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Technology Innovation Support in Development of Local Superior Shallot in North Sulawesi

AUTHORS INFO

Olvie Grietjie Tandi
North Assessment Institute for Agriculturan Technology (BPTP Sulawesi Utara)
olvietandi@gmail.com

Faisal
North Assessment Institute for Agriculturan Technology (BPTP Sulawesi Utara)
faisalbptp@gmail.com

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Abstract

The need for Shallot at the community level continues to increase every year in line with the increase in population. Shallots are used as cooking spices and used in the herbal medicine industry. Minahasa Regency is one of the centers of shallot development in North Sulawesi, where production at the farm level is still below the average of 7-8 t/ha. For this reason, a breakthrough in cultivation technology innovation is needed to increase yields. This writing aims to provide information on technological innovation support in the effort to develop local superior shallots in North Sulawesi and to see the results of farming from the application of the technology. The data obtained from the results of interviews and research results both conducted by the North Sulawesi AIAT Assessment Team and other research results. The support of technological innovation in efforts to develop shallots is the application of onion PTT Innovations: land management, preparation of plant spacing, use of certified seeds, planting and fertilizing, watering and controlling weeds, controlling plant pests, harvesting and post-harvesting. The conclusions obtained by the application of PTT shallots, which were examined by BPTP North Sulawesi using local varieties Lansuna. The B / C ratio is 4.23 by giving an income of Rp. 273,058,000 compared to the way of farmers where B / C ratio = 2.23 with income of Rp. 138,233,000 / hectare

Keyword : shallot, local, technology innovation

A. Introduction

Shallot is a main ingredient of Indonesian cuisine seasoning. In addition to the basic seasoning of cuisine, shallots can be used as a herbal medicine because the nutrient content is quite complete. In 100 grams of shallots contains carbohydrate (9,34 g), sugar (4,24 g), fiber (1,7 g), saturated fat (0.042 g), protein (1.1 g), water (89.11 g), thiamine (0.046 mg), riboflavin (0.027 mg), niacin (0.116 mg), vitamin B6 (0.12 mg), folate (19 mg), vitamin C (7.4 mg), vitamin E (0.02

mg), vitamin K (0.4 mg), calcium (23 mg), iron (0.21 mg), magnesium (0.129 mg), phosphorus (29 mg), potassium (146 mg), sodium (4 mg), and zinc (0.17 mg) (Waluyo and Sinaga, 2015).

The production of shallots to date is still centered in several districts in Java namely Kuningan, Cirebon, Brebes, Tegal, Pemalang, Bantul, Nganjuk, and Probolinggo. Based on data from Directorate General of Horticultural, Ministry of Agriculture, the demand of shallots nationally tends to increase from year to year, as well as shallot production. In 2007 For example, the demand for shallots amounted to 909,853 tons with a production of 807,000 tons, the year 2008 demand increased to 934,301 tons with a production of 855,000 tons. In the year 2009, the need for shallots in Indonesia reached 936,103 tons with a production of 965,164 tons and increased in 2010 to 976,284 tons with a production of 1,048,228 tons. Production decline occurred in the year 2011 with production of 893,124 tons. Increased production of shallots is predicted to occur in 2012 to 960,179 tons (Departemen Pertanian, 2013). Increased production of shallots directed to meet domestic needs and increase competitiveness can be pursued through the expansion of new areas and increased productivity.

According to Badan Pusat Statistik (2016) specifically for North Sulawesi the harvest area of shallots is 310 ha, production of 1,715.5 tons with productivity 5.5 tons/ha. The pattern of shallots consumption on North Sulawesi people is 4.56 kg/KAP/year (Dinas Pangan Sulut. 2016). Data of the population of North Sulawesi up to the year 2015 amounted to 2,412,118 people, then the need for consumption of shallot in North Sulawesi is 10,999 tons/year means North Sulawesi still requires shallots consumption of 9,238.8 tons/year, which must be in From outside areas like Enrekang and Brebes.

Demand for shallots seeds throughout the year in North Sulawesi continues to increase, if it refers to the extensive harvest data of 2015 is 310 ha, specifically for the shallots varieties Lansuna requires seed of 1200 kg/ha, so the total needs of Special varieties seeds of Lansuna in North Sulawesi amounting to ± 372 tons per year. For varieties of Bima, Maja Cipanas or varieties of Sembrani (Balai Pengkajian Teknologi Pertanian, 2016b), with the need for seed of 800-1000 kg/ha, then the seed needs of the 3 varieties are 310 tons.

