Various cropping patterns of chili and shallot crops as land intensification program in some production centers

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Abstract. Ministry of Agriculture launched Chili and shallot as one of the strategic commodities. Chili and shallot are planted in various cropping patterns. The aim was to identify various cropping patterns of chili and shallot in eight production centers, namely Cirebon, Bandung, Demak, Temanggung, Bangli, Solok, East Lombok, and Enrekang. The study was a descriptive observation, conducted from April to August 2018. Data collection was carried out through interviewing farmers and survey. The results showed that the cropping patterns applied to eight production centers can be grouped into 1) monoculture: chili or shallot, 2) polyculture such as intercropping, multiple cropping, relay cropping, and sequential planting between chili or shallot with other plants.

Keywords: chili, cropping pattern, intensification, shallot

1. Introduction
Chili and shallot are main vegetable commodities that are launched by The Ministry of Agriculture to be a strategic commodity. The demand for chili and shallot continue to increase in line with increasing population. Chili and shallot are seasonal crops that only produce in certain months, while consumption of chili and shallot are almost every day, especially on religious holidays [1,2]. Increasing on chili price indicates that this commodity is preferred by consumers in Indonesia and abroad. Usually the price of chili rises during rainy and festive season/holiday which affects inflation rate [3,4]. Based on data from BPS, the development of shallot prices in 1984-2015 at the producer level tended to increase with an average growth of 14.44% per year. At the consumer level tended to increase with an average growth of 17.09% per year (figure 1) [2].

Based on data from 2011 to 2017, shallot production has increased, except in 2015. Large chili continues to increase except in 2015 has decreased and increased again in 2017. Cayenne pepper always increases and the most significant occurred in 2017. While the data about shallot harvested area from 2011 to 2017 always increase, in 2013 decreased and rose again in 2017. In 2012 and 2015, large chili experienced decrease and increased again in 2013, 2014, 2016, and 2017, while cayenne pepper showed a pattern with an upward trend, except in 2015, and in 2017, cayenne pepper harvested area reached the highest increase [5].
Figure 1. Graph: a. production and b. area chilli and shallot planting in 2011-2017

Chili and shallot are included in 11 strategic food commodities of the Ministry of Agriculture besides rice, corn, soybeans, sugar, beef/buffalo, oil palm, rubber, coffee and cocoa. Some government programs were focused for those commodities in order to accelerate the achievement of self-sufficiency and increase production [6].

High consumption of chili and shallot must be balanced with the availability and stability of supply, so it is necessary to manage the production patterns of chili and shallots [7]. To improve the availability and stability of supply in several production centres, chili and shallots are planted with a variety of cropping patterns. Therefore this study have been carried out to gather information about various chilli and shallot cropping patterns, in eight production centres namely Cirebon, Bandung, Demak, Temanggung, Bangli, Solok, East Lombok, and Enrekang.

2. Methods and Implementation
The research was a descriptive observation, conducted in eight production areas namely Cirebon, Bandung, Demak, Temanggung, Bangli, Solok, East Lombok, and Enrekang. Eight areas were chosen because the region is the location of developing agricultural areas, especially shallots and chillies, based on Permentan No. 18 of 2018 concerning Guidelines for Development of Corporate-Based Agricultural Areas. The selection of locations in 8 areas (Cirebon, Bandung, Demak, Temanggung, Bangli, Solok, East Lombok, and Enrekang) was based on Minister of Agriculture Regulation No. 18 of 2018 concerning Guidelines for Farmer-Based Farming Area Development, which is determined by: (a) the location that is most responsive to the addition of input and technology application; (b) continuity with previous programs that still need capacity building; and (c) Success guaranteed which is supported by the readiness of farmer group [8].

