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The adoption behaviour and its influenced factors of true shallot seed technology in Central Java

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The adoption behaviour and its influenced factors of true shallot seed technology in Central Java

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Abstract. True shallot seed (TSS) technology is one of the way to increase shallots productivity. Its ability to produce high amount of onion requires a willingness to carry out good cultivation practices. This study was aimed to analyze the behavior of adoption of TSS technology and to analysis factors that influence the behavior of farmers adoption. The research was carried out in two regions, namely Wanasari District, Brebes Regency and Klambu District, Grobogan Regency which were the centers of shallot production. One hundred respondents were chosen with 50 farmers in each region. The data were analyzed using descriptive method and multiple regression. The result showed that the adoption rate of TSS technology in Wanasari District was higher than in Klambu District. The farmers age, education level, land acreage, farmers income, number of families, land status, and regions were significantly influence the farmers behavior in adopting TSS technology.

1. Introduction

Shallot is one vegetable which has high economic value. This commodity was categorized as developed successfully in 2017 [1]. Traditional shallot production was based from seed bulbs grown. The government has been carryout various new innovations in accordance to increase shallot productivity, such as seed technology originated from True Shallot Seed (TSS). This technology is developed for the solution of seed source demand to meet the seed quality requirement [2].

The advantages of TSS compared to those grown from tubers are low virus and diseases transmission through seeds, higher productivity than seed bulb cultivars, and low production costs [3], more profitable [4] and TSS distribution process is easier and cheaper [5]. Although the use of TSS as a seed source has a feasibility in technical and economical point of view [3, 4, 5], as well as able to increase the yield twice compared to the use of conventional seed bulbs [6], however the main obstacle to its development the disseminated of using TSS to the farmers.

Adoption is a process of behaviour change in the form of knowledge (cognitive), attitude (affective) and skills (psychomotor) of a person [7]. Previous studies have been carried out to know the adoption of new varieties in rice technology, patterns of cooperation, perception, and management of Integrated Crops of paddy rice [8, 9, 10]. Other studies also reported on the technology adoption related to farmer attitudes and farmer activity in counselling [11], age, education, credit, access to markets [12], knowledge [13]; [14]. The adoption rate is determined by the characteristics of farmers [15]. While the results of [16] show the level of knowledge of farmers (capital), farmers' knowledge and the experience, influence the level of technology adoption. Further, effective extension services

significantly influence both adoption and level of adoption [17]. However, the results of [18] stated that farmers' decisions in adopting technology are more influenced by the availability of such technology inputs.

Adoption of new technologies in farmers is determined by the needs and suitability of technology with biophysical, socio-cultural conditions, and location specifics. Previous study [19] reported that the behaviour of adopting shallot technology in Bantul was influenced by communication, motivation, and education. According to the previous facts, the purpose of this study was to analyse the behaviour of TSS technology adoption and the factors that influence farmers' decisions in adopting TSS technology.

2. Methods

Cross-sectional primary data were collected through a semi-structured questionnaire given to 100 shallot farmers from Wanasari District, Brebes Regency and Klambu District, Grobogan District, in Central Java. The validity and reliability of data collection instruments have been tested previously. Primary data is complemented by interviews, focus group discussions and secondary data from the Central Java Agriculture and Forestry Service, the Indonesian Ministry of Agriculture and the Central Bureau of Statistics.

This study uses a multi-stage random sampling method. First, districts that are conducive to agriculture are deliberately chosen based on data from two research areas which are the centre of onion production. Second, from each district, 5 villages were chosen deliberately as villages that had been introduced by TSS technology. Third, ten farmers were selected with sampling quota from each village. The villages from Wanasari District were Wanasari, Siasem, Sisalam, Kupu and Sidamulya and villages from Klambu District were Kandangrejo, Taruman, Klambu, Terkesi, and Jenengan.

To determine the value of adoption behaviour based on the level of adoption of farmers in TSS technology components. These components include seed use and land preparation, which consists of fungicide treatment in TSS, nursery preparation. The planting technique includes setting the distance between the bed, making the shade house, closing the seedlings. Plant maintenance includes balanced fertilization, balanced watering, weed control, pest and disease control according to the dosage and type of plant-disturbing organisms. The behaviour of TSS technology adoption was analysed based on twelve statements related to TSS technology components to gather information on knowledge, attitudes, skills and perceptions of onion farmers using scores. Scores are classified into 3 classes, namely low (0 - 39.99%), moderate (40-79.99%), high (80-100%).

Factors that influence the level technology adoption TSS in Central Java were analysed using multiple linear regression according to the following formula:

$$Y = a + b_1land + b_2age + b_3edu + b_4expr + b_5inc + b_6fm + b_7pf + b_8D_1lts + b_9D_2area + e$$

Where : Y is a level technology adoption of TSS (score); a as constant; b_1-b_7 as coefficient model; land as land acreage (ha); age as level of age (years); edu as level of education (years); expr as farm experience (years); inc as farmer income (IDR/season); fm as family member; PF as farmers' perception ; D_1lts as dummy land tenure status and D_2area as dummy research area (1 = Wanasari District and 0= Klambu District); and e as error term.