The main barrier factor in shallots farming is the availability of high quality seeds that are still very limited, the height intensity of pests and diseases in certain seasons. The seeds of a superior variety of certified shallots are required as the main requirement to initiate the commodity production process in order to achieve high quality and prime results. Certified shallot seeds are still a rare item and can meet the needs of farmers.

In supporting the productivity of shallots, maximum required seed tuber high quality. According to Sutoso, S.W. Hetetik dan I Purnomo (2007). Tuber seeds are good to be planted contain no disease, no defects, and not too long stored in the shed. The need for seed is between 1.3-2.6 ton/ha with the diameter of the seed bulbs of 1.5-1.8 cm (Sunarmani and Hidayat, 2005) with a land efficiency of 65%. Good seed tuber is a tuber that does not break the dormancy time, healthy and optimal size. Large tuber can provide enough food reserves to support growth and development in the field.

Shallots are generally reproduced with tuber as a seed. A good seed tuber must come from a healthy crop, it is quite old or aged 70-80 days after planting. The superior varieties used are adaptive in the rainy season in dry land or *tegalan*. The seeds used are tuber that have been stored 2.5-4.0 months with a growing point of at least 80% fresh, stocky, non-flawed, and free from pest diseases. Further, a selection of tuber that will be made to seed for same plant growth. The size of the seed tuber is classed into three classes, namely (a) large (Ø = > 1.8 cm or > 10 g), (b) moderate (Ø = 1.5-1.8 cm or 5-10 g), and (c) Small (Ø = < 1.5 cm or < 5 g). Good seed tubers are medium-sized, because they are more efficient than large-sized seeds, and early growth is good. Seeds need about 1,200 kg/ha (Rismunandar 1986; Stallen and Hilman 1991).

In 2015, the need for shallot was projected to reach 1,195,235 tons. If the productivity of the shallot is projected to reach 10.22 tons/ha, it takes about 116,950 ha of Harvest area. Referring to the harvest area in the year 2012, which is 99,519 ha, then the fulfillment of the need for shallots year 2015 requires the expansion of the harvest area about 17,432 ha or about 6 000 ha per year. The production target of 1,195,235 tons in 2015 included for shallots seeds about 102,900 tons. The projection of shallots needs up to year 2025 is listed in table 1.

The results of the explanation, and the synchronization of the horticultural development implementation 2008, revealed some fundamental problems confronted in the development of shallot production, namely; 1) The capability of cultivation technology and seed multiplication by

breeders still limited, 2) local varieties of existing seeds are not able to adapt throughout the season so forced to use the seeds of imported shallot, 3) often occurs price fluctuations of shallots especially in Brebes district, so it does not provide guarantees of business continuity, 4) imported shallots entered at the time of harvesting even in the supply to the production centers so that the selling price of farmers fall, 5) Production costs continue to increase due to the use of excessive chemicals (not according to the rules), the price of chemical inputs continues to increase while farmers have a dependency on such substances, and 6) the limitation of seed sources so that it inhibits in the multiplication of seeds.

Table 1. Project Data Of Shallots Need In 2015-2025

Years	Needs (Ton)				
	Consumption	Seeds	Industry	Export	Total
2015	952,335	102.900	40,000	100,000	1,195,235
2020	1,067,527	107,000	50,000	110,000	1,335,427
2025	1,194,837	116,900	80,000	150,000	1,541,737

Source: Directorate General of Horticultural Production, Republic Indonesia Ministry of Agriculture

B. Technology Innovation Support in Development of Local Shallot Superior in North Sulawesi

1. Potential

Minahasa, one of the districts in North Sulawesi, where the West Tompaso district is the most widely cultivated area of shallots. This area is located at an altitude of ± 800-900 meters from sea level with a condition of topography flat to the ramps and has an average ground slope above 5-10 degree, which includes 20 km with an average slope of 10 degree. The dominating soil type is Reyosol with a pH of 5-7.