The sample areas were several sub-districts in each district, namely: Cirebon Regency (Waled, Losari, Pabedilan, Ciledug, and Gebang) districts, Bandung Regency (Pangalengan, Cikuncung, Cimaung, Cimenyan, and Pacet districts), Demak District (Mijen, Wedung, Dempet, Gajah, Karanganyar and Wonosalam districts), Temanggung Regency (Parakan, Kledung, Ngadirejo, Candiroto, Bulu, Tlogomulyo, Tembarak and Selopampang), Bangli District (Kintamani District), Solok District (Lembang Jaya District, Candiroto, Bulu, Tlogomulyo, Tembarak, and Selolopampang), Bangli Regency (Kintamani District), Solok District (Lembang Jaya Subdistrict, Lembang Jaya Subdistrict), Twin Lakes, Gumanti Valley, Mount Talang and Junjung Sirih), East Lombok Regency (Suralaga, Sembalun, Pringgabaya) and Enrekang District (Baroko, Curio, Anggeraja Districts).

The research was conducted from April to August 2018. Data collection was gathered by interviewing farmers and survey at the plantations area. Data was analyzed descriptively. Farmers interviewed as respondents were key farmers totaling 1-3 people per district.
3. Results and Discussion

Cropping pattern indicates the proportion of area under various crops at a point of time where as the crop combination indicates to grow different types of crops under the same agriculture field [9]. Cropping patterns were divided into two types, namely: monoculture and polyculture (figure 2). Monoculture is an agricultural practice of growing a single crop that aims to increase production. Monoculture is a cultivation technique which is relatively easy because it uses the same handling method for one land, but the weakness is easier attack by pests or diseases.

The polyculture cropping pattern is agriculture practices by planting many plants in one land by applying better environmental aspects. Polyculture are divided into several types, namely: a) Intercropping, i.e. planting more than one kind of crop (same or different years), b) overlapping (multiple cropping), i.e. planting more than one crop continually throughout the year, c) Relay cropping, i.e. cropping patterns by inserting one or some kind of plants other than the main crop (in the same or different times) and d) Rotating plants or sequential planting, i.e cropping patterns which replace type of plant every season which aimed to increase productivity of agricultural land [10,11].

Population is increasing, while productivity and land ownership by farmers is decreasing due to the conversion of agricultural land. Technology of cultivation is needed to increase productivity such as intercropping (poly culture) cropping patterns. Benefits of this system are efficient use of land and water, reduction of weed, and increasing of income in the farming system [12]. Yielding time with this cropping pattern will vary. This will be beneficial because if the price of one commodity is low, it can be covered with the price of another commodity.

Intercropping of two types of plants causes interaction, because each plant needs enough space to maximize cooperation and minimize competition, so that in the intercropping system there are several things that must be considered including setting plant spacing, plant population, harvest age of each plant and plant architecture [13]. Silalahi (1991) stated that the double cropping system can reduce production costs because the land being cultivated can be more efficient, the excess fertilizer given to one crop can be utilized by other plants [14].

Mariani (2009) states that intercropping systems are profitable compared to monoculture systems because land productivity is higher and the risk can be reduced [15]. Erlangga (2008) and Manurung (2007) reported that shade plants can increase plant height, length and width of leaves of turmeric plants [16]. Chilli that are intercropped with other vegetables (mustard greens, celery and scallions) is more profitable than monocultures. Production of red chilli intercropped with leeks gives higher yields than monocultures. Intercropping chili with other leaf vegetables result lowest attack of plant-disturbing organisms. Economic feasibility of intercropping chili farming with leafy vegetables provides higher profits compared to chilli farming by monoculture [17]. Intercropping of potato and celery can reduce the attack of Trips leaf pests around 44 percent and Myzus persicae aphids around 55.6 percent in potato plants. Profitable financial of potato + celery intercropping was showed by a marginal rate of return of 81.45 percent [18]. Chilli intercropping on tomatoes has a positive effect on plant growth, the level of resistance to leaf rot, increased absorption of major nutrients (NPK) and can increase marketable tomato yields. Crop synergism in vegetable intercropping systems in the highlands is greatly influenced by plant management in the field [19]. Intercropping systems of tomato and red chilli in the Kadungora Sub-district area can reduce production inputs such as fertilizers and pesticide efficiently. Intercropping systems can provide benefits to farmers, this can be seen from the R/C value obtained at 2.65 [20]. The multiple cropping system is chosen based on considerations of (a) avoids the possibility of total yield losses and total financial losses (b) efficiency of land and sunlight energy utility, (c) reducing the instability of results that is caused by environmental stress and pests and diseases, and (d) efficiency of labor and capital use. Intercropping systems must be supported by technical skills about selecting types of plants to be intercropped, designing layout of plants, determining the right planting time and better managerial skills. Most of the respondent farmers give a positive respond of intercropping related to the possibility of increasing income, reducing price / yield risk and maintaining / improving environmental sustainability [21].
Intercropping is an agriculture practice by planting more than one type of plant in a certain time in order to get optimal production and maintaining soil fertility [14]. Jumin (2002) states that the purpose of intercropping systems is to optimize the use of nutrients, water and sunlight as efficiently as possible to get maximum production [22].