3. Results and discussions

In terms of socio-economic characteristics, the results in Table 1 show that in the two research areas most respondents were aged at 35-50 years that are 58% in Wanasari and 54% in Klambu. They mostly have low education level (primary school) and have a family member of around 3-5 people. Farming costs mostly rely on loan from cooperatives or farmer groups.

Table 1. The Respondent socio-economic characteristic

Category	Wanasari (n=50)		Klambu (n=50)	
	Frequency (%)	Average ± Std	Frequency (%)	Average ± Std
Age structure				
Below 35 years	5 (10)	46.36 ± 8.28	8 (16)	48.04 ± 9.98
36-50	29 (58)		27 (54)	
50 years and above	16 (32)		15 (30)	
Educational level				
Primary school (PS)	19 (38)	SS	30 (60)	PS
Secondary school (SS)	15 (30)		13 (26)	
High school (HS)	12 (24)		5 (5)	
Academic/university (A/U)	4 (8)		2 (4)	
Family size				
< 3 members	19 (38)	3.5 ± 1.15	15 (30)	3.22 ± 1.22
3-4 members	23 (46)		28 (56)	
> 4 members	8 (16)		7 (14)	
Experience in farming				
< 10 years	5 (10)	22.48 ± 5.56	8 (16)	19.22 ± 7.87
10-15 years	10 (20)		7 (14)	
16-20 years	11 (22)		7 (14)	
21-25 years	8 (16)		13(26)	
> 25years	16 (31)		15(30)	
Credits sources				
No credit	21 (42)		30 (60)	
Relatives	2 (4)		4 (8)	
Cooperation/farmer group	25 (50)		16 (32)	
Banks	2 (4)		-	
Sources of Information				
Formal sources	46 (92)		32 (64)	
Relationship	4 (8)		18 (36)	

Note: Signs in parentheses specify percentages

3.1. Adoption behaviour

The distribution of respondents' behaviour towards TSS innovations shown in Table 2. Both areas were categorized in high for the TSS technology adoption.

Table 2. TSS Technology Adoption Behaviour

Aspects	Wanasari (%)			Klambu (%)		
	High	Moderate	Low	High	Moderate	Low
Knowledge	84	16	0	86	14	0
Attitude	24	64	12	18	72	10
Skills	90	10	0	88	12	0
Behaviour	66	30	4	64	32.7	3.3

On average, the knowledge possessed by the onion farmers was high, because there was routine, at least once a month, group meetings which discussing many matters related to the farming issues. The attitude of farmers related to TSS was in moderate category. Its could be explained due to farmers were assumed that the cultivation process is a little more complicated than the treatment using tubers. This due to the farmer also have to go through the nursery stage then the seeds were transferred to the cultivation land. These activities requires more time and energy, also requires a longer harvest period than tuber seeds. The TSS cultivation is expensive, require more money, at the start of implementation, but it will provide higher return compared to the shallots from tubers when harvested.

Table 3. Score Level of Adoption of TSS Technology components

No	Component	Klambu	Wanasari
		(n=50)	
1	Land preparation and tillage	5	5
2	Seed handling	4.70	4.80
3	Planting Techniques	3.07	3.23
4	Plant Maintenance	4.22	4.64
5	Harvest	4.80	4.85
	Average	4.36	4.50

3.2. The determinant factors of farmers adopting TSS technology

The multiple regression model shows that the relative independent variables explain the factors that were influenced the adoption of TSS technology. The multiple regression model shows all estimator variables simultaneously at the 99% level. There are six independent variables that significantly influence farmers in adopting TSS, namely age, land area, income, number of families, the status of land and area of application of TSS technology. Meanwhile, the level of education, farming experience and participation in the group did not show a real influence on the adoption of TSS technology. The results of the analysis with multiple regression models were presented in Table 4.

Table 4. Factors affecting the adoption of TSS technology

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	1.567620	0.372385	4.209672	0.0001 **
Age	-0.018159	0.005050	-3.595879	0.0005 **
Education	0.014919	0.036360	0.410305	0.6826
Experience farming	0.005767	0.007352	0.784482	0.4348
Land acreage	0.105306	0.047659	2.209569	0.0297 *
Income	-2.55E-05	1.20E-05	-2.130353	0.0359 *
Family member	-0.151940	0.029172	-5.208401	0.0000 **
Land status	0.215722	0.051653	4.176393	0.0001 **
Perception of farmer	-0.088190	0.054697	-1.612324	0.1104
Dummy Area	-0.286259	0.072334	-3.957453	0.0002 **
R-squared	0.570677			
Adjusted R-squared	0.527745			
F-statistic	13.29250			0.0000*

Note: *, and ** indicate significance at the 5% and 1% level, respectively.

4. Conclusion

The level of TSS technology adoption in this study was high category that is 66% in Wanasari and 64% in Klambu. Factors of age, education, farming experience, the land area controlled, farmer's income, number of families, farmers' perception, land status, and location simultaneously have a significant effect to the TSS technology adoption. Partially, the factors that influence the adoption of TSS technology are age, land area, farmers' income, number of families, land status, location.

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