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Farmer's perception of True Seed Shallot production

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1. Introduction

To find out what the current knowledge of farmers and their attitudes towards True Shallot Seed (TSS), a case study was held in Cirebon and Brebes.

In the last decades TSS varieties have been bred and are ready for introduction to farmers and markets. True Shallot Seed cultivation is a shallot production technique that does not start with vegetative bulbs obtained either from a previous commercial production field or from a specialized plant material production field, but from seeds. Farmers can opt to start with the seed and raise seedlings themselves or use it as direct sowing. Alternatively they could choose to buy the seedlings from a professional farmer or seedling grower. Nevertheless the TSS technique means that farmers have to get used to a different cultivation technique which might slow down its dissemination. Investment requirement for TSS might be different from the traditional shallot cultivation where bulbs for the next planting season can be saved from harvest without any cash involvement. In the meantime, other inputs to grow TSS might also be needed too. Moreover, lack of knowledge might become a limiting factor for TSS adoption at the farmers' level.

The aim of the study was to assess farmers' perceptions to TSS innovation attributes and farmers' attitudes towards TSS cultivation.

2. Materials and methods

A case study research method was employed to explore farmers' attitudes towards the use of TSS in shallot cultivation. Three farmers from Cirebon, West Java and five farmers from Brebes, Central Java were involved in on-farm participatory research of cultivating three TSS varieties in their own fields (side by side with their bulb-seed crop). This study was carried out in the fall of 2019.

After harvesting their TSS crop, each farmer was interviewed by using a structured questionnaire. A total of 103 sets of statements were collected to cover most of the area related to factors that might influence farmers' attitudes towards TSS cultivation. A step-by-step procedure of Likert's summated ratings was followed to develop a standardized attitude scale. Each farmer was asked to respond to each item according to their perceived attitude intensity towards the items on five point continuum (for example: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; and 5 = strongly agree).

3. Results

In average, the respondents are of medium age with the youngest farmer being 28 and the oldest one is 61 years old (Table 1). Most of them only attended and finished primary school. The farms are mostly operated by the farmer himself with some helps from other household members. The farm holding size is quite small averaging of 3650 m².

Table 1 General data interviewed farmers who took also part in testing TSS varieties.

	mean	frequency		Min	Max
		Yes	No		
Age	44.5			28	61
Education level					
Primary		5			
Secondary		2			
College		1			
Land size (m2)	3650			1600	10000
Number of household members	4			3	5
Household members involved in farm besides the farmer:					
no others		2			
1 other person		6			
Member of a farmer group		6	2		
Participated in training or extension on shallot		8	0		
Participated in training or extension on TSS		6	2		
Experience with shallot crops (year)	13.5			3	38
Experience with TSS		8	0		
How many times TSS tried?					
1x		7			
4x		1			

Table 2 indicates that four out of eight farmers agree that shallot is a profitable crop. However, since the mean of 3.4 is closer to neutral, this may imply that farmers are actually quite uncertain about the profitability of shallot. Similarly, farmers also seem to be uncertain about higher probability of getting profit since only three out of eight farmers are in agreement and the mean score is just 3.3. The uncertainty may be partly explained by their opinion suggesting that the loss risk of cultivating shallot is higher compared to other vegetable crops. Farmers are motivated to cultivate shallot because it suits their expertise and capital endowment. They are also driven to cultivate shallot because it can be grown multiple times in a year and they can save seeds for the next planting. It is interesting to note that the possibility of getting higher yield seems to be considered less important in motivating them to grow shallot. Even though the price of shallot is perceived to be less stable compared to other crops, farmers are still motivated to grow shallot because of habit and social pressures. Six out of eight farmers are in agreement that growing shallot is quite reliable for maintaining and improving family welfare.