According to the Dinas Pertanian Kab. Minahasa (2017), the area of horticultural cropping crop is approximately 5000 ha, the area that can be optimized for cultivation of shallots is approximately 2000 ha spread in sub-district in several sub-districts. Data of potential land area for the development of shallot in Minahasa district is as follows:

Table 2. Data of Potential Land Area For the Development of Shallot in Minahasa District

No.	Sub District	Potential Area (ha)	Description
1.	Tompaso	150	
2.	Tompaso Barat	350	
3.	Langowan Utara	40	
4.	Langowan Barat	800	
5.	Langowan Selatan	50	
6.	Langowan Timur	25	
7.	Kawangkoan	100	
8.	Kawangkoaan Barat	50	
9.	Kawangkoan Utara	20	
10.	Sonder	25	
11.	Kakas	25	
12.	Kakas Barat	40	
13.	Romboken	10	
14.	Tondano Selatan	20	
15.	Tondano Utara	10	
16.	Tombulu	10	
17.	Tombariri	30	
18.	Kombi	50	
19.	Lembean Timur	50	

Source: Agriculture Agency of Minahasa District 2017

The production of shallots that still leafy in 2012 in North Sulawesi for 5,301 tons with a crop area of 680 hectares and a productivity average of 7.80 tons/ha (BPS, 2013). The data of average local shallots productivity Lansuna at the farmer level in the Minahasa district just reached 7-8 t/ha. That productivity is still relatively low because the shallots plants are well-preserved productivity can reach 20 tons/ha. Demand needs for the shallots seeds continues to increase. The activities of mentoring especially the development of shallots in North Sulawesi in the year 2015 (state budget of North Sulawesi province) is 30 ha need seeds for 30 t/ha and for the year 2016 increase to 120 ha and need seed ± 120 T/ha or 12,000 kg/ha.

Lansuna varieties is one of the local superior shallot that has got protection of plant varieties (PPV) by the central government based on SK Agriculture Minister No. 044/Kpts/SR. 120/D. 2.7/5/2016. This variety has long been used by local farmers planted continuously and traditionally selected by farmers in Tompaso sub district and known as Bawang Magelang. Because this shallots in its growth is able to adapt to both summer and rain, the Minahasa government made a request for the protection of a variety in 2016. From the results of temporary research by BPTP North Sulawesi varieties Lansuna has a high average plant 34.9 cm; The number of leaves 23.7 per plant and the number of saplings 6.7 per plant with the potential yield 13.5 t/ha bulbs. Bright tubers color. Pests and diseases (OPT) often attacked in local shallots are shallots caterpillars (*Spodoptera Mauritia, S. Litura and S. Exiqua*) while the common disease encountered in this local shallots crop is fusarium wither caused by *Boletus fusarium oxysporum* (BPTP, 2016a).

Tabel 3. Description of Local Shallots Lansuna Varieties

No	Description	Description
1	Origin	Introduction from Filipina
2	Lineage	Positive selection
3	Varieties Type	Klon
4	Plant Height	26 – 44 cm
5	Leaf Shape	Silindris, middle hollow
6	Leaf Size	21 – 39 cm
7	Leaf Color	Bright green (RHS 140 C)
8	Leaf amount per tuber	4 – 11 blades
9	Leaf amount per clumps	23 – 61 blades
10	Harvest age (80% batang melemas)	56 – 60 days
11	Tuber shape	Round
12	Tuber size	Height 2,4 – 3,6 cm Diameter 2,0 – 3,6 cm
13	Tuber color	Dark red (RHS N 57 B)
14	Weight per tuber	3,25 – 15,14 gram
15	Tuber amount per clumps	3 - 12
16	Tuber weight per clumps	35,71 – 93,52
17	Tillers amount	3 – 12 tillers
18	Storage capacity of tuber in temperature 27-30oC	3-4 months
19	Shrink tuber weight (wet-dry save)	18,7 – 20,0 %
20	Tuber results per hectare	7,94 – 14,12 tons
21	Population per hectare	222.223 plants
22	Seeds need per hectare	1.111,12 kg
23	Main characteristic	Round tuber shape, large tuber size, with largest diameter in the centre, tuber color is red (RHS N 57 B)

Based on SK Agriculture Minister No.044/Kpts/SR.120/D.2.7/5/2016
Source : BSPB Minahasa District (2016)

The age of plants in the field is only about 65-70 days, then within a year of chance to harvest 2-3 times, so that in one year to 1 ha will be produced approximately 30 tons of fresh shallots. Planting season (PS I) is valid during the rainy season in February, where farmers generally utilize the existing lands in the area surrounding the mountains while for the dry season (PS II) in July

generally the shallot in planting on rice field lands. Local shallots from Minahasa District have description as below table 3.

