PRODUCTION AND PRICE RISK ANALYSIS OF SHALLOT (*ALLIUM STIPITATUM* REGEL) CULTIVATION AMONG FARM HOUSEHOLDS IN BREBES DISTRICT, INDONESIA

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Abstract. Indonesian majorities rely considerably on the agricultural sector as economic activity. However, the outputs are often unable to meet domestic demand. Demand and supply imbalance frequently happened to most agriculture commodities, one of them being shallot. Shallot (*Allium stipitatum* Regel) is known to have high economic value, thus resulting in supply-side inflation (cost-push inflation). Consequently, causing scarcity and escalation in the price of goods offered. Therefore, it is necessary to analyze shallot farming to increase productivity and balance the supply and demand in the market. Brebes District in Central Java Province was chosen as research location due to its production volume of shallot is the highest in the nation and known as one of the centers of shallot production. This research uses primary data attained by interviewing 120 shallot farmers from two sub-districts in Brebes District, namely Wanasari and Larangan. The result of this study shows how the coefficient of the variation value obtained is 0.20 and lower than 0.5, while the lower price limit is IDR. 13,730.49 and more than 0. These indicate a gain of profit and a low-risk possibility.
Keywords: *bulb seedlings, monoculture, risk analysis, shallot farming, supply-side inflation*

Introduction

Indonesian majorities rely considerably on the agricultural sector as their main economic activity (Susanawati et al., 2018; Kusumaningrum, 2019). As of February 2022, it absorbed 1.86 million laborers, equivalent to 29.96% of the total available workforce, which is 135.6 million, and ranked first among other sectors (BPS, 2022). However, the production outputs of agricultural sectors are often unable to meet domestic demand. Demand and supply imbalance frequently happened to most agriculture commodities, one of them being shallot.

Shallot (*Allium stipitatum* Regel) is one of Indonesia's strategic commodities highly valued to maintain food security and part of the primary staples (*bapokting/bahan pokok dan penting*) issued by Presidential Regulation (*Perpres/Peraturan Presiden*) no. 71 of 2015. Following National Socioeconomic Survey (*Susenas/Survei Social Ekonomi Nasional*) data metric in 2021, the amount of shallot consumption summed around 790,630 tons or 2.49 kg/capita per week (PDSIP, 2021), while the production reached 2,004,590 tons (BPS, 2021). Provinces with the highest shallot production are Central Java, East Java, and West Nusa Tenggara. Central Java contributed about 28.15% of the national production with 564.26 thousand tons of production and 55.98 thousand hectares of harvested area (BPS, 2022). Brebes District produce the highest outputs

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among other districts in this province, which amount to 302 tons by 2019, followed by Demak District for 46 tons and Pati District at 39 tons (PDSIP, 2020).

The characteristics of shallot farming in the centers of production in Indonesia are (a) carried out on both the low wetland and high dryland, (b) small scale and scattered, (c) low farmer capital capability, (c) non-optimal application of technology, both the use of seeds, cultivation and post-harvest, (d) excessive use of pesticides to control pests, (e) lack of use of certified seed/seedlings, (f) non-optimal development of shallot areas based on farmer corporations, and (g) inefficient product marketing system and high price fluctuations (Saptana, 2021).

The surplus of supplies has little to no impact over exponentially increasing inflation rates of many necessity goods, in this case, shallot. Its price varies by province. Some regions are exceptionally high, while others have moderate to regular pricing. As of December 1st, 2022, the information provided by National Strategic Food Prices Information Center (*PIHPS/Pusat Informasi Harga Pangan Strategis Nasional*) showed IDR 37,750/kg (USD 2.45) as the average pricing of all provinces. North Maluku and West Papua reached the highest price of IDR 58,750/kg (USD 3.82) and IDR 56,250/kg (USD 3.66) sequentially. Most regions, especially on Java and Sumatra islands, have considerably moderate prices averaging around IDR 30,000/kg, (USD 1.95) with Bali having the lowest price at IDR 24,500/kg (USD 159).

According to statements made by Indonesian government and experts on the news outlets, they tried to approach such phenomena based on export activities and natural disasters such as weather anomalies, drought, prolonged rains, and monsoons that impact crop failure, thus resulting in supply-side inflation (cost-push inflation). Consequently, causing scarcity and escalation in the price of goods offered. A study by Haryati et al. (2022) showed that while the main risk on upstream level of shallot supply chain were suspected to be the fluctuation of selling price and its uncertainty at the farmer level. However, study findings show more economic aspects risk at the trader level, i.e., waste products, raw material shortage, shallot quality consistency, failure to fulfill orders, unstable selling prices, demands from consumer, difficulty in getting supplies, obtaining labor and location restriction. Yet, speculations were made about the possibility of market monopoly and stockpiling. Therefore, the author considered the necessity to analyze shallot farming from economic perspective and aiming the study for find out and understand the state of shallot farming feasibility in Brebes District, Indonesia.

