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vegIMPACTNL

Improving vegetable production and strengthening private sector development in Indonesia

The vegIMPACT NL program contributes to improved vegetable production and private sector development in Indonesia. The program builds on the results of previous joint Indonesian-Dutch horticultural cooperation projects, especially the vegIMPACT program (2012 – 2017). The program activities of vegIMPACT NL (2017-2020) address Knowledge transfer, Seed potato technology and supply system, Shallot production and post-harvest technology and Young farmers, while digital information and social media are cross-cutting and supporting activities. The vegIMPACT NL program is financed by the Government of the Netherlands and coordinated by Wageningen University & Research in The Netherlands.

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Effect of plant material source on plant establishment and production of shallot (Allium cepa var. aggregatum) raised from seeds

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1. Introduction

Shallot is an important crop in Indonesia and is the largest vegetable crop. Traditionally farmers use vegetative bulbs as starting material for the production of shallots for consumption. Currently about 1 ton per hectare bulbs is planted to produce 5 to 10 tons shallots. However, the quality of the planting bulbs is quite diverse. In many cases the planting bulbs are already infected with diseases. This is due to the current sourcing system for planting bulbs. In many cases farmers keep a part from their own produced shallot bulbs grown for consumption as planting bulbs for next crop cycle. When the own production did not result in good quality bulbs for consumption buying bulbs from a colleague farmer is also possible but still these bulbs were also originated from a field for consumption shallot production. Only a few farmers have specialised themselves in growing shallots to be sold as planting bulbs under a certification system.

Since a few decades breeding companies have invested in developing shallot varieties to be grown from seeds rather than from vegetative bulbs. These so called True Seed Shallot (TSS) varieties have many benefits over the traditional system. First of all the seeds are free of diseases and virus, secondly transport of seeds from the store to the field is less laborious than the transport of bulbs needed to plant on a same field. Thirdly, TSS is potentially or more likely to have higher yields.

However, a challenge is how to optimize the start of the production of shallots for consumption. Several options are possible for the farmers of which raising seedlings from the seeds in a nursery and transplanting the raised seedlings in the final production field seems to be the most promising one. Other options are direct sowing in the production field or producing sets or mini-bulbs first. When using the seedling or transplant system there are several factors that can influence the quality of the seedlings and the final production. Sowing distance, sowing depth, age of transplants and time between uprooting the transplants from the seedbed and transplanting them in the production field can all have an impact on the performance in the field. To assess the effect of sourcing of the transplants and the period between uprooting and planting a test was carried in 2019 at the Allium Training and Education Centre of EWINDO (ALTEC) at Garut, West-Java.

2. Materials and methods

The field was located at SMKN 12 in Garut, West-Java, Indonesia. Soil at the test location was a clay soil. Beds of 1 x 5 m were made surrounded by ditches to accommodate irrigation and drainage.

Transplants of the variety Sanren F1 from three different sources were obtained: 1) plants raised at EWINDO, Purwakarta, 2) plants raised at the SMKN 12 location, and 3) plants raised by a farmer nearby Garut. Transplants from a commercial farmer were uprooted 1 day before planting, transported to the field location and stored for 1 night. Transplants from SMKN 12 were uprooted 1 day before the planned transplant date and stored or uprooted and planted immediately. Transplants from EWINDO were uprooted four days before planting, temporarily stored at ambient temperature and semi air dried at Purwakarta and transported to Garut. The semi airdrying was done to prevent condensation during transport and subsequently rotting of plants due to the free moist.

At uprooting random 10 plants were taken for observations, for each plant length was measured from root till the stretched longest leaf tip and a visual assessment of root quality on a scale from 1 till 5 where 1 indicates very poor root system and 5 excellent root system. For each treatment transplants were split into three batches for planting on three plots. From each plot 20 plants were taken and the total weight in grams was observed.

Table 1. Overview of transplant treatments and nursery information, 2019.

Origin	Treatment	Sowing Date	Date of uprooting	Trans plant Age (DAS)	Storage period (days)	Sowing density (g seeds sowed/m)	Population density (plants /meter)
Farmer	S1	10 April	20 May	40	1	1	152
Purwakarta	S2	5 April	17 May	42	4	0.5	57
Garut	S3	8 April	20 May	42	1	1.25	183
Garut fresh	S4	8 April	21 May	43	0	1.25	183

Figure 1. Transplants ready for uprooting at Purwakarta.

Figure 2. Uprooted transplants from Purwakarta and packed for transport.

Figure 3. Uprooting of transplants at the commercial farmer.

Figure 4. Sowing in the nursery at Garut.

Figure 5. Transplant raising at SMKN 12 Garut.