**Figure 2.** Example various cropping patterns of chili, shallots and several other vegetable crops: a. Chili monoculture (Districts Pangalengan, Bandung Regency), b. Shallot Monoculture (Districts Bulu, Temanggung Regency), c. Intercropping and overlapping 2 types of plants, d, e, f. Intercropping and overlapping more than 2 types of plants (districts Ngadirejo and Bulu Temanggung regency), g. Relay/Insert (Districts Bulu, Temanggung Regency), h and i. Rotate (Districts Lembang Jaya and Danau Kembar, Solok Regency)

From the observations of various chili and shallot cropping patterns in several production centers, generally chili and shallots are planted by various cropping patterns according to their respective regions. The results are as follows:

1. Cropping pattern of chili or shallot monoculture. Chili or shallots are planted without any other crop in one field.
2. Intercropping and overlapping patterns consisting of two types of plants. Chili or shallot is planted together with other plant in one field.
3. Relay cropping pattern. This cropping pattern has other plants (coffee) as the main crop, while the chili or shallot and other vegetables are planted among the coffee plants.

4. Rotation pattern. Chili or shallot are planted alternately with other plants over a period of one year. When the chili or shallot plants have been harvested, then in the same land the same plants or other plants are planted as substitutes in the next planting period.

Table 1. Various cropping patterns for chili and shallots in the production center area

| Regency        | Planting patterns | Chili M | P IC | O | I | R | Shallot M | P IC | O | I | R |
|----------------|-------------------|--------|-----|---|---|---|----------|-----|---|---|---|
| Cirebon        |                   | ✓      | -   | - | ✓ | ✓ | ✓        | -   | - | - | ✓ |
| Bandung        |                   | ✓      | ✓   | - | - | ✓ | ✓        | ✓   | - | - | ✓ |
| Demak          |                   | -      | ✓   | - | - | ✓ | ✓        | ✓   | - | - | ✓ |
| Temanggung     |                   | -      | ✓   | ✓ | ✓ | ✓ | ✓        | ✓   | ✓ | ✓ | ✓ |
| Bangli         |                   | ✓      | ✓   | - | ✓ | ✓ | ✓        | ✓   | - | ✓ | ✓ |
| Solok          |                   | ✓      | ✓   | - | - | ✓ | ✓        | ✓   | ✓ | - | - |
| Lombok Timur   |                   | ✓      | ✓   | - | - | ✓ | ✓        | ✓   | - | - | ✓ |
| Enrekang       |                   | ✓      | ✓   | - | - | ✓ | ✓        | ✓   | - | - | ✓ |

Information:
M: Monoculture
P: Polyculture
IC: Intercropping
O: Overlapping Turn
I: Insert
R: Rotate