Materials and method

The study aspires to incite more scientific research among farm households on how to manage the productions and costs efficiency and improve their livelihoods by utilizing the resources and statistics effectively. A quantitative approach was used to process the information needed, which concentrates more on numbers and statistics rather than focusing on in-depth information. Hence, the usage of closed-ended questions is presented during data collection with a deliberately structured questionnaire regarding overall production costs and needed information from 120 shallot farmers as research samples determined by using proportional random sampling. The survey was carried out from 1 July to 30 September 2021. The data obtained from the research proceed to be analyzed and transcribed for further study.

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Description of study area

Brebes District is astronomically located at 108° 41'37.7" - 109° 11'28.92" East Longitude and 6° 44'56'5" - 7° 20'51.48 South Latitude. The area is geographically located on the northwestern part of Central Java Province with an overall width of 1,769.2 km^2 with population of 1,978,759 people according to 2020th national census. The research sites were determined purposely in 2 sub-districts with the highest production volume, namely Wanasari and Larangan that consist of 4 villages such as, Jagalempeni, Sigentong, Rengaspendawa and Pamulihan (*Fig. 1*).

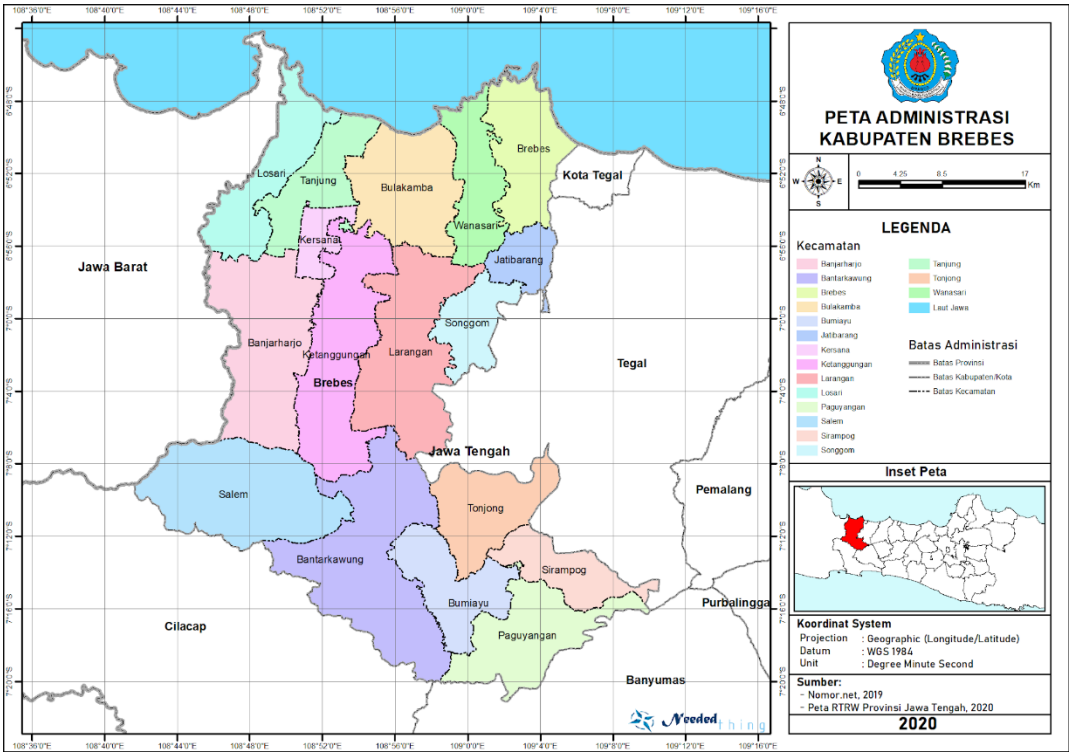

Figure 1. *Brebes District map*

Population and sampling methods

The study gathered 120 respondents from the designated research sites within Brebes District using proportional random sampling due to the convenience and probability type of sampling. Proportional random sampling is a method of taking samples from members populations utilizing a random method without regard to the inner strata of that population. The research participants are characterized by their identities including age, gender, education level, and farming experience length (*Table 1*).

Based on *Table 1*, it concluded that the ages of shallot farmers were mainly in the range of 31-65 years and within productive years, amounting to 108 subjects or 90% of the total respondents. Furthermore, shallot farming is still highly dominated by men and the less educated, most of whom only graduated from elementary school. Yet, shallot farming periods experienced are considerably lengthy, and about 91% cultivate shallot for more than ten years. These years long experiences gave farmers sufficient knowledge and wisdom accumulated and consequently find suitable and appropriate innovation needed to be applied (Nurhapsa, 2013).