Table 2 motivation to grow shallot

Statement: I grow or would like to grow shallot because.....	mean	frequency				
		1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree
1 Profitable crop	3.4	0	1	3	4	0
2 Higher probability of getting profits than experiencing loss	3.3	0	1	4	3	0
3 The loss risk is lower compared to other vegetable crops	2.4	2	3	1	2	0
4 Shallot can be grown 3-4 times a year in the same parcel of land.	4.6	0	0	0	3	5
5 Shallot cultivation suits my expertise	4.8	0	0	0	2	6
6 Shallot cultivation costs are still within my capital availability	4.5	0	0	0	4	4
7 Shallot is a habitual practice for most farmers in the area	4.6	0	0	0	3	5
8 Following the neighbouring farmers that mostly grow shallot	4.4	0	0	0	5	3
9 With shallot save seeds for next planting season	4.3	0	0	2	2	4
10 The price of shallot is relatively more stable compared to other vegetable crops in the area	1.5	4	4	0	0	0
11 The shallot crop is quite reliable for maintaining and improving family welfare	3.8	0	0	2	6	0

In Table 3, all farmers perceive that pesticide and labor availability are never become restrictions in cultivating TSS. Most farmers suggest that the seed is rarely an obstacle in growing TSS since they are aware that it is already commercially available in the market (especially, Sanren and Maserati). As tenant farmers, the land availability can be sometimes a constraint if they do not acquire the rented parcel long before the time of planting. Meanwhile, farmers indicate that fertilizer may often become a constraint because during the survey period they are experiencing difficulty to obtain subsidized fertilizers. Farmers prefer to use subsidized fertilizers because they are much cheaper than the non-subsidized ones.

Table 3 Rating of perceived resource constraints for producing TSS by the farmers.

Statement: TSS is not easy to implement due to.....	mean	frequency				
		1 never	2 rarely	3 sometime	4 often	5 always
12 Seed availability	1.9	3	3	2	0	0
13 Fertiliser availability	3.6	0	0	3	5	0
14 Pesticide availability	1.0	8	0	0	0	0
15 Labour availability	1.0	8	0	0	0	0
16 Land availability	2.5	2	1	4	1	0

As compared to traditional shallot production, most farmers agree that TSS production is more profitable and less seed costly (Table 4). Farmers also consider TSS production more prestigious probably because not many farmers practice or adopt this innovation yet. However, more farmers seem to disagree that TSS production is less costly, less risky and less need for pesticide and labor. Meanwhile, in terms of providing better cash-flow, most farmers perceive TSS production as neutral.

Table 4 *Rating of perceived benefits in producing TSS by the farmers.*

Statement: TSS is...../ or has ...		mean	frequency				
			1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree
17	More profitable	3.3	0	3	0	5	0
18	Less costly	2.6	0	4	3	1	0
19	Lower seed costs	3.6	0	2	0	5	1
20	Less pesticides required	3.0	0	1	6	1	0
21	Less labour required	2.4	0	5	2	0	0
22	Lower crop failure risk	2.5	0	4	4	0	0
23	More prestigious	4.6	0	0	0	3	5
24	Better cash flow	3.1	0	1	6	0	1

Table 5 suggests that most farmers seem to be in agreement with all aspects of TSS production compatibility. To a certain extend farmers even perceive that the use of TSS can solve some issues of excessive use and misuse of chemicals.

Table 5 *Rating of compatibility producing by the farmers.*

Statement:		mean	frequency				
			1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree
25	TSS cultural practice is similar or comparable with shallot cultivation using bulb seeds	4.0	0	1	0	5	2
26	TSS technology is compatible with farmers' demand or needs	3.8	0	1	1	5	1
27	TSS technology is compatible to answer the productivity/yield problem	4.0	0	1	0	5	2
28	TSS technology is compatible with the effort of answering fertilizer and pesticide excessive use problems	3.4	0	2	2	3	1
29	TSS technology is compatible with local yearly cropping pattern	4.1	0	0	0	7	1
30	TSS technology is compatible with local social/cultural values	4.8	0	0	0	2	6

Most farmers perceive that TSS technology is easily understood, not complicated, and not difficult to be learned (Table 6). More than half of farmers are in agreement with the three statements that have been asked (31, 32 and 34). However, farmers seem to be quite skeptical when asked to respond to if TSS cultivation is more practical than bulb-seed cultivation. In other words, comparing to the traditional shallot practices with bulbs farmers are not yet fully convinced that TSS is more practical. Overall, farmers perceive that TSS cultivation is no more complex than the traditional shallot production technique.

Table 6 Perceived complexity of grasping TSS technology.

