, so that the opportunity value of farmers' risk behavior can be determined as follows:

$$P = \frac{1}{1+e^{-(\alpha+\beta_i X_i)}} \qquad (4)$$

Where :

P = Farmer risk behavior opportunity (value between 0 and 1)

Xi = free variable

α = Interception

βi = Logit function parameter

e = natural number is 2.7182

If equation (4) is modified then:

$$e^{-(\alpha+\beta_i X_i)} = \frac{1-P}{P}$$

$$e^{(\alpha+\beta_i X_i)} = \frac{1-P}{P}$$

$$\ln e^{(\alpha+\beta_i X_i)} = \ln\frac{1-P}{P}$$

$$p^* = \ln\left(\frac{1-P}{P}\right) = \alpha + \beta_i X_i$$

With this modification, the ordinary regression process can be applied. The logit function implementation model is as follows:

$$Ln\left(\frac{P_i}{1-P_i}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} \quad (5)$$

Where :

Pi = Farmer risk behavior opportunity, Pi = 1 if Farmer Risk averse and Pi = 0 if Farmer risk taker (risk averse and risk taker values are obtained from criteria based on the value θand λ; and analyzed based on risk behavior per individual farmer)

α = Interception

Z1 = Age, measured in years.

Z2 = Education, measured by the unit of length of formal education of the farmer (years).

Z3 = Number of family members of productive age (people)

Z4 = Number of family dependents (people)

Z5 = Distance to home (meters)

Z6 = Shallots Income (Rp)

Z7 =Agricultural income excluding shallots (Rp)

Z8 =Off-farm income (Rp)

Z9 =Dummy extension from the government (0 = farmers not getting extension, 1 = farmers receiving extension)

Z10 =Dummy extension from the private sector (0 = farmers not getting extension, 1 = farmers receiving extension)

Z11 =dummy access of farmers to credit (0 = farmers who do not get credit; 1 = farmers who get credit)

Z12 =dummy membership of farmers in farmer groups (0 = not KT members, 1 = KT members)

Z13 = Dummy land ownership (0 = rented land, 1 = self-owned land)

III. RESULTS AND DISCUSSION

3.1. Factors Affecting Productivity, Risk and Technical Inefficiency

Estimation results with the translog production function (where input-output is made per hectare) obtained a basic picture of the sign, magnitude, and significance level of the estimated parameters. However, because the form of the productivity function is a translog, the estimation parameters do not reflect the elasticity of each production input. The results of estimation of factors of production that affect productivity, risk and technical inefficiency are presented in Table 1.

Based on the estimation results of factors of production that significantly influence (90-99 percent confidence level) on productivity are female paid labor, seed, and adhesive, with the elasticity value of -0.08 each; 0.95 and -0.06. This means that increasing the use of female paid labor by 1 percent, ceteris paribus, will reduce productivity by 0.08 percent. Increasing the use of seeds by 1 percent, ceteris paribus, can increase the productivity of shallots by 0.95 percent and increasing the use of adhesive by 1 percent, ceteris paribus, will reduce productivity by 0.06 percent.

The use of female paid labor can reduce productivity. This shows that the addition of labor input will actually lead to an increase in production costs so that reducing the use of female labor in the family will reduce costs and increase production. Jobs that use female workers include a variety of jobs such as planting, weeding and harvesting.

Adding the use of seed inputs will significantly increase the production of shallots. The results of this study are the same as those of Nurhapsa (2013), Tahir et al. (2011) and Fauziyah et al. (2010). Factually, the average farmer uses 1.7 tons / ha of seeds, which is still lower than the recommendation from the Agriculture and Food Crops Horticulture Office, in Brebes in 2011, with a spacing of 15x20 cm2 or 20x20 cm2 requiring 1.8 tons of seeds or 2.4 tons. Therefore, increasing the number of quality seeds to increase productivity is needed, because superior seeds are more responsive to fertilizers and have high potential production.

The use of adhesive inputs has an effect on decreasing productivity. These results differ from studies conducted by Villano et al. (2005), where adhesives are used to treat pests, in other words, control decision making tends to be more directed at anticipating the risk of pests and at the same time to overcome pests, but their use is excessive, so adding the use of adhesives will only reduce productivity and increase risk. This is due to the use of traps with adhesives which causes beneficial insects or even natural enemies to become trapped.