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Table 1. *Identity of shallot producers in Brebes District*

No	Respondent identity	Total	Percentage (%)
1.	Age (years)		
	a. 25-30	6	5
	b. 31-35	9	7.5
	c. 36-40	15	12.5
	d. 41-45	14	11.67
	e. 46-50	14	11.67
	f. 51-55	29	24.17
	g. 56-60	17	14.17
	h. 61-65	10	8.33
	i. > 65	6	5
	Total	120	100
2.	Gender		
	j. Man	119	99
	k. Woman	1	1
	Total	120	100
3.	Education level		
	a. No school	1	1
	b. SD (elementary school)	86	71
	c. SMP (junior high school)	14	12
	d. SMA/SMK (high school)	18	15
	e. College	1	1
	Total	120	100
4.	Farming experience length		
	a. < 10 years	4	3
	b. 10 years	7	6
	c. > 10 years	109	91
	Total	120	100

Data collection method

This research occurred from 1 July to 30 September 2021 and took place in Brebes District, Central Java, based on its extensive production volume on top of the significant amount of shallot farmers. Moreover, Brebes District is one of the centers for shallot farming in Indonesia and contributed 3,410,565 quintals of shallots in 2021 alone, or 17% of total national production amounted to 2,004,590 tons (BPS, 2021). Wanasari and Larangan were sub-districts selected for further efficacy due to their highest production volume, sequentially 1,006,512 quintals and 825,454 quintals (BPS, 2021).

The primary data was collected by face-to-face interviews using sets of questionnaires with 120 shallot farmers from two sub-districts in Brebes District, namely Wanasari and

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Larangan. Shallot farmers who participated as research subjects consisted of 60 farmers from the Wonosari sub-district, 31 from Jagalempeni, and 29 from Sigentong. While 60 farmers from the Larangan sub-district, 35 from Pamulihan, and 25 from Rengaspendawa.

The questionnaire includes the required information such as, farmers identity (name, gender, age, education, address, contact information, family members, farming experience, land ownership, side jobs, cultivation method, irrigation method, variety of seedling, pest and disease, area width, cropping period); farming inputs (seedlings, fertilizers, pesticides); production quantity; income and revenue; labors costs; depreciation costs and miscellaneous expenses.

Data analysis method

(a) Costs, revenue, and income

(1) Cost

The concept used in this study is the concept of operating costs calculated from the sum of the implicit and explicit costs used in shallot farming production activities. Implicit cost mainly consists of mechanism, system, opportunity, and friction cost. Whereas explicit cost refers to visible and actual expenditures in an account. When calculating accounting profits, enterprises do not deduct the implicit cost from total revenue but the difference between total and explicit costs (Zang, 2018). Mathematically, the total cost can be formulated as follows:

$$TC = \text{implicit costs} + \text{explicit costs} \quad \text{(Eq.1)}$$

Descriptions:
TC = total cost (Rupiah)
Implicit costs = opportunity cost outside of actual expenditure (Rupiah)
Explicit costs = visible and actual expenditure in account (Rupiah)

(2) Revenue

Revenue is the value of the overall production of agricultural commodities before being reduced by production costs and calculated from the volume multiplied by the price per unit of production (Soekartawi, 1994). To calculate the total revenue. Researcher use this following formula:

$$TR = Q \times P \quad \text{(Eq.2)}$$

Descriptions:
TR = total revenue (Rupiah)
Q = quantity of output (Kg)
P = price of product per kg (Rupiah)

(3) Income

Income includes overall values from the production of goods received, self-consumed, given to others as wages, and used in the following production process (Soekartawi, 1994). Below is the formula to calculate income:

$$Pd = Q \times P - (TFC + TVC) \quad \text{(Eq.3)}$$

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Descriptions:
Pd = income (Rupiah)
Q = amount product shallots sold (kg)
P = product price per Kg (Rupiah)
TFC = total fixed cost (Rupiah)
TVC = total variable cost (Rupiah)

Operating income is the difference between total revenue and total costs. The method of calculating shallot farming income is mathematically formulated as follows:

$$Pd = TR - TC \quad \text{(Eq.4)}$$

Descriptions:
Pd = income (Rupiah)
TR = total revenue (Rupiah)
TC = total cost (Rupiah)

(b) Production and price risk

Counting the magnitude of the risk shallot farming using the calculation of the coefficient of variation and the lower limit of income. The coefficient of variation is the ratio between the risks that must be borne by the shallot farmers and the average amount of income that will be obtained as a result and the amount of capital invested in the production process, mathematically it can be formulated as follows:

$$CV_S = \frac{V}{E} \quad \text{(Eq.5)}$$

Descriptions:
CV = coefficient of variation
V = standard deviation of shallot farming income (Rupiah)
E = average income (Rupiah)

Before measuring the coefficient of variation, it is necessary to find the average income of shallot farming and its standard deviation, which is formulated as follows:

$$E = \frac{\sum_{j=1}^{n} E_i}{n} \quad \text{(Eq.6)}$$

Descriptions:
E = average income (Rupiah)
E_i = income received by producers (Rupiah)
n = number of shallot farmers (people)

After knowing the average income of shallot farming, then look for the standard deviation using the method of analysis of variance, because the standard deviation is the root of the variance, namely:

$$V = \sqrt{V^2} \quad \text{(Eq.7)}$$

As for the calculation of the analysis of variance is formulated as follows:

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$$V^2 = \frac{\sum_{j=1}^{n}(E_i - E)^2}{(n-1)} \quad \text{(Eq.8)}$$

Description:
V2 = variation
N = number of shallot farmers (people)
E = average income (Rupiah)
Ei = revenue received (Rupiah)

To find out the lower limit of shallot farming income and agroindustry processed shallot-based products formula used:

$$L = E - 2\,V \quad \text{(Eq.9)}$$

Descriptions:
L = lower limit (Rupiah)
E = average income (Rupiah)
V = standard deviation (Rupiah)

The greater the CV value indicates that the risk that must be borne by the producer is greater. The criteria used are as follows:

The value $CV \leq 0.5$ or $L \geq 0$, means the producer processed shallot-based products will always avoid losses.