2. Seed System

In general, shallot farmers in Minahasa District farming is still conduct farming business of shallots with a traditional way. The use of local varieties has been a long time ago and farmers selected their own tuber crops to be used as a source of seed. A few varieties of perna are planted by farmers such as Super Filipine and Bima and are unable to adapt to the environment. Fertilization of plants has not been recommended as well as the use of inorganic fertilization tends to be excessive, and less utilizing organic fertilizer. To achieve high productivity needed an assembly of appropriate technology that can increase farmers ' income and the availability of superior seeds continuously. The technology that must be applied is the cultivation technology of the GAP (Good Agriculture Practice) shallots, ranging from seed preparation, soil processing, spacing, fertilization, harvesting and handling in the field post harvest.

Adiningrat (2008) states that, in developing a growing industry there are 6 main steps that should be carefully conducted and passed in full to differentiate it from the seed trading efforts, namely: the development of production systems, marketing system development, distribution system development, quality control, and market control.

The national private sector of seeding is a business institution that organizes a series of processes all activities in producing new seed/superior varieties, producing and high quality with high competitiveness, multiply, circulate, and trade it, whether in one intact business institutional or one of the other business units such as seed-making, and incubators that utilize national biological resources wisely and sustainable (Baihaki, 2008).

Seeds of superior varieties shallots, both seed source as well as seed spread today is still a necessity of goods that are still difficult to be obtained by farmers. To be able to plant shallots, farmers are forced to buy seeds in the market with common varieties and quality. The shallot seeds that are on the market are often made from the reduced shallot consumption. Farmers are still struggling to acquire high quality shallot seeds that are certified. The use of seed certified by farmers is still very low, which is about 5% and and limited in the area of main production center Pantura (Baihaki, 2002). The cause among others is the availability of source seed (FS or SS) is virtually none, the route of the BS trip to the SS is not smooth, and the lack of passion of farmers become the seed/producer of shallots as the process is too complicated (Badan Tenaga Atom Nasional, 2008).

Seed is one of the main key in the success of a farming. The requirements of good shallot seeds include:

- Storage life of seed is enough namely about 2.5-3 months. It aims to make the growth good and evenly, although for the younger storage life of the seed still grows but in subsequent growth will be lower result than the seed that has been ready to plant (have enough of the shelf life).

-Harvest age when prospective seed tubers are planted in the right field.

-Medium seed size, about 5-6 grams. The use of a seed that is too large will increase the cost as more needs.

-The seed needs of each hectare range from 800 – 1200 kg, depending on the size of the tuber.

-Tubers of brightly colored seeds, with shiny skin, tuber seeds of pious, healthy, dense, non-bone loss and not malleable. If there is a seed tuber that does not have such properties should not be used.

-Tuber seeds are not attacked by pests and diseases.

-Before planting, the tuber is cleaned first from the dry skin and if the performance has not been seen at the end of the tuber, then preferably the tip of the tuber cut 1/3 to accelerate the emergence of shoots

The requirements for agroecological suitability for the shallots are mainly determined by moisture, texture, structure and soil fertility. In general the plant of shallots requires dry month 4-5 months, precipitation 1000-1500 mm/year, drainage and good fertility, sandy clay texture and soil structure.

Table 4. Productivity Potency of Some Shallots Varieties

No.	Varieties	Tillers Amount (tubers /clump)	Development Area	Productivity Potency (ton/ha umbi kering)
1.	Bima Brebes	7-12	Brebes	9,9
2.	Bauji	9-16	Nganjuk	14
3.	Super Philip	9-18	Jawa	17,6
4.	Tiron	9-21	Bantul	13
5.	Kuning	7-12	Probolinggo, Brebes	21,4
6.	MajaCipanas	6-12	Jawa Barat	10,9
7.	Keramat 1	6-9	Probolinggo, Brebes	22,7
8.	Biru Lancor	6-13	Probolinggo, Bantul	12,47-14,08

Source: Directorate of Germination, Directorate General of Indonesian Horticultural Production Development Ministry of Agriculture's, 2004

3. The Application of Shallot PTT Technology Innovation

The application in the shallots technology PTT innovation is basically not much different from the application of conventional cultivation of farmers, only some components of technology that must be adjusted such as seed treatment, planting distance, fertilization, pest control and the management of proceeds for the preparation of tubers for commercial and tubers for the seed.