Table 1.Elasticity of production, risk and technical inefficiency (TI) of shallots farmers in Brebes

No	Inputs (per hectare)	Production	Risk	TI Elasticity

		Elasticity	Elasticity	
1	Male Family Labor (Male Workdays)	2,67	17,84**	7,17
2	Male Paid Labor (Male Workdays)	1,24	8,02	0,73
3	Female Family Labor (Female Workdays)	-0,51	2,86	-11,12
4	Female Paid Labor (Female Workdays)	-0,08**	-3,06	0,01
5	Seed (kg)	0,94***	2,15	0,53
6	Urea (Kg)	2,15	40,19	7,38
7	TSP (Kg)	0,53	-19,43	3,08
8	KCL (Kg)	-2,31	7,36	-0,68
9	Phonska (Kg)	0,68	67,68	10,17
10	ZA (kg)	-3,76	-21,46	-10,68*
11	Carbofuran (Kg)	-3,17	22,87	-4,94
12	NPK Mut Total (kg)	-0,47	-8,05	-0,13
13	NPK Reg (kg)	5,84	-11,58	7,80
14	Lime (kg)	1,86	-47,25	-10,44
15	OrganicFertilizer (Kg)	2,00	28,88	7,80
16	Herbicide (liter)	0,18	1,77	0,35
17	Fungicide (liter)	-0,24	-1,55	-0,27
18	Insecticide (liter)	0,12	-0,37	0,03
19	Adhesive (liter)	-0,05*	1,07*	0,20

*** = significant at 0,001
** = significant at 0,01
* = significant at 0,05
‘ = significant at 0,1

Estimation results on the production risk function show male family labor production factors and adhesives significantly influence (90-99% degree of confidence) on the risk of productivity of shallot farming with elasticity values of 17.84 and 1.07. This means that when the use of male family labor is increased by 1 percent, it will increase the risk by 17.84 percent and when the use of adhesive is increased by 1 percent, the risk will increase by 1.07 percent.

There are 14 interaction variables between factors of production that significantly affect the risk of shallot production. Interactions that negatively and significantly affected, namely the interaction of male family labor with male family labor, male paid labor with female family labor, female paid labor with urea, urea with urea, TSP with fungicide, KCL with pearl NPK, phonska with phonska. The interaction of these production factors can reduce the risk of productivity of shallot farming, whereas interactions that can increase production risk are interactions between male family labor and seeds, male family labor with insecticide, female paid labor with female paid labor, TSP with TSP, phonska with adhesive, NPK pearl with adhesive and herbicide with adhesive. This means that increasing the use of these inputs together can increase risk.

The use of male family labor significantly contributes to increased risk. This workforce includes various jobs such as land management, planting, weeding, spraying, fertilizing and harvesting. These results are consistent with the study of Mutisari and Meitasari (2019) which states Labor can increase production risk and is different from the results of research conducted by Kurniati (2012) and Saptana et al. (2010) which states that Labor can reduce risk. The results show that the allocation of labor in the family is excessive. In addition, it is likely that the skills possessed by family labor are inadequate so that its use in farming will only increase production risk. The implication is that there are needs to be an increase in skills from family labor, so that it can be transferred to other sectors outside of shallot cultivation.

The use of adhesive inputs has an effect on increasing risk. These results differ from studies conducted by Villano et al. (2005), where adhesives are used to treat pests, in other words, control decision making tends to be more directed at anticipating the risk of pests and at the same time to overcome pests, but their use is excessive, so adding the use of adhesives will only reduce productivity and increase risk. This is due to the use of traps with adhesives which causes beneficial insects or even natural enemies to become trapped.

The estimation results of production factors that affect technical inefficiencies that significantly influence (90 percent confidence level) are ZA fertilizer, with an elasticity value of -10.44. This means that when ZA fertilizer is increased by 1 percent it will reduce technical inefficiency by -10.44 percent. There are 7 interaction variables between factors of production that significantly affect the technical inefficiency of shallots. Interactions that negatively and significantly affect, namely: interactions between male family labor and male family labor, female paid labor with urea and lime with herbicides, while interactions that can significantly increase inefficiency, namely interaction of seeds with NPK pearls, TSP with carbofuran and herbicides with adhesives.