The value of $CV > 0.5$ or $L < 0$ means that there is a chance that the producer will suffer losses processed shallot-based products.

Results and discussion

Land ownership status

According to Oktinafuri and Sudrajat (2016), existing customary factors influence land ownership statuses. The clarity of these statuses minimizes the occurrence of disputes and conflicts related to property rights (*Table* 2).

Table 2. *Land ownership status for shallot farming in Brebes District*

No	Land ownership status	Total	Percentage (%)
1.	Owner	60	50
2.	Lessee	58	48
3.	Laborer	2	2
Total		120	100

The ownership statuses of the respondents consist of 60 land owners or 50% of the total respondents, 58 farmers (48%) owning the land with lease status, while the other two farmers (2%) are laborers with no ownership. The number of respondents who own land minimizes the risk of land disputes. Land ownership allows high agricultural activity and no rental costs. So, it is possible to earn higher incomes than non-owner.

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Cropping pattern

The main cultivation practice in Brebes District is monoculture and there are no farmers who practice the intercropping system or crop rotation due to the already fixed schedule for all year around and it is part of the common practice from generation to generation. The farmers involved, only plant one commodity that they deemed the most profitable, which is shallot. Even though, the intercropping system has numerous advantages over monoculture and potentially gives farmers higher benefits while avoiding possible risks (*Table 3*).

Table 3. *Types of shallot cultivation practice in Brebes District*

No	Cultivation practice	Total	Percentage (%)
1.	Monoculture	120	100
2.	Intercropping	0	0
Total		120	100

Many studies about the intercropping method of shallot discovered similar results in most farm households that cultivate shallot with this technique and simultaneously in crop rotation instead of monoculture as strategies to optimize income while maintaining soil fertility. Farmers expect other crops inter cropped with shallot to succeed and cover the chance of loss (Purnamadewi and Firdausi, 2018; Mahfudz et al., 2019; Sriyadi and Yekti, 2021).

Purnamadewi and Firdausi (2018) learned that in most cases, farmers plant shallots by intercropping and in rotation with other crops. Both on dryland and wetland. On dryland, shallot cultivation starts at the beginning of the rainy season. The cultivation happens once or twice, inter cropped with cabbage, chili, and ginger. In wetland areas, the cultivation starts after the paddy harvest while intercropping with cabbage and chili. Shallot harvest begins in about two months, while chili continues to grow and can be harvested continuously until its seventh month. Mahfudz et al. (2019) also discovered a practice of using other crops, for example, cucumber, as trap crops to divert the pests from shallots. These efforts aim to avoid the risk of crop failure (Sriyadi and Yekti, 2021).

Seedling and variety

Shallots reproduce by both vegetative and generative methods. Shallots can produce botanical seeds or true shallot seeds (TSS) for generative reproduction. Meanwhile, vegetative propagation of shallots is carried out using the tubers. Vegetative propagation is the most common way for Indonesian farmers to propagate plants (Solahudin et al., 2022).

Based on the results of interviews, the varieties of shallots planted was bulb form of Bima Brebes and Curuk varieties. The unit prices range between IDR 10,000-80,000 (USD 0.69-5.58) with the average of IDR 34,000 (USD 2.37). Meanwhile the quantity purchased by farmers varies from 100-1600 kg with the average of 396.29 kg. The seedlings costed farmers approximately IDR 13,588,812.5 in average or around USD 948.67.

Bima Brebes Shallot is one of the main varieties of shallot in Indonesia, while Bima Curuk variety is a local shallot variety originating from *Dukuh* Curug, Kedung bokor Village, Larangan Sub-district, Kudus District. Similar usage of the Bima shallot variety

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is found in Sigi Regency, Central Sulawesi. Rahayu et al. (2019) conducted a study that observed shallot cultivation by farmers in the lowlands of Dolo and Sigi Biromaru sub-districts which are among the centers of shallot production in Sigi District. Varieties of shallot used by farmers in these two sub-districts are Bima and Tajuk.

Seed variety is a crucial factor that contribute greatly toward yield volume and production efficiency. As Susanawati et al. (2018), researched about factors Influencing income of shallot farming in 3 districts in Java Indonesia namely, Cirebon, Brebes, and Nganjuk Districts. The study conclude that seed costs have the highest contribution to the total costs of shallot farming.

Nur et al. (2015) study further support such statement from their research on farmers in Central Sulawesi Province of Indonesia who grow a local variety of shallot called *Lembah Palu Shallot* or *Palu Fried Shallot* as one of the leading commodities potentially to be registered as a geographical indication of the associated area. Yet, several limitations as follows, low soil fertility, lack of water availability as well as infestation of pests and plant diseases play big parts in sub-optimal yields, way below its biotic potency (Christoporus et al., 2016; Lasmini et al., 2015; Saleh et al., 2018). These results conclude how significant seed varieties are used in shallot cultivation toward production outputs.