**Cirebon Regency**

Cirebon Regency is appropriate location for chili cultivation, especially in rice fields. Chili (cayenne pepper) is widely planted in several districts, especially in Waled and Losari Districts. Chilies are planted not only monoculture but also rotation with other plants. Shallots are planted in rice fields in Pabedinan Wetan Village, Pabedinan Subdistrict, Deojonagara Ciledug Subdistrict, Kalirahayu Subdistrict, Losari Subdistrict and Gebang Subdistrict. Every village and sub district has variant planting intensity in one year. Shallot is planted four times per year on November in Pabedinan Wetan Village, Pabedinan District. In Bojongnagara Village, Ciledug, shallot is planted on March in rotation with sweet corn (shallot - sweet corn - shallot). In Kalirahayu Village of Losari District shallot is planted twice in May and October. In Gebang Village, Gebang District, farmers plant shallot four times in June, November, February and May. Cropping patterns in all villages and districts are shallot monoculture with Bima Curut varieties, except in Bojongnagara Village, Ciledug District using Bima Brebes varieties.
Shallot cultivation in District Losari

**Bandung Regency**

Chili is planted in various villages and sub-districts namely Margamekar Village and Tribaktimulya District Pangalengan, and Mandalasari Village Cikancung District. The topography of chili planting in Margamekar and Tribaktimulya villages is flat to sloping, while in Mandalasari Village is considered steep. Chili is planted in a dry land with altitude is 1000 meters above sea level. Curly chili is planted in Bandung Regency. Chili are planted only once a year, not only monoculture, but also intercrop of shallots and other plants such as tomatoes, corn, leeks and cabbage. Chili is planted in January and intercropped with tomatoes and chicory (Chinese cabbage), which are planted twice per year.

Shallots are planted in Sukamaju Village, Cimaung District, Mekarmanik Village, Cimenyan District, Cikawao Village, and Pacet District. The land topography is a plateau (700-1200 meters above the sea level). The condition of the shallot crop slope in Bandung Regency is quite steep (15-30%) and in some places on the steep slope (> 30%).

The shallot cropping patterns in Bandung are monoculture and intercropping, such as in Mekarmanik Village, Cimenyan District and Cikawao Village, Pacet District. In Mekarmanik Village, Cimenyan District, shallot was planted in monoculture and intercropping for example shallots with corn, that corn is planted 10 days before shallots harvesting, shallots with cabbage, and shallots with chili. In Cikawao Village, Pacet District shallots are intercropped with chili, corn, peanuts and red beans. In Sukamaju Village, Cimaung District, shallots are intercropped with chili which should be planted a month earlier than chili.

**Demak Regency**

The topography of the location of chili and shallot plantations in Demak Regency is flat, located in 0-100 m above sea level. Shallots is main commodity in Demak and more farmers are interested to develop shallot. Some areas which develop shallots are in the Districts of Gajah, Mijen, Demak,
Attempt, Wajah, Wonosalam and Karanganyar. Agro-climate conditions, land potential and the availability of human resources support shallot development. Demak is also a central for chili, especially in the Dempet district. In this area many farmers also grow chili at the same time as they grow shallots... In Demak Regency, chili is planted in various villages and sub districts which are most planted in Dempet Subdistrict. Chili is intercropped with other vegetable in rice fields once a year. Chili is usually planted during dry season, and rotate with shallots.

Shallots are usually planted in rainy season and the beginning of dry season. Shallot is moncropped, but in some lands shallot was planted on the edge of the beds other plants such as peanuts or chili. Within 1 year, shallot can be harvested 2-3 times depend on season. Crop rotation done by farmers in 1 year is: a) rice - shallot - shallot - shallot, or b) rice - shallot - chili - shallot.