3.2. Risk Behavior of Shallot Farmer Production in Input Allocation

Based on the results of the analysis of risk behavior per individual, it is obtained that the average shallot farmer in Brebes behaves Risk averse to productivity risk in the allocation of the use of production inputs used. The results of this study are in accordance with the research of Dadzie and Aquah (2012) in which 67.5 percent of food crop farmers in Ghana are risk averse, Nurhapsa (2018) produces the average shallot farmer in Erekang is risk averse and Mutisari and Meitasari (2019) states the behavior of shallot farmers in Batu, on average is Risk Averter. In contrast to soybean farmers in Sambas Regency as much as 48.39 percent behave as risk neutral (Kurniati 2015).

Most farmers behave to avoid risk and influence the allocation of the use of production inputs, so to encourage farmers to take risks is (1) increasing knowledge about the shallot business must be improved, (2) providing information related to production risk needs to be improved, (3) appropriate risk management strategies (overlapping cropping systems, Warehouse Receipts for Shallots and Agricultural Insurance).

Farmers behave to avoid production risks in the use of inputs, because farmers view these production inputs as the main inputs that determine the success of large shallot farming. In general, farmers have a perception that shallot farming without fertilization and medicine will fail, so that the allocation becomes more to keep good results.

Table 2.The consequences of production risks of shallots farmers on the allocation of inputs and the level of productivity, TE, and income in Brebes

No	Input, Produktivity, TE and Income	Risk Taker	Risk averse
1	family labor Male	508,36	512,18
2	paid labor Male	210,62	283,54
3	family labor Female	155,56	208,97
4	paid labor Female	143,62	203,44
5	seed	2.063,31	1.694,38
6	Urea	181,65	202,28
7	TSP	278,25	326,63
8	KCL	201,85	127,63
9	Phonska	132,17	177,81
10	ZA	78,54	135,01
11	NPK Mut Total	163,25	191,93
12	NPK Reg	6,99	110,18
13	Lime	59,30	45,03
14	Organik Fertilizer	8,61	21,83
15	Karbofuran	21,26	27,59
16	Herbisida	3,69	3,44
17	Fungisida	7,62	7,81
18	Insektisida	13,81	15,28
19	Adhesive	6,75	7,56
20	Produktivity	9,13	7,74
21	Technical Efficiency	0,73	0,75
22	Income	44.255.603	15.178.304,10

The influence of shallot farmers' behavior in facing productivity risks and their impact on the allocation of production inputs, level of productivity, TE, and income or profits of shallot farming among risk takers and Risk averse farmers in detail can be seen in Table 2. In general, shallot farmers who behave dare to take productivity risks (risk takers) allocating labor, fertilizers, and medicines are less than farmers who behave in risk averse behaviors. Because farmers who are risk averse will try to reduce the risk that will occur by allocating more inputs for better results and increasing the value of technical efficiency (Oppong 2016). The results of this study are in accordance with Isik and Khana (2002) stating that the adoption of site-specific technology under uncertainty of production and land conditions makes risk averse farmers allocate more fertilizer. Liu and Huang (2013) produce the same research, namely farmers who are more risk averse to use more pesticides.

More seed allocation for farmers who behave dares to take risks. This is because farmers consider that the seeds used are good, and can increase production by increasing the use of fertilizers, medicines and labor. Based on the results of the study, it indicates that the seed is an input that can significantly increase production, and its use is still below the recommendations, so that its use can still be increased. These results in higher levels of productivity and risk takers compared to risk averse farmers. The implication is the importance of shallot farmers to pay more attention to which production inputs must be increased in allocation so as to significantly increase productivity, TE and profits. This is consistent with the research of Asmara et al. (2019), ie farmers with risk seeker preferences are more daring in allocating seed production inputs when compared to the average use of hybrid seeds according to the technical guidelines for corn cultivation. Whereas corn farmers who are with risk averse preferences on average uses seeds under technical recommendations.

3.3. Socio-Economic Factors Affecting Risk Behavior

The characteristics of shallot farmers and the influence of farmer's behavior in facing productivity risks between groups of farmers that lead to avoid productivity risk and those that lead to dare to take risk (risk takers) are presented in Table 3.