Figure 6. Uprooting of transplants for planting into the field.

Planting was done on May 21 in the field at distances of 10 x 10 cm. The test was implemented as a randomized experiment with three blocks. Shallots were grown according to standard good agricultural practices.

Figure 7. Planting of shallot transplants on beds.

During the field period plant height and number of tillers per plant was observed on 12 and 21 June, 6, and 19 July. On August 2 a last observation on number of tillers only was done. Just before harvest on the same day number of established plants per plant position was observed and number of bulbs per plant position. With harvest fresh weight and weight after drying was weighed.

3. Results

At transplanting the root quality of the plants grown by the farmer was rated the highest. Plant length of transplants raised in Purwakarta was the tallest with 29 cm. Also the plant weight was the highest for transplants raised in Purwakarta. For Garut differences were present in plant weight between transplants uprooted 1 day before planting and at the day of transplanting. Plants uprooted one day before were 7 gram per 20 plants lighter than plants uprooted immediately before planting.

Table 2. Transplant observations, Garut 2019.

	Treatment	Plant length (cm)	Root Quality rating	Weight per 20 seedling shallot (g) 1 day before planting	Weight per 20 seedling shallot (g) at planting	Weight loss per day (%)
S1	Farmer	27	4.3	43.7	29	31.6
S2	Purwakarta	29	3.8	66.0	38	42.3
S3	Garut	25	4.2	18.9	13	29.9
S4	Garut fresh	22	3.4		20	
	mean	25	3.9	42.9	25	34.6
	Fprob	0.002	0.009	<0.001	<0.001	0.3
	LSD a=0.05	3	0.1	11.3	7	18.8
	n=	10	10	3	3	3

After planting the shallot plant height showed different patterns for the different treatments (Fig.) Transplants from Garut 1 day old and the transplants from Purwakarta showed maximum height on June 20 while the other two treatments showed maximum height on July 5th. The transplants from Garut showed the tallest length with 40 cm.

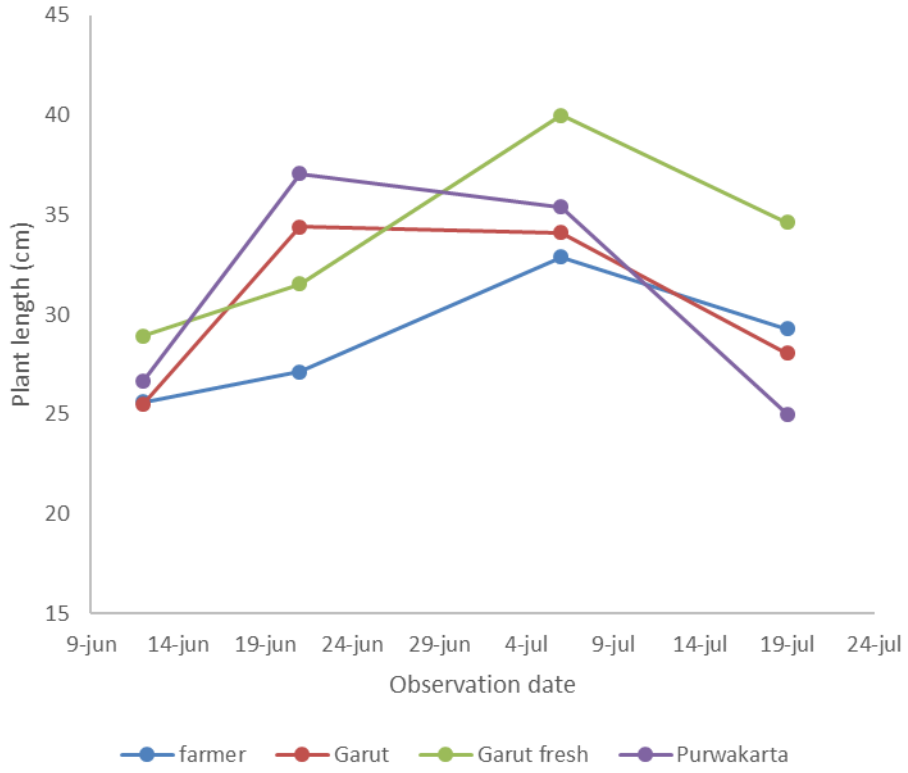

Figure 8. Plant height development of shallot, Garut 2019.

Transplants raised in Garut and immediately planted after uprooting showed the highest number of tillers with a number of 2.7 on August 2. Transplants from Garut showed on July 29 2,3 tillers after which it dropped to 1.7. This might be either an indication of earlier maturing at which the leaves die or infection by a fungal disease causing the leaves to die, but with the bulbs still present at harvest.