**Figure 5.** Planting of intercropped chillies with several vegetable plants (a) and monoculture shallots with other plants on the edge of the beds (b) in District Dempet

**Temanggung Regency**

Topography of chili plantations location in Temanggung Regency is generally sloping and also flat land. Tobacco is main commodity in Temanggung Regency. Therefore chili and shallot are planted in rotation with tobacco which are planted at the end of the rotation plants. Shallot is planted at the beginning of rainy season (October / November), and chili is planted in January / February, while tobacco is planted in April / May. Chili are planted in upland with altitudes less than 1,200 meters above sea level for example in Parakan, Kledung, Ngadirejo, Candiroto, Bulu, Tlogomulyo, Tembarak, and Selopampang, while some are planted at the altitude of more than 1,200 meters above sea level, for example in Pagerjurang Village, District Bulu. Chili is planted once a year and generally intercropped with other vegetable crops. Chili is usually planted in rotation with shallot or garlic. If chili is planted in rotation with shallots, chili should be planted 30 days after shallot planted, but if chili is planted in rotation with garlic, chili is planted 60 days after garlic.

In Parakan District, cayenne pepper was intercropped with cauliflower. Curly chili was intercropped with corn and purple sweet potato. In Kledung Subdistrict, curly chili and big chili are intercropped with cauliflower, leeks and red beans. In Ngadirejo Subdistrict, curly chili or big chili are intercropped with cabbage, red beans, peanut, and shallot. In Candiroto District there are monoculture curly chili, and intercrop with red beans and cabbage. In Bulu Subdistrict, there are intercropped curly chili with cabbage, garlic, shallot, leeks, peanuts and lettuce and chili monoculture patterns. In Tlogomulyo subdistrict, chili is intercropped with corn and side by side with tomatoes. In Tembarak Subdistrict cayenne pepper and curly are intercropped with lettuce and some with shallot and peanuts. In the Selopampang District, curly chili is intercropped with cabbage and red beans.

In Temanggung Regency, shallots are planted in several districts including Kledung, Candiroto, Bulu, Tlogomulyo, Tembarak and Selopampang in October-December and harvested in January-March. There are monoculture pattern in Parakan, Kledung, Candiroto, Tlogomulyo, Tembarak and Selopampang Districts, while intercrop, overlapping and alternating (rotation) patterns with chili,
leeks, red beans, peanuts, corn or cabbage are planted in the subdistricts of Kledung, Ngadirejo, Tlogomulyo, Tembarak and Bulu. Bulu village implement an insertion cropping pattern. Chili and shallots are planted among coffee. The function of coffee is as a staple crop while the chili and shallots are inserted between the staple crops.

![Figure 6](image)

**Figure 6.** Monoculture shallots in Bulu sub-district (a), Intercropping of 2 plants in District Ngadirejo (b), Intercropping of more than 2 plants in District Bulu (c, d), pepper with coffee plants in District Bulu (e), Take turns in the district of Tembarak (f).

**Bangli Regency**
In Bangli Regency, chili is planted in Kintamani Subdistrict, in the Village of Songan B that has an altitude of 80-1200 meters above sea level with land topography including steep (slopes > 25%). In Songan B Village, cayenne pepper is intercropped with shallots, tomatoes or cabbage. Shallots and chilies are planted almost simultaneously. Shallots are planted first, after five days chilli are planted on the edge of the planting hole of shallot. Every bed consists of five rows of chili.

In Songan Village, Kintamani District, shallot can be planted in February-April, May-August and July-September. Shallots can grow well when watering therefore shallot is planted in November. If the season is is not suitable shallots growing, farmer’s plant large red chilies, tomatoes and cabbage.

The cropping patterns applied in Songan Village are shallot monoculture and shallot rotation with chili and tomatoes. Chilies are planted 25 days after planting shallots, while tomato are planted 60 days after the chili planted, when the shallots have been harvested.
Figure 7. Planting of monoculture chili (a) and monoculture shallot (b) in District Kintamani

Solok Regency
In Solok Regency, chili is planted once a year in upland or rice fields in various villages and subdistricts namely Lembang Jaya, Danau Kembar, Lembah Gumanti, Chili is grown monoculture or intercropping with other vegetable plants, and also side by side with other plants such as shallots, cabbage, carrots, tomatoes, beans or other vegetable crops. The topography of the location of chili plantations in Solok Regency is generally sloping but some are flat. Chili are planted in land with an altitude of more than 1,300 meters above sea level (Lembang Jaya, Danau Kembar, Lembah Gumanti, and Gunung Talang). Some are planted at an altitude of less than 1,000 meters above sea level, namely in the Junjung Sirih District.