Irrigation

Natural capital includes resources such as the number of lands owned by farming households, total cultivation area (irrigated and non-irrigated), water source/reservoir, access for irrigation, and other uses including its availability (Purnamadewi and Firdausi, 2018).

The irrigation system used by 120 respondents taken in two sub-districts in Brebes District, namely Wanasari and Larangan consists of three types: rain-fed, well, and river water. A total of 2 farmers uses a rain-fed system, 90 farmers use river water irrigation with the help of diesel water pump to prevent water shortages, and the remaining 28 use well water irrigation because the land used is far from the river flow.

Approximately, around 95,000 m^2 from 379.650 m^2 total area and about 25% of farmers exposed to the possibility of yield loss caused by drought due to the distant location of farming area from irrigation system. It can reach around IDR 750,207,030 (USD 52,374.12) of profit loss from the production costs itself.

A number of researches gave similar results of irrigation system importance. Transforming and maximizing the growth of agricultural commodities requires investments and improvements of irrigated land expansion and the conveyance of irrigation water. Moreover, Improvement of irrigation infrastructure and on-farm water management will further help farmers achieve self-sufficiency and productivity (Khaliq and Boz, 2018; Stoyanova et al., 2018).

Pests and diseases

Basuki (2014) mentioned that the crucial problems faced by farmers in obtaining optimum shallot production, some of them are pests and diseases. Not to mention the limited capital for purchasing fertilizers and pesticides. Low productivity is the risk faced as well, in addition to harvest failure due to pests and diseases of plants (Purnamadewi and Firdausi, 2018; Astuti et al., 2020).

The results of this study show that the pests and plant diseases encountered by farmers in Brebes District were relatively similar. Farmers complain of hoppers, caterpillars,

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fleas, and grasshoppers that often disturb their cultivated plants. In addition to pests, there is a fungal disease due to stale water. Shallots plant does not require much water for their growth and it cause the water flow to be stagnant.

There are 3 types of pesticides recorded in the survey, such as insecticide, fungicide and herbicide that cost IDR 21,735,605 (USD 1,517.42) in total and IDR 181,130.04 (USD 12.64) in average. Insecticide cost around IDR 106,255.45 (USD 7.41) in average for each area and IDR 12,750,655 (USD 890.16) in total. While fungicide amount to IDR 7,353,550 (USD 513.37) in total and IDR 61,279.58 (USD 4.27) in average. The total of IDR 1,631,400 (USD 113.89) spent for herbicide or IDR 13,595 (USD 0.95) in average. The yield losses that caused by pests generally destroyed 100% of the total yields due to its severity, quick transmission and the close distance of one area with another that create a domino effect. Reaching USD 25,193,869.042 and 264,850 kg of yield losses in one planting season.

Average land area

According to Sari et al. (2021), land as a factor of production includes parts of the earth surface used for farming, housing, and natural wealth contained. Farmers in Brebes District have an average land area of 3,163.75 m^2 out of 379,650 m^2 in total. It signifies that the average land ownership owned by farmers is less than 1 ha and merely a quarter of a hectare or even less. Mandang et al. (2020) mentioned farming carried out by utilizing large land areas is used more often because it is efficient. However, researchers conducted several studies related to this with the results that farming with small land use has the same chance of production efficiency. The possibility of development in a small area has enough opportunity, if used optimally and intensively (*Table 4*).

Table 4. *Land area width for shallot farming in Brebes District*

No	Land area (m^2)	Total	Percentage (%)
1.	1,000	1	0.83
2.	1,200	1	0.83
3.	1,250	36	30
4.	1,500	1	0.83
5.	1,700	1	0.83
6.	1,750	2	1.67
7.	2,000	1	0.83
8.	2,500	36	30
9.	3,500	5	4.17
10.	3,750	7	5.83
11.	5,000	18	15
12.	6,250	1	0.83
13.	7,500	2	1.67
14.	8,750	1	0.83
15.	10,000	7	5.83
Total		120	100

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Planting season

The results of interviews with 120 respondents from two sub-districts in Brebes District, namely Wanasari District and Larangan District, show that farmers plant seedlings thrice a year and the most frequently used shallot planting season are June-August and November-January. It is due to the sufficient sun exposure and low rainfall that optimum for the growth of shallots in Brebes District.

The yield of shallots may vary between regions in terms of quality and amount of production. Each region has different varieties of shallots due to the need for farmers to adapt to climatic conditions, soil, and topography. The difference in planting time may cause the differences in growth and harvest time that ultimately caused the differences in the resulting production. As a result, the cultivation inevitably depends on weather and climate changes (Sriyadi and Yekti, 2021)

Sriyadi and Yekti (2021) give further example on farmers who plant shallots in the middle of the rainy season or around December with a high precipitation rate would be affected by low production output. On the contrary, farmers who plant shallots at the end of the rainy season with less rainfall intensity would produce a large number of productions.