Statement:	mean	frequency				
		1	2	3	4	5
		strongly disagree	disagree	neutral	agree	strongly agree
31 TSS technology is easily understood as well as shallot cultivation using bulb seeds	3.6	0	1	1	6	0
32 As in shallot cultivation using bulb seed, TSS cultivation is not complicated	3.5	0	1	2	5	0
33 TSS cultivation is more practical than bulb seeds cultivation	3.1	0	1	4	2	0
34 Learning about TSS cultivation is not difficult	3.8	0	1	0	7	0

Before adopting TSS most farmers prefer that they will have the opportunity to try it in small scale trials or demonstrations (Table 7). Perceptions regarding access to information and seeds have made farmers are not feeling constrained by the possibility of trying out TSS technology.

Table 7 Prerequisites to start with TSS.

Statement:	mean	frequency				
		1	2	3	4	5
		strongly disagree	disagree	neutral	agree	strongly agree
35 Before adopting TSS, farmers should carry out trials	4.8	0	0	0	2	6
36 TSS information is easily obtained by farmers & can be tried on a small scale	3.9	0	1	2	2	3
37 Availability of TSS seeds is not a problem and it can be tried at any time	3.4	0	2	2	3	1
38 TSS technical complexity is low so that it can be tried on a small scale without any help	2.6	0	5	1	2	0

In terms of learning how to grow TSS, farmers agree with the statements that they can learn from observing results at colleagues and share the gained knowledge to others (Table 8). Overall, the observability aspects of TSS innovation are perceived to be positive by farmers.

Table 8 *Farmer's preference on how to learn producing TSS.*

Statement:	mean	frequency				
		1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree
39 Results and benefits of TSS innovation are easily observed by prospective users	3.5	0	2	1	4	1
40 TSS technology is easily emulated or replicated by users	3.4	0	1	3	4	0
41 Observation from TSS demo-plot and increased knowledge from attending TSS extension are easily passed on to other farmers	3.5	0	1	2	5	0

Even though, TSS is perceived as a new technology for farmers, but they are quite open and eager to learn more since it is positively perceived as prospective (Table 9). Farmers perceive that TSS cultivation is similar to bulb-seed cultivation and it may provide higher yield and better bulb quality. Farmers also consider that TSS cultivation is more profitable even though this perception may slightly contradict their opinions that the use of TSS tends to be more costly and riskier in terms of pest/disease attacks.

Table 9 *Attitude of farmers towards the cultivation of TSS.*

Statement:	mean	frequency				
		1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree
42 I am open to new knowledge/information about shallot cultivation	4.5	0	0	0	4	4
43 TSS cultivation is a new thing for me	4.5	0	0	0	4	4
44 I want to learn more about TSS cultivation	4.6	0	0	1	1	6
45 I have positive impression regarding the prospect of TSS	4.1	0	0	1	5	2
46 I understand that TSS cultivation can be carried out through seedling transplanting or direct seeding	4.5	0	0	0	4	4
47 TSS cultivation is similar to bulb-seed cultivation	3.6	0	3	5	0	0
48 TSS cultivation needs longer time to be harvested (compared to bulb-seeds)	4.4	0	0	0	5	3
49 When using TSS, I am expecting to buy seedlings from seedling growers	3.5	0	2	2	2	2
50 In my opinion, production cost of TSS is lower than bulb-seeds	2.9	0	2	5	1	0
51 In my opinion, yield of TSS is higher than bulb-seeds	3.9	0	1	0	6	1
52 In my opinion, the bulb quality resulted from TSS cultivation is better than that of bulb-seeds	4.8	0	0	0	2	6
53 In my opinion, TSS cultivation is more profitable than bulb-seed cultivation	3.6	0	1	2	4	1
54 In my opinion, harvested TSS can be marketed as easy as harvested bulb-seed	3.9	0	0	1	7	0
55 The risk of crop failure because of pest and disease attacks is lower in TSS compared to bulb-seed	2.8	0	2	6	0	0

In terms of social pressure, farmers tend to perceive as neutral. They do not experience pressures for adopting TSS from either research/extension nor from their peers (Table 10).

Table 10 Normative belief regarding perceived pressure to adopt TSS.

Statement:	mean	frequency				
		1	2	3	4	5
56 Researchers/extension workers think that I should adopt TSS	2.9	0	3	3	2	0
57 My fellow farmers think that I should adopt TSS	3.4	0	0	5	3	0

In table 11 the responses per scale rating are presented for statements 58 till 64.