Table 5. Shallots Existing Technology in Minahasa district

Technology Components	Traditional Farming Business
Varieties	- Lansuna varieties (local superior) - Seed needs : 800 kg-1400 kg/ha - Without tuber cut
Planting Distance	Planting distance in the field 30 cm x 15 cm; 40 cm x 15
Fertilizer	Rarely use manure, if there are 1-3 ton/ha, SP-36: 500 kg/ha, 300 kg/ha; Phonskah 300 kg/ha; fertilizer 3 x (basic: manure, SP-36, ½ Phonska, 14 hst urea dan 30 hst ½ phonska)
OPT Control	OPT worm shallots, Fusarium wither and rotten tuber by bacteria especially on the tuber that has been harvested. Sprayed by mixing some pesticide products, fertilizer leaves etc.). Spraying Schedule 3 a week.
Productivity	7-8 t/ha

Primary data from interview results of farmer

Production efforts in accordance with good and proper cultivation norms need to be conducted to produce quality shallots with optimal productivity. Therefore, the implementation of the standard operational procedure (SOP) of the shallots cultivation as published by the Ministry of Agriculture must be consistent and well documented by every business performer. Good SOP can generate productivity by 15-20 tons/ha (depending on the shallot varieties). In order to execute the SOP, the appropriate production process will be required as below.

Soil Processing

The processing of soil is conducted when there are not rain for 2-4 weeks before planting. The aim is to inflate the soil, improve the drainage and aeration of the soil, flatten the ground, and eradicate the remnants of weeds. Soil processing begins with the create of trenches as the distance between the bedwith the width of 40-50 cm, then the soil is chopped up as deep as 40 cm. Cultivation is done on a bedthat has been prepared with the desired size and the direction of the bed is correct. The size of the bedis 100-200 cm with a height of 30-50 cm, and the length according to the needs of land processing begins with creating bedengan. The direction of the bedis East-west with a width of 1-2 m with a long adjustable land condition. A week later, it was melted down. It is then left for 1-2 weeks so that soil pests and diseases can be minimized, as well as the seeds of weed in the soil also experiencing death. After 2 weeks, there was the cleaning of the grass on the ground and the making of trenches between the bedengan. Water is then channeled to the land until the ground level, so that the soil gets enough water content. A week

later it was conducted by manure. After a week of silence, the soil is ready to be planted with shallots.

Table 6. Components of Technology Innovation PTT Shallots

Technology Components	Technology Innovations
Varieties	- Sembrani, Maja Cipanas, Trisulla dan Bima I dan II - Lansuna (superior local seeds) -Seed treatment, where the tip cutting treatment is 1/3 seed and given Mancozeb (100 kg Seed: 100 g mancozeb), put in the sack, tied and stored 1x 24 hours after that the seeds are ready planted
Planting Distance	15 cm x 20 cm and 20 cm x 20 cm and height bed25 cm
Fertilizer	Manure 5 t/ha, basic fertilizer Ponska 533 kg/ha; SP-36 111 kg/ha and KCl 66 kg/ha administered 7 days before planting together with manure. Follow-up Urea 92 kg/ha and ZA 202 kg/ha administered when the plant is 15 HST and 30 HST
OPT Control	-Carried out in a preventative range of plants aged 7 HST with an interval of 3-4 days. -Systemic fungicide: 21 HST next use contact fungicide if there is wither plant. -Mounting trap OPT: Feromon exi 40 point/ha where control decision based on the catch of the Exigua moth as many as 30 tails/traps or crop damage has reached 50%.
Productivity	10-15 ton/ha

Primary Data Technology Components of PTT Shallots from Balitsa

Planting Distance Setup

Planting distance arrangement basically aims to give plants the possibility to grow well without experiencing competition in water intake, nutrients and sunlight, as well as facilitate the maintenance of crops. Less precise planting distance can stimulate weed growth, thereby lowering the yield. Results showed that the results of the highest shallots were obtained on the use of large seed tuber (> 10 g) with a planting distance of 20 cm x 15 cm, but statistically not distinct with the use of medium seed tuber (5-10 g) and the same spacing.