Business analysis

The study analyses main aspects from economic factors such as, production costs (fixed costs and variable costs); production risks; revenue and profit; price risk; income and income risk. The resulted values are acquired through application of shown formulas above using *MS. Excel* software. These aim to indicate and estimate the feasibility of shallot farming as business which help to quantify and articulate the sought out information.

The average value of the depreciation cost of the equipment is IDR 476,284 (USD 33.25). The average value of miscellaneous expenses consisting of taxes, land, equipment rent, and transportation is IDR 2,197,133 (USD 153.38). The average total fixed costs incurred by farmers are IDR 2,673,417 (USD 186.63) (*Table 5*).

Table 5. *Average fixed cost of shallot farming production in Brebes District*

Details	**Fixed cost**	
Fixed fee	**IDR**	**USD**
a. Depreciation cost	476,284	33.25
b. Miscellaneous expenses	2,197,133	153.38
Average total cost	2,673,417	186.63

The average value of input costs for farming is IDR 16,810,017 (USD 1,173.55). The average value of labor costs consisting of workers within and outside the family is IDR 5,671,292 (USD 395.92). The average total variable costs incurred by farmers are IDR 22,481,309 (USD 1,569.48) (*Table 6*).

The results of primary data analysis suggest that farming costs consist of fixed and variable costs. The results show that the variable costs of 120 respondents are Rp. 2,687,007,505 (USD 187,587.79) with an average of IDR 22,391,729 (USD 1,536.23). The fixed cost of shallot farming in Brebes District is IDR 320,300,168 (USD 2,361.08)

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with an average of IDR 2,669,172 (USD 186.34). Meanwhile, the total cost incurred by shallot farmers in Brebes District is IDR 3,007,308,168 (USD 209,948.9) with an average value of IDR 25,006,901 (USD 1,745.8) (*Table 7*).

Table 6. *Average variable costs of shallot farming production in Brebes District*

Details	**Variable Cost**	
Variable cost	**IDR**	**USD**
a. Input cost	16,810,017	1,173.55
b. Labor costs	5,671,292	395.92
Average total cost	22,481,309	1,569.48

Table 7. *Frequency of fried shallot producers in Brebes District*

No	**Cost**	**Total**		**Average**	
		IDR	**USD**	**IDR**	**USD**
1.	Variable cost	2,687,007,505	187,587.79	22,391,729	1,536.23
2.	Fixed cost	320,300,168	2,361.08	2,669,172	186.34
	Total cost	3,007,308,168	209,948.9	25,006,901	1,745.8

Business success might depend on the amount of income and potential risks. Production costs incurred by producers can affect revenue risk. If the costs incurred are high, it will affect the income earned by producers. *Table 7* shows that the average shallot production by farmers in Brebes District is 2,207.083 kg. The standard deviation obtained is 1,769.2 with a variance of 3,130,222.514. Based on the calculation, the coefficient of variation obtained is 0.801%, and the lower price limit is negative IDR 1,331.4 (USD 0.09) so the farmers potentially losses. The coefficient of variation is 0.801, which implies that the production risk experienced by farmers is high (*Table 8*).

Table 8. *Production risk in shallot farming in Brebes District*

Description	**Value**
Average production (kg)	2,207.083
Standard deviation (V)	1,769.2
Variety (V2)	3,130,222.514
Coefficient of variation (CV)	0.801
Lower limit (L)	-1331.4

The total cost of production (TC) for all respondents is IDR 3,007,308,168 (USD 209,948.9) with an average of IDR 25,060,901 (USD 1,749.57). The total price of shallots per kilogram is Rp. 2,773,001 (USD 193.59) with an average of IDR 23,108 (USD 1.6). The total production of all respondents is 264,850 kg, with an average of 2,207.083 kg. The amount of revenue (TR) obtained by respondents in one production is IDR 5,867,501,800 (USD 409,627.32) and average revenue of IDR 48,895,848 (USD 3,413.56). The amount of income or profit (∏) obtained by the respondent in one

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production is IDR 2,860,193,632 (USD 199,678.41) and the average production is IDR 23,834,947 (USD 1,663.98) (*Table 9*).

Table 9. *Average production cost, revenue and income of shallot producers*

Description	Unit	Total		Average	
		IDR	USD	IDR	USD
Production cost (TC)	Rp	3,007,308,168	209,948.9	25,060,901	1,749.57
Price (P)	Rp/kg	2,773,001	193.59	23,108	1.6
Production (Q)	Kg	264,850		2,207.083	
Total revenue (TR)	Rp	5,867,501,800	409,627.32	48,895,848	3,413.56
Profit (∏)	Rp	2,860,193,632	199,678.41	23,834,947	1,663.98

The average selling price of shallots by farmers in Brebes District is IDR 23,108. (USD 1.61) Based on the calculation, the coefficient of variation obtained is 0.20, while the lower price limit is IDR 13,730.49 (USD 0.95) for the farmers to avoid losses. The coefficient of variation value of 0.20 implies that the price risk experienced by farmers is low (*Table 10*).