Table 11 Description for rating used for statements 58-64.

Description					
Frequency scale:	(58)	(59)	(60) & (64)	(61)	(62) & (63)
1	Very difficult	Very bad	Very unlikely	Strongly disagree	Completely false
2	Difficult	Bad	Unlikely	Disagree	Somewhat false
3	Neutral	Neutral	Neutral	Neutral	Neutral
4	Easy	Good	Likely	Agree	Somewhat true
5	Very easy	Very good	Very likely	Strongly agree	Completely true

Farmers are convinced that they can adopt TSS (statement 58), is good for them (statement 59) and that the decision is theirs (statement 61)(Table 13). They also responded in a positive way that they intend to and could adopt TSS.

Table 12 Perceived control behavior, subjective norms, attitude and intention towards TSS technology.

Statement:	mean	frequency				
		1	2	3	4	5
58 For me, adopting TSS is (easy/difficult)	3.3	0	2	2	4	0
59 For me, adopting TSS is a thing	3.8	0	0	2	6	0
60 I have a plan to adopt TSS	4.0	0	1	0	5	2
61 The decision to adopt TSS is mostly up to me	4.0	0	0	1	6	1
62 Most farmers close to me have adopted TSS	2.8	0	2	6	0	0
63 I am sure if I "want", I can adopt TSS	4.0	0	0	1	6	1
64 I intend to adopt a new technology of TSS	4.0	0	0	1	6	1

When adopting TSS farmers also perceive that they will be more knowledgeable on shallot cultivation, more successful in agribusiness and having more contacts with experts for obtaining better and more complete information, especially regarding shallot farming in general (Table 13). Other than that, farmers also expect that they will become more GAP orientated and able to supply GAP produced shallots.

Table 13 Perceived control behavior towards TSS adoption.

Statement: Adopting TSS will help/give me....	mean	frequency				
		1	2	3	4	5
		Very unlikely	Unlikely	Neutral	Likely	Very likely
65 to have better understanding of shallot cultivation in general	4.1	0	0	0	7	1
66 the success of my agribusiness and increase the profitability of shallot farming	3.8	0	0	3	4	1
67 give me a chance to interact more with researchers/extension workers/other farmers	4.6	0	0	0	3	5
68 to develop GAP habit	4.0	0	0	0	8	0
69 to obtain better information and explanation regarding shallot farming in general	4.0	0	0	0	8	0

Most farmers are quite positive in relation to accepting possible changes as consequences of adopting TSS (Table 14). Even when in case that TSS could lead to a crop failure, they are still willing to take the risk. However, in most cases farmers are actually expecting that adopting TSS would lead to positive changes and not to negative changes.

Table 14

Statement: I'm ready to accept chances in	mean	frequency				
		1	2	3	4	5
Readiness:		Extremely NOT	NOT	Neutral	YES	Extremely YES
70 crop failure when adopting TSS	4.0	0	0	1	6	1
71 yield (increase or decrease) when adopting TSS	4.0	0	0	1	6	1
72 product quality when adopting TSS	4.0	0	0	1	6	1
73 quantity used and cost of seeds when adopting TSS	4.1	0	0	1	5	2
74 quantity used and cost of fertilizers when adopting TSS	4.1	0	0	1	5	2
75 quantity used and cost of pesticides when adopting TSS	4.1	0	0	1	5	2
76 quantity used and cost of labours when adopting TSS	4.0	0	0	1	6	1
77 harvesting time when adopting TSS	4.1	0	0	2	3	3
78 cultural practices when adopting TSS	4.0	0	0	1	6	1
79 farm profitability when adopting TSS	3.9	0	0	1	7	0

Most farmers seem to be not active in collecting information regarding TSS cultivation. Other than farmers' hesitance or unwillingness or they are much occupied in taking care of the bulb-seed cultivation (traditional), the availability of information regarding TSS as a new technology may probably still scarce or not easily accessible (Table 15). Half of the farmers even have occasionally tried out TSS.