Seed Preparation

The use of seed quality is an absolute condition in the cultivation of shallots. The varieties of shallots that can be used are Bima, Brebes, Ampenan, Medan, Keling, Maja Cipanas, SUMENEP, Yellow, Timor, Lampung, Bull and other local varieties. The difference in productivity of any variety/cultivar not only depends on its nature, but is also heavily influenced by local situations and conditions. Climate, fertilization, irrigation, and soil is a determining factor in the productivity and quality of shallot. Plants are usually harvested quite old between 60-80 days, have been selected in the field and in the storage place. The tuber to be used for the seed should come from a plant that is already old enough age, which is about 70-80 days after planting. Tuber for seed should be medium size (5-10 g). The appearance of the seed tuber should be fresh and healthy, pious (solid, not wrinkled), and the color is bright (not dull). Seed tuber is ready to be planted when it has been stored for 2-4 months since the harvest and its shoots have reached the end of the tuber. A sufficient factor determining the quality of shallot seeds is the size of tuber. Based on the size of the tuber, seed tubers are classified into three classes, namely: large seed tuber (diameter 1.8 cm or > 10 g); Medium seed tuber (diameter 1.5-1.8 cm or 5-10 g) and small seed tuber (diameter < 1.5 cm or < 5 g).

Planting and Fertilization

Planting is conducted at the end of rainy season. With the Penugal tool, the planting holes are made as deep as an average as high of tubers. The way of cultivation is: tuber skin pads are peeled first and separated by the cloves. As a note, for the tubers of shallots that had been stored more than 40 days, at the time of planting does not need to be cutting the tip of the tuber. This is due to the tuber is quite a time of Dorman, the growth rate is quite good and the mortality rate of the tuber is also low. As for tubers stored less than 40 days, it is necessary to cut the tip of the tuber to accelerate the exit of shoots by cutting the seed end to 1/3 parts. The seed planted stands on a

beduntil the surface of the slice is covered by a thin layer of soil. Basic fertilizer used is an organic fertilizer that is ripe like chicken manure at a dose of 5-6 tons/ha, or compost at a dose of 4-5 tons/ha especially on dry land. Fertilizer is done in conjunction with soil processing. Fertilizer is an artificial fertilizer with a dose of Urea fertilizer 200 kg/ha, ZA 300 kg/ha, SP-36 250 kg/ha, KCl 200 kg/ha, and TSP 250 kg/ha. Fertilization is done 3 times in 1 planting season. Fertilization was first done a week after planting, namely Urea 100 kg/ha, ZA 150 kg/ha, SP-36 150 kg/ha, TSP 100 kg/ha, and KCl 100 kg/ha. The second fertilization is done 3 weeks after planting of Urea 50 kg/ha, ZA 75 kg/ha, SP-36 50 kg/ha, TSP 75 kg/ha, and KCl 50 kg/ha. The last fertilization is done when the shallot is 6 weeks after planting, namely Urea 50 kg/ha, ZA 75 kg/ha, SP-36 50 kg/ha, TSP 75 kg/ha, and KCl 50 kg/ha.

Watering and Weed Control

Although it does not require a lot of rain, but the shallot plants require adequate water during its growth through watering. Cropping in the field of former rice fields in the blistering dry season requires adequate watering, usually 1 times a day in the morning or evening, since planting until the harvest. The watering done in the rainy season is generally aimed at rinsing the leaves of plants, namely to lower the spark of soil stuck on the leaves of shallots. Watering can use a gembor or sprinkler, or by melting the water around the bedso-called LEB system.

Watering is conducted by first pumping the groundwater using a diesel pump machine. By using the pump machine, the water will be out and then channeled into the shallots cultivation area. Water that flooded/filled the trench was then used to irrigate shallots. The way of watering the shallots is to use a small bucket or gembor. With the Gembor/small bucket, the farmer will walk along the trench while watering the shallots that the water comes from the groundwater resulting from the diesel pump. The growth of weeds in the planting of young shallots until the age of 2 weeks is very fast. Therefore, weeding is imperative and is done intensively for limited area. Weeding can be conducted in conjunction with watering.