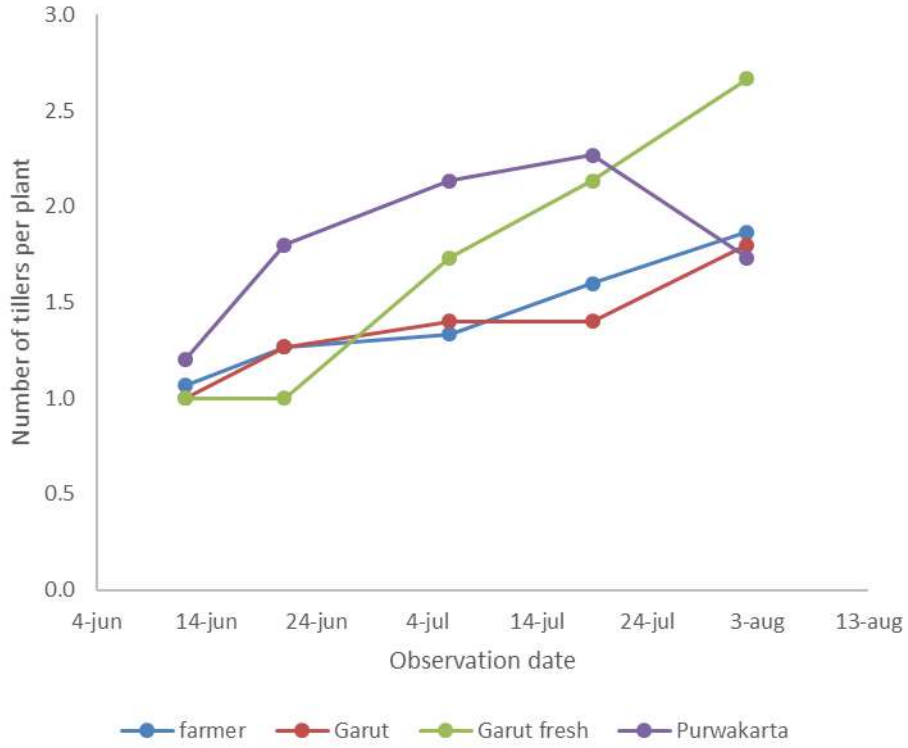

Figure 9. Development of number of tillers per plant in shallot, Garut 2019.

Figure 10. *Shallot field with transplants from Purwakarta in the front and behind it transplants from SMKN 12 immediately planted on 26 June 2019, Garut.*

At harvest the lowest number of plant clusters was present with transplants from Purwakarta. This might be a result of a lower survival rate after transplanting or a later infection in the field causing the plants to die.

Table 3. Number of plants present at harvest, fresh yield and yield after drying of shallot, Garut 2019.

		Plants at harvest (% of planted)	Mean number of bulbs per plant	Fresh weight (kg/m2)	Dried weight (kg/m2)	drying losses (%)	Mean fresh bulb weight (g/bulb)	Mean bulb weight after drying (g/bulb)
S1	farmer	67.5	2.2	1.9	1.3	33.5	14.3	10.8
S2	Purwakarta	29.7	1.6	1.4	0.9	34.6	21.0	16.4
S3	Garut	69.2	2.2	2.0	1.3	34.1	10.3	8.4
S4	Garut fresh	78.9	2.7	2.7	1.6	38.9	15.2	11.5
	mean	61.3	2.2	2.0	1.3	35.3	15.2	11.8
	fprob	0.013	0.48	0.19	0.20	0.47	0.16	0.14
	lsd	25.5	1.7	1.2	0.7	8.7	9.8	7.0

4. Discussion and conclusions

Source of planting material has an impact on final results. It looks like that time between uprooting and planting has a large effect on final performance. When comparing the transplants from Garut with different uprooting dates, it is clear that more plants were present at harvest when transplants were immediately planted after uprooting. However, no significant differences were observed in terms of number of bulbs per plant, average bulb weight or yield.

The transplants from Purwakarta were uprooted a couple of days before planting and also showed the lowest survival rate in the field the final yield was low and almost significant different from the best yield obtained with immediately planted transplants from Garut after uprooting. Nevertheless it seems that due to low plant population the crop compensates this by producing larger bulbs. Although not significant different, transplants from Purwakarta showed an average bulb weight of 21 g while the weight of bulbs produced with transplants from other sources was less.

The results from this test are not conclusive, but transport time, nursery type, age of transplants and weight of plants at transplanting seems all to have an effect on the final production. It is recommended to follow up on this to avoid disappointing results on a farmers level due to poor performing transplants.