Table 10. *Price risk in shallot farming in Brebes District*

Description	Amount
Average price (Rp/Kg)	23,108
Standard deviation (V)	4,688.93
Variety (V2)	21,986,033.72
Coefficient of variation (CV)	0.20
Lower limit (L)	13,730.49

The average acceptance of shallots by farmers in Brebes District is IDR 48,895,848 (USD 3,413.56). Based on the calculation, the average value of the total cost is IDR 25,060,901 (USD 1,745.8). The average value of the income of shallot farmers in Brebes District is IDR 23,834,947 (USD 1,663.98) (*Table 11*).

Table 11. *Average income of shallot farming in Brebes District*

Description	Amount	
	IDR	USD
Average revenue (Rp)	48,895,848	3,413.56
Average total cost (Rp)	25,060,901	1,745.8
Average income (Rp)	23,834,947	1,663.98

The average income of the shallot business in Brebes District is IDR 23,834,947 (USD 1,663.98). The standard deviation value is 21,003,671.62. The coefficient of variation obtained is 0.88, and the lower price limit is negative IDR 18,172,396 (USD 1,268.67) so the farmers potentially losses (*Table 12*).

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Table 12. *Income risk in shallot farming in Brebes District*

Description	Amount
Average income (Ei)	23,834,947
Standard deviation (V)	21,003,671.62
Variety (V2)	441,154,221,333,297
Coefficient of variation (CV)	0.88
Lower limit (L)	-18,172,396

Conclusion

This study based on 120 shallot farmers in Brebes District as respondents with the average land area farmed is 3,163.75 m^2. The majority of these farmers are dominated by land owner that utilize monoculture cropping practice with planting season amounted to thrice a year, mainly start around June-August and November-January. The seed varieties used are Bima Brebes and Curuk that cost IDR 13,588,812.5 in average or around USD 948.67 per farmers for the average of 396.29 kg seedlings in one planting season. The sources for irrigation system used in the cultivation practice are rainfall, well, and river. Approximately, around 95,000 m2 or about 25% of farmers exposed to the possibility of yield loss caused by drought due to the distant location of farming area from irrigation system. It can reach around IDR 750,207,030 (USD 52,374.12) of profit loss. Pesticides that consist of insecticide, fungicide and herbicide cost IDR 21,735,605 (USD 1,517.42) in total. Leaf hoppers, caterpillars, fleas, and grasshoppers are the pests that destroying the yield in shallot cultivation, while the disease found is mainly from fungal infection. The yield losses estimated from pest infection reaching USD 25,193,869.042 and 264,850 kg of yield losses in one planting season.

Based on the result of production risk calculation, the coefficient of variation obtained is 0.801 %, and the lower price limit is negative IDR 1331.4 (USD 0.09) which mean that the farmers potentially losses and production risk experienced by farmers is high. On the other hand, the calculation of price risk showed the coefficient of variation obtained is 0.20, while the lower price limit is IDR 13,730.49 (USD 0.95) for the farmers to avoid losses and price risk experienced by farmers is low. The average income of the shallot business in Brebes District is IDR 23,834,947 (USD 1,663.98) with the coefficient of variation obtained is 0.88, and the lower price limit is negative IDR 18,172,396 (USD 1,268.67) so the farmers potentially losses and face high income risk.

These results are best utilized for development of shallot cultivation in Brebes District, especially for government and farmers to implement a much more efficient measures and efforts to maintain the risk on the lower side so farmers can achieve efficiency on production and cost consequently. Consideration towards cropping pattern is needed, knowing how farmers heavily rely on one commodity all year around without crop rotation that might damage the sustainability of the farming practice and soil quality. Adequate irrigation system has been implanted for the majority of farmers with 25% of exception, it is best to develop the infrastructure further to demonstrate equality. In the term of pest and disease control, farmers utilize chemical substances that keep increasing in quantity due to pest resistance that built up after years of cultivation, application of alternatives method such as organic matters and natural predator can give a huge leap for the sustainability of shallot farming in the future.