In Nagari Salayo Tanang Bukit Sileh, Lembang Jaya District, chillies are planted in an intercropping pattern between chili and celery, chili with buncy onion, chili with sweet potatoes. In addition there are monocultures that are planted side by side with other vegetable crops such as tomatoes, carrots or beans. In the Danau Kembar District, there is intercropped curly chili with some shallots and some are planted side by side with cabbage and tomato plants. In Lembah Gumanti Subdistrict, the curly chili is not only intercropped with cabbage but also planted monoculture. In Gunung Talang Subdistrict, chillies are intercropped with leeks. In Junjung Sirih District, cayenne pepper was intercropped with shallots in the beginning, but after shallot was harvested, the cayenne pepper was as a monoculture crop.

In Solok Regency, shallots are also planted in Lembang Jaya District, Danau Kembar, Lembah Gumanti, Gunung Talang and Junjung Sirih. Shallots can be planted throughout the year. In Lembang Jaya District, there is some crop pattern in one year for example shallot can be planted three times with only one tillage. In the Danau Kembar, shallots are planted rotate with chilli which is planted after shallot harvesting. Another crop pattern, there is shallot which is planted twice intercropped with chilli. In Lembah Gumanti Subdistrict, the cropping patterns used are intercropping with other commodities such as chili, cabbage, potatoes and tomatoes. In Gunung Talang District, there are shallots, chili, tomato, leeks, shallots which are planted monoculture and can be cultivated three times a year. In Junjung Sirih District, there are shallot and chili plantations. Shallots can be planted 3 or 4 times a year. There is two times shallot’s planting that is continued with chili. Shallot and cayenne chilli are planted intercrop at the same time, or rotate of chilli after shallot harvesting.
In East Lombok Regency, chilli is planted in various villages and districts, namely Krongkong Village, Suralaga District, Sembalun Village, Sembalun District, and Pohgading Village, Pringgabaya District. The topography of the location of chilli planting in Krongkong Village, Suralaga Subdistrict and Pohgading Keacamatan Pringgabaya Village is flat to sloping, except Sembalun Village Sembalun Subdistrict which is classified as steep with the use of upland and rice fields with average altitude above 1171 meters above sea level (plateau). In the three Sub-districts of Suralaga, Sembalun and Pringgabaya, chilli fields are rotated with paddy with the intensity of planting once a year (IP 100).

The main plants in Kerongkong Village, Suralaga Subdistrict is chilli, grown out of season (rainy season). Chili is planted in the middle row while the tomatoes and cucumbers are planted in the edge of the beds. In Sembalun Village, Sembalun District, chili are intercropped with shallots and garlic. Chili is planted when garlic is 30-45 days after planted, while shallots are planted when garlic is 1-2 weeks after planted. In Pohgading Timur Village, Pringgabaya District, the main crops are chilli, tomatoes and tobacco. Chili is planted monoculture and intercrop with tomatoes or chili with tobacco. Chili and tomato are planted simultaneously. Likewise, intercropping chili with tobacco, chili and tobacco are also planted simultaneously. After the tomato or tobacco plants are finished harvesting, only the existing chilli plants will start production. The time to plant chilies or tomatoes depends on the market situation, generally planting is done in the rainy season (MH).

