Effect of Manure Fertilizer Dosage and Mulch Types to The Vegetative and Generative Growth Performance of Cayenne Pepper Crops in Klungkung Regency, Bali

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Abstract. Klungkung Regency is one of cayenne pepper centre producers in Bali. Mostly, cayenne pepper farming system in Klungkung Regency is done by applying traditional cultivation therefore cayenne pepper productivity in this regency still low. Agriculture technology dissemination such as the utilization of manure fertilizer is required to introduce to the farmers. The goal of this study was to understand the growth responses of cayenne pepper crop to the dosage of manure fertilizer application and mulch types. The research was conducted in July to December 2020 using Factorial Block Randomized Design with treatments were dosage of fertilizer manure namely 10ton/ha; 20 ton/ha; 30 ton/ha and mulch types namely straw and silver-on-black plastic mulch, replicated for 4 times. Parameters observed were plant height, stem diameter and branches amount during vegetative period and fruit weight, fruit length and fruit diameter during generative period. The results showed that interaction between dosage of manure fertilizer and mulch types significantly affected to overall parameters during vegetative and generative period except fruit diameter. Cayenne pepper growth was lower by application of 30 ton/ha of manure fertilizer compared to 10 ton/ha and 20 ton/ha. The utilization of silver black plastic mulch gives the better growth response than straw mulch.

1 Introduction

Agriculture sector has critical role as promising opportunities for economic growth in developing countries include Indonesia as an agrarian country supported by natural resource wealth. The Indonesian agriculture sector have made significant growth and promoted the transformation of agrarian economy. Therefore, increasing production in the agricultural sector is often one of the government's strategic policies in an effort to increase economic growth in Indonesia [1, 2]. One of the agricultural sectors with the high potential to be developed in Indonesia is the horticulture commodity sector. Indonesia's horticulture

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namely fruit and vegetable industry continuously to witness great growth in terms of local production for export and domestic market. As one of the horticultural commodities which intensively cultivated by farmers, the Indonesian Vegetable Crops Research Institute still established the chilli crops as major commodity in addition to red onion and potato.

Chilli has been known as one of the most famous commercial spice crops and are referred to as chile, hot peppers, bell peppers, chillies, red peppers, pod peppers, cayenne peppers, pimento, paprika and capsicum in other different part of the world. Chillies are most important ingredient in many different cuisines around the world particularly in Indonesia as it adds taste, flavour, pungency and colour to the dishes. As it is consumed daily, chilli is an indispensable spice in the kitchen as important condiment. It causes the demand for chilli production continuously increase every year and impact to the economic value of chilli became quite high and be most favourite commodity for farmers to be cultivated commercially [3, 4]. Unfortunately, Indonesian horticulture production include chillies still face critical issues due to the lack of farmer's knowledge on cultivation, post-harvest management, poor access of technology supporting and inconsistent or limited capital which influence on productivity and farmer's income [5].

One of the efforts to solve these issues is by applying low of chemical input cultivation technology such as technology innovation by The Indonesian Agency for Agricultural Research and Development namely Integrated Crop Management (ICM) technology. ICM is alternative crop production system which enhances and conserves natural resources while producing great quality food on economically viable and sustainable foundation. It emphasizes the combination of the traditional best method with appropriate modern technology for balancing the crops economic production with sustainable environment management [6]. The components of ICM technology in chilli cultivation according to Reference [6] include the application of manure fertilizer with the right dosage and the utilization of silver black plastic mulch.

Klungkung Regency is one of chilli centre producers in Bali Province particularly for cayenne pepper which has declared as horticulture commodities development area particularly for cayenne pepper. In other sides, cayenne pepper productivity in this Regency has not achieved yet optimum productivity or it can be said it is lower than cayenne pepper productivity for Bali regional and national. It is predicted due to the application of manure fertilizer dosage and utilization of mulch types which not suitable to the components of ICM technology for cayenne pepper cultivation. Furthermore