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REFERENCES

[1] Astuti, L. T. W., Daryanto, A., Syaukat, Y., Daryanto, H. K. (2020): Efficiency analysis of shallot farmer in Brebes, Central Java. – International Journal of Research and Review 7(11): 551-558.
[2] Basuki, R. S. (2014): Problems identification and shallots farming analyze in the highland at rainy season in Majalengka District. – Journal of Horticulture 24(3): 266-275.
[3] BPS (2021): Statistik Hortikultura. – BPS-Statistics Indonesia. Catalogue: 5204003.
[4] BPS (2022): Distribusi Perdagangan Komoditas Bawang Merah di Indonesia 2022. – BPS-Statistics Indonesia. Catalogue: 8201018.
[5] BPS (2022): Indikator Pasar Tenaga Kerja Indonesia Februari 2022. – BPS-Statistics Indonesia. Catalogue: 2302004.
[6] Christoporus, C., Mustabjad, M. M., Hanani, N., Syafrial, S. (2016): Using production input and productivity of local shallot with the implementation of Good Agriculture practices in Donggala, Indonesia. – Rjoas 57(9): 33-40.
[7] Haryati, N., Rayesa, N. F., Faizal, F., Fanani, M. A. (2022): Risk analysis of shallot upstream supply chain in Malang during COVID-19 pandemic. – IOP Conference Series: Earth and Environmental Science (1063) 012034.
[8] Khaliq, A. J. A., Boz, I. (2018): The role of agriculture in the economy of Afghanistan. – 2nd International Conference on Food and Agricultural Economics, April 27-28, 2018, Alanya, Turkey, pp. 192-198.
[9] Kusumaningrum, S. A. (2019): Pemanfaatan Sektor Pertanian ebagai Penunjang Pertumbuhan Perekonomian Indonesia. – Jurnal Transaksi 11(1): 80-89.
[10] Lasmini, S. A., Kusuma, Z., Santoso, M., Abadi, A. L. (2015): Application of organic and inorganic fertilizer improving the quantity and quality of shallot yield on dry land. – IJSTR 4(4): 243-246.
[11] Mahfudz, M., Saleh, S., Antara, M., Anshary, A., Bachri, S., Made, U., Hasanah, U., Rauf, R. A. (2019): Adoption and advantages of eco-friendly technology application at the Shallot farming system in Indonesia. – Agronomy Research 17(4): 1679-1687.
[12] Mandang, M., Sondakh, M. F. L., Laoh, O. E. H. (2020): Karakteristik petani berlahan sempit di Desa Tolok Kecamatan Tompaso. – Agri-Sosioekonomi 16(1): 105-114.
[13] Nur, A., Burhamzah, O. D., Paserangi, H. (2015): The protection of the legal indication of the geographical of Palu Fried Onions. – Analisis 4(2): 179-187.
[14] Nurhapsa (2013): Technical efficiency analysis and farmer risk behavior as well as its effects on the superior variety application in potato farming in Enrekang Regency, South Sulawesi Province. – Dissertation, Bogor Agriculture University.
[15] Oktinafuri, D., Sudrajat (2016): Pengaruh status kepemilikan lahan sawah terhadap. – Jurnal Geografi Dan Ilmu Lingkungan 1(1): 1-6.
[16] PDSIP (2020): Outlook Bawang Merah 2020. – Ministry of Agriculture, ISSN: 1907-1507.
[17] PDSIP (2021): Buku Buletin Konsumsi Pangan Semester I 2021. – Ministry of Agriculture 12(01).
[18] Purnamadewi, Y. L., Firdaus, M. (2018): Analysis of income determinants among farm households in the upland shallot production center in Malang District, Indonesia. – 2nd International Conference on Food and Agricultural Economics, April 27-28, 2018, Alanya, Turkey, pp. 68-78.
[19] Rahayu, E. S. P., Muchtar, Saidah. (2019): The feasibility and farmer perception of true shallot seed technology in Sigi District, Central Sulawesi, Indonesia. – Asian Journal of Agriculture 3(1): 16-21.
[20] Saleh, S., Anshary, A., Made, U. (2018): Integrated management of leaf miners Liriomyza spp. (Diptera: Agromyzidae) on shallot crops by trap cropping system and arbuscular mycorrhizae. – Journal of Biopest 11(2): 114-120.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
DOI: http://dx.doi.org/10.15666/aeer/2103_26252640

[21] Saptana, G. E., Perwita, A. D., Sukmaya, S. G., Darwis, V., Ariningsih, E., Ashari (2021): The competitiveness analysis of shallot in Indonesia: a policy analysis matrix. – PLoS ONE 16(9): e0256832.
[22] Sari, L. R., Raikhani, A., Susilo (2021): Pengaruh luas lahan, biaya produksi dan harga pasar terhadap peningkatan pendapatan petani bawang merah. – Journal of Public Power 1(1): 500-506.
[23] Soekartawi (1994): Farming Analysis. – PT Raja Grafindo Persada, Indonesia, Jakarta.
[24] Solahudin, M., Sucahyo, L., Amarilis, S., Purnamasari, L. A. (2022): Techno-economy analysis of shallot seedling production form TSS (true shallot seed) with LCAC (low cost aeroponic chamber) technology. – IOP Conference Series: Earth and Environmental Science 1038: 012012.
[25] Sriyadi, Yekti, A. (2021): Farmers' behavior towards risks of shallot farming: a case study in Kalisoro village, Tawangmangu district, Karanganyar regency, Central Java. – E3S Web of Conferences 316: 02043.
[26] Stoyanova, A., Veleva, P., Valkova, E., Pevicharova, G., Georgiev, M., Valchev, N. (2018): Dry matter content and organic acids in tomatoes, greenhouse grown under different manuring and irrigation modes. – 2nd International Conference on Food and Agricultural Economics, April 27-28, 2018, Alanya, Turkey, pp. 257-265.
[27] Susanawati, Jamhari, Masyhuri, Darwanto, D. H. (2018): Factors influencing income of shallot farming in Java Indonesia using UOP profit function model. – Advances in Engineering Research 172: 68-74.
[28] Zang, P. (2018): Management and control of implicit cost in enterprise. – International Journal of Science 5(6): 214-217.

http://www.aloki.hu ● ISSN 1589 1623 (Print) ● ISSN 1785 0037 (Online)
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