Table 15 *Farmers' efforts to learn more about TSS.*

Statement: How often do you.....	mean	Frequency per response				
		1	2	3	4	5
		Never	Seldom	Some times	Frequent	Always / Very frequent
80 look for information on TSS?	3	0	1	4	3	0
81 attend TSS extension program or TSS demo-plot?	3	1	1	4	2	0
82 discuss TSS with other farmers or groups?	3	2	1	4	1	0
83 try to cultivate TSS in small-scale?	3	1	2	4	1	0
84 grow shallot by using TSS?	2	2	2	3	1	0

In most cases, farmers seem to have quite neutral opinion regarding TSS extension or dissemination activities (Table 16). Nonetheless, they do agree with the statement that researchers and instructors are knowledgeable and do know how to grow TSS. From another perspective, farmers are also open to other farmers' opinion and are willing to listen. Furthermore farmers are willing to attend TSS extension and dissemination, since these activities are expecting to be helpful for them in mastering their TSS technique.

Table 16 *Farmers' attitudes towards TSS extension or dissemination activities.*

Statement:	mean	frequency				
		1	2	3	4	5
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
85 I think TSS extension activities and technical guidance are very beneficial	3.4	0	0	5	3	0
86 I wish I can invite other farmers to TSS extension or technical guidance activities	3.5	0	0	4	4	0
87 Attending TSS extension or technical guidance activities is not time-consuming and do not disrupt my farming activities	3.5	0	0	4	4	0
88 The location in which TSS extension or technical guidance activities held is comfortable and conducive	3.5	0	0	4	4	0
89 Interactions among farmers participated in TSS extension or technical guidance activities are very good	3.5	0	0	4	4	0
90 Farmers are actively participated in TSS extension or technical guidance activities	3.5	0	0	4	4	0
91 Material/explanation provided during TSS extension or technical guidance activities is complete and comprehensive	3.9	0	0	3	3	2
92 Material/explanation provided during TSS extension or technical guidance activities is clear and easily understood.	3.8	0	0	4	2	1
93 Equipment and facilities provided during TSS extension or technical guidance activities are good	3.9	0	0	3	3	2
94 I will be willing to be present in the next/similar TSS extension or technical guidance activities	3.9	0	0	2	5	1
95 Overall I am satisfied with the TSS extension or technical guidance activities	3.4	0	2	3	1	2
96 Researchers/instructors master and have broad insights regarding TSS technology	3.9	0	0	1	7	0
97 Researcher/instructors listen and respond to my opinion during the discussion	3.9	0	0	1	7	0
98 During the extension activities, there was no interference that can distract participants from the material provided	3.5	0	0	4	4	0
99 I am satisfied with the time allocation of TSS dissemination/extension	3.6	0	0	3	5	0
100 TSS extension or technical guidance activities have driven me to improve the usual shallot cultivation	3.6	0	0	3	5	0
101 TSS extension or technical guidance activities increase my knowledge to improve vegetable cultivation in general	3.9	0	0	1	7	0
102 TSS extension or technical guidance activities help me to find alternative technology that can improve my shallot (vegetable) cultivation techniques	3.9	0	0	1	7	0
103 TSS extension or technical guidance activities give me the opportunity to improve my skill in shallot cultivation	3.8	0	0	2	6	0

4. Conclusions

Overall, most farmers respond positively to the TSS innovation attributes (relative advantage, compatibility, complexity, trialability, and observability) which suggest a positive likability to TSS. Farmers are quite open and eager to learn more about TSS and they consider that TSS may provide higher yield and better bulb quality, hence more profitable. However, on the other hand, farmers also consider that TSS production costs are more expensive and more risky to pests and diseases damage.

Without any social pressures and based on their own decision, farmers seem to be convinced that they are capable of adopting TSS and accepting all of its consequences. However, it is not clear whether because of their unwillingness or information scarcity and inaccessibility that they are quite inactive in seeking and collecting information about TSS cultivation. In the meantime, farmers are willing to attend TSS extension/dissemination considering the expectation that their participation may help them to be successful in TSS cultivation. In general, farmers have positive attitudes towards TSS that may lead to an increased adoption rate of TSS.

The findings of this study cannot be generalized to shallot farmers population (statistical generalization) because of too limited samples (lack of representativeness), but they can be generalized to the theory (analytical generalization) of new technology adoption. In other words, the findings may contribute to expand knowledge of theoretical proposition and hypotheses in the adoption theory.