Table 3.The characteristics of shallot farmers on productivity risk behaviorinBrebes

No	Characteristics of Shallot Farmers	Risk Taker	Risk averse
1	Age	51,21	50,61
2	Education	6,40	5,50
3	Family Members	1,85	2,15
4	Family Dependents	0,98	0,97
5	Farm-Home Distance	5.250	2.512,31
6	Non-Shallot Income	13.356.884,62	13.763.479,75
7	Off-farm Income	17.696.873,08	14.815.821,50
8	Dummy Government Extension	1 = 38,46%; 0 = 61,54%	1 = 36,45%; 0 = 63,55%
9	Dummy Private Extension	1 = 38,46%; 0 = 61,54%	1 = 49,84%; 0 = 50,16%
10	Dummy Credit	1 = 36,54%; 0 = 63,46%	1 = 39,25%; 0 = 60,75%
11	Dummy Farmers Group member	1 = 40,38%; 0 = 59,62%	1 = 36,14%; 0 = 63,86%
12	Dummy land ownership	1 = 48,08% 0 = 51,92%	1 = 41,12%; 0 = 58,88%
13	Shallot Plot Area	0,22	0,23

Based on the analysis of risk behavior per individual, for farmers who dare to risk having an older age, higher education, fewer family members, more dependents, closer land distance, less income outside shallots, outside income more agriculture, more extension from the government but less extension from the private sector, fewer who get credit, more are registered as Farmers Group members, and more are landowners, and smaller shallot land areas . Only the number of family members is significantly different in risk averse and risk takers. This is because shallot farming is classified as labor intensive, so the number of productive family members is a source of family labor for risk averse farmers who allocate more labor.

The results of the regression analysis estimating socioeconomic variables that affect the probability of the risk behavior of shallots farmers in Brebes are presented in Table 4. The results show that the number of productive family members has a negative and significant effect on the probability of farmer risk behavior. This means that the greater the number of production family members, the opportunity for farmers as risk averse is greater. The large size of the household indicates the need for more consumption with limited land ownership, causing farmers to become less willing to accept the risk. On the other hand, a large household size is a source of household labor, which can be utilized by farmers to undertake business in order to avoid risk. These results are in accordance with research by Diadzie and Acquah (2012) and Amaefula et al. (2012).

Private extension from the private sector has a positive and significant effect on the probability of farmer risk behavior. This means that farmers who get extension from the private sector will be more risk averse compared to farmers who do not get extension. This shows that the performance of the instructor is still not good. The possibility is due to the lack of extension workers so farmers do not get enough knowledge to be able to face production risks. In addition, extension from the private sector is usually an extension of the products they produce, so the material provided in the extension is in line with the allocation of more inputs.These results are in accordance with research byAstutiet al. (2019)

Table4. Estimating socioeconomic variables that affect the probability of the risk behavior of shallots farmers in Brebes

Variabel	Coefisien	Wald	P value	Odd Ratio
Age (Z1)	-0,08	0,48	0,49	1,01
Education (Z2)	-0,15	2,03	0,15	1,08
Family Members (Z3)	0,21	3,03	0,08*	0,74
Family Dependents (Z4)	-0,10	0,81	0,37	1,22
Farm-Home Distance (Z5)	0,02	0,01	0,91	1,00
PendapatanBawangMerah (Z6)	-0,02	0,02	0,90	1,00
Non-Shallot Income (Z7)	-0,01	0,01	0,91	1,00
Off-farm Income (Z8)	0,01	0,02	0,88	1,00
Dummy Government Extension (Z9)	0,04	0,12	0,73	0,87
Dummy Private Extension (Z10)	0,30	7,89	0,00***	0,34

Dummy Credit (Z11)	-0,07	0,57	0,45	1,30
Dummy Farmers Group member (Z12)	-0,09	0,76	0,38	1,39
Dummy land ownership (Z13)	-0,07	0,55	0,46	1,30

IV. CONCLUSION

1. Female paid labor input and adhesive have a negative effect on productivity while seed has a positive effect on productivity. Male family labor and Adhesive inputs can increase the risk of shallot farming production. ZA fertilizer can reduce technical inefficiencies.
2. Shallot farmers on average in the study location are afraid to take production risk (risk averse) in the allocation of the use of production inputs.
3. The number of family members of productive age and extension dummy from the private sector has a positive and significant effect on the probability of farmer risk behavior.

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