In East Lombok Regency shallots are planted in the lowlands namely Belanting Village, Sambelia District (25 m asl), Pringgabaya Village, Pringgabaya District (175 m asl), Sembalun Village Sembalun District (1,171 m asl). The topography for shallot planting in the district of East Lombok is flat (1% - 8%). In Belanting Village, Sambelia District, shallots are planted in April to May and harvested in September. Shallot are planted monoculture and intercropping patterns, rotate between shallots with chili. Chili is planted after shallot in 30 days after planted. Tobacco is planted after shallots harvesting. Then after tobacco is harvested, it is continued by planting corn or beans.
In Pringgabaya Village Pringgabaya District red shallots are planted in the dry season from April to September with a monoculture planting pattern. Sometimes shallots can be planted in September or October because the rain is not yet too heavy. In Sembalun Village Sembalun District shallot are generally interspersed with chili and garlic.

![Figure 9. Monoculture chilli plants (a), intercropping chili and shallot (b) in District Sembalun](image)

In Enrekang Regency, chilli is planted in various villages including Tongko Village Baroko District and Sumbang Village Curio District. The topography of the location of chilli planting in the village of Tongko has a flat to steep slope (25-40%), dry land with a height of 1273 m above sea level while Curio District is at an altitude of 740 - 1,098 m above sea level. In Tongko Village, Baroko and Sumbang, Curio, Chili can be planted throughout the year. The chilli cropping patterns are monoculture and some are intercropped between chili and shallot or between chili and cabbage. Chili and other vegetables (cabbage, tomatoes, leeks and shallots) are planted at the same time.

Shallots are widely planted by farmers in Anggeraja District, Pekalobean Village, Tampo Village, and Batunoni Village. Shallots are planted from the flat area, which starts from Tampo and Batunoni with an altitude of 528-882 m above sea level up to the plateau that is Pekalobian Village with an altitude of 1000 m above sea level in dry land.

In Pekalobean Village, shallots are generally planted twice a year, in the September-November and January-March periods. In the period between March and September other commodities such as red chili, cabbage, sweet corn and leeks are planted. Shallot can be planted continually if applied with technological innovation. The problem happened when shallot is planted in April due to uncertainty weather (cold temperature and very high rainfall). In the village of Tampo, shallots are planted in early October to early December, then in January to March. Other vegetables such as corn and chilli are planted in April. In Batu Noni Village the first shallot planting was carried out in November, the second planting is in February. After April the land is planted with corn, rice, cabbage and chili. The shallot cropping pattern adopted by farmers in Anggeraja District is monoculture in Pekalobean Village and Batu Noni Village, while in Tampo Village there is a shallot monoculture but some are intercropped with shallots with chili.
Intercropping or crop rotation usually follows the change of seasons related to the availability of water for planting. In Temanggung Regency, chili and shallot are planted in rotation with a rotation pattern that is almost the same in all districts and at the end of the rotation plants are always planted with tobacco. Shallots usually start to be planted at the beginning of the rainy season (October / November), chili start to be planted in January / February. Farmers in Temanggung and Solok Regencies do tillage for shallot intercropping only once or twice a year so that basic fertilizer needed can be reduced, and fulfilled when supplementary fertilizers are used to provide fertilizer for the first crop and subsequent crops. Costs and labor required are reduced because tillage is not needed on every planting in several planting times. In addition, agricultural facilities used can also be more efficient, for example black silver plastic mulch can only be used once for a whole year with alternating plants. Pest and disease control can also be done in an integrated manner for several types of plants.

4. Conclusion
Based on observations at eight production central it can be concluded that:

1. The cropping patterns applied can be grouped into chili monoculture, shallots monoculture, intercropping, overlapping, insertion and rotation between chili and /or shallot with other plants.
2. Temanggung Regency is the most complete area of cropping patterns, while Cirebon Regency is the least amount of cropping patterns applied.
3. From the observations in the eight production centers of chili and shallot, it is known that with various cropping patterns applied can increase land efficiency, save energy and costs for tillage, save costs for fertilizing, control plant pests and provide yields with several commodities varies. Therefore intercropping can be applied as an effort to increase land productivity for the production of chili and shallots.

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