Plant Destruction Organism (pest) control

Pests that commonly invade the plant of shallots are soil caterpillars, leaves caterpillars, grayak caterpillars, lice leaves, and nematodes roots. Pest control is conducted by sanitation and disposal of weed, collecting and destroying larvae, land processing to dismantle the caterpillars, the use of insecticides, as well as crop rotation. The main pest in the shallots that need to be wary of is the shallots-leaf caterpillars (Spodoptera exigua). S. Exigua control can be done as follows:

1). Use of trap lights.

The trap lamp is mounted on a wooden pole with a height of 10-15 cm above the water tub. The mouth of bath water should not be more than 40 cm above the tip of the leaves of shallots. The type of lamp used is neon, with the distance between one light trap (point) with the other point is 20 m x 20 m or 25 dots/ha.

2). Use of SE-NPV.

Se-NPV can be obtained from Balitsa Lembang or IPB to be further reproduced through the worm S. Exigua infected. The infected caterpillars are taken, crushed and then filtered and sprayed into the shallot plant. With this SE-NPV can turn off the Caterpillar 4 days after application.

3). Chemical control.

This is the most recent recommendation, if the two ways above are not effective or cannot be done and the pest population has reached the threshold of control, namely damage to leaves > 5% per clump. Diseases that often attack shallots are purple patches, dew flour, rotten stem neck, antrnosa, rotten tuber, Fusarium wither, and rotten wet. Disease control can be done by curative and preventive. Curatively is:

(a). Sanitation, that is, immediately unplug the plants that have been severely attacked or died and pluck the leaves are dried, collected and then removed from the garden and burned. This is an attempt to reduce the source of infection.

(b). Watering, that is watering the plants if it rains with the use of gembor so that the grains of soil attached to the leaves due to a splash of rain water is not long to stick, because it can be a source of infection (containing pathogenic incoum).

(3). Chemical control by using a chemical fungicide, should be done when the intensity of the attack has reached the threshold of control, namely the average attack intensity above 10%.

It is preventative:
(1). Sanitation, special against the plant and the rest of the infected plant.
(2). Planting of disease-free tubers.
(3). Tuber treatment with fungicide effective.
(4). Rotate the crop with the plant instead of shallots, nuts, pumpkins, or eggplants.
(5). Set the planting time, namely in the dry season.
(6). Improvement of land drainage system.
(7). Plant a resilient cultivar, for example Sumenep cultivars .
(8). Use of antagonist agents, such as fungi, or bacteria.

Harvest

The harvest of shallots is done when the tuber is quite age about 60 – 70 HST. The shallot plants began to be harvested after visible signs of 60% soft stem neck, plant collapsed, and leaves began to yellow. The way is remove the whole plant carefully so that no tuber is left or blisters. Harvesting should be carried out on dry soil conditions and sunny weather to prevent tubers of rotten disease attacks in storage warehouses.

Storage is conducted in the para-para with dried. The old seed storage is 3-6 months which can be used on the next PS. Each week is controlled and fumigation. The warehouse has enough ventilation, the floor should cement to be waterproof, warehouse roof with direct sunlight. Shallots storage activities are absolutely done during the period of seed dormancy, before the seeds ready to plant. During storage is done maintenance by means of sorting after ± 25 days to dispose of the foul. The seed storage process in the warehouse also determines the quality level of the resulting seed and imperfect storage will bring losses due to high weight shrinkage. According to Darkam & Sinaga (1994), decrease in quality of shallots during storage due to mechanical damage, physiological and microorganisms characterized by decreased moisture content, growth of shoots, softening tubers, growth and rot. Therefore, the need for post-harvest (storage) technology is an integral part of the effort to obtain a quality seed. The results showed that the seeds of shallots that were stored in the dry season in the drought had a depreciation of 22%, while the unsmoked depreciation occurred about 17%.

Shallots Farmer Business Analysis

Shallot farming in the dry plains of the medium-land in Minahasa District uses Lansuna varieties (local superior), following the farmer's pattern economically worthy to be cultivated with B/C ratio = 2.23 with revenues of RP. 138, 233, 000108/hectare (table 7). While using technology innovation PTT shallot results study by BPTP planted in April 2016, using Lansuna varieties, B/C ratio = 4.23 with revenues of Rp. 273,058, 000/hectare (table 8). This means that the received profit can be used to perform farming activities in the next planting season. Fore is expected with technological innovations and the establishment of the Farmer Group and the existence of a promising distribution line market, shallots farming business in Minahasa District can thrive.

Table 7. Analysis of Lansuna Shallots Farming Business Farmer Technology in Minahasa District

NO	DESCRIPTION	UNITS	Volume	PRICE UNITS (RP)	PROCE (Rp)
A.	Materials				
1	Seeds	kg	800	35,000	28000000
2	Pukan	kg	3000	600	1800000
3	SP-36	kg	500	2,100	1050000
4	Phonska	kg	300	2340	702000
5	Urea	kg	300	1,800	540000
	Fungisida				
6	Dithane	kg	3	100000	300000
7	Score	bottle	12	150,000	1800000
8	Tarmex	bottle	5	75,000	375000
9	Sack	sheet	150	3000	450000
B.	Labor				
1	Land Processing and bed	man-hour	30	125000	3750000
2	Planting and basic fertilizer	man-hour	45	125000	5625000
3	Weeding I	man-hour	30	125000	3750000
4	Continuation Fertilizer	man-hour	3	125000	375000
5	Weeding II	man-hour	30	125000	3750000
6	Spraying H & P	man-hour	16	125000	2000000
7	Embellishment	man-hour	30	125000	3750000
8	Harvest	man-hour	30	125000	3750000
	Total Cost				**61767000**
	Production				
	a. Total	**kg**	8000	25,000	200000000
	B. Cost		25,000		
	Revenue		200,000,000		
	Revenue				**138,233,000**
	B/C				2,23

Tabel 8. A Analysis of Lansuna Variety Shallots Farming Business Using Shallots PTT Innovations

NO	DESCRIPTION	UNITS	Volume	PRICE UNITS (RP)	PRICE (Rp)
A.	Materials				
1	Seeds	kg	800	35,000	28000000
2	Pukan	kg	5000	600	3000000
3	SP-36	kg	150	2,100	315000
4	Phonska	kg	550	2340	1287000
5	Urea	kg	300	1,800	540000
6	KCL	kg	100	5,500	550000
7	Pestisida	Package	1	2,000,000	2000000
8	PPC	Package	1	550,000	550000
9	Sack	Sheet	150	3000	450000
10	Pestisida nabati	Package	1	1,000,000	1000000

Tabel 9. A Analysis of Lansuna Variety Shallots Farming Business Using Shallots PTT Innovations

NO	DESCRIPTION	UNITS	Volume	PRICE UNITS (RP)	PRICE (Rp)
A.	Materials				
1	Seeds	kg	800	35,000	28000000
2	Pukan	kg	5000	600	3000000
3	SP-36	kg	150	2,100	315000
4	Phonska	kg	550	2340	1287000
5	Urea	kg	300	1,800	540000
6	KCL	kg	100	5,500	550000
7	Pestisida	Package	1	2,000,000	2000000
8	PPC	Package	1	550,000	550000
9	Sack	Sheet	150	3000	450000
10	Pestisida nabati	Package	1	1,000,000	1000000
B.	Labor				0
1	Land Processing and bedengan	man-hour	30	125000	3750000
2	Planting and basic fertilizer	man-hour	45	125000	5625000
3	Weeding I	man-hour	30	125000	3750000
4	Continuation Fertilizer	man-hour	3	125000	375000
5	Weeding II	man-hour	30	125000	3750000
6	Spraying H & P	man-hour	16	125000	2000000
7	Embellishment	man-hour	30	125000	3750000
8	Harvest	man-hour	30	125000	3750000
	Total Cost				**64442000**
	Production				
	a. Total	**kg**	13500	25,000	337500000
	B. Price		25,000		
	Revenue		337,500,000		
	Revenue				**273,058,000**
	B/C				4,23

C. CONCLUSION

Lansuna is one of the local superior varieties with the average potential yield at the farmer level at 7-8 t/ha. These varieties are adaptable to both the rainy season and the dry season. The prospect of developing shallots in the Minahasa district is very potential, and provides benefits on raising farmers ' income. The result of the analysis of the farming efforts of the way farmers used Lansuna B/C ratio = 2.23 with revenues of Rp. 138,233,000/hectare. According to the results of study BPTP of North Sulawesi B/C Ratio was 4.23 with revenues of Rp. 273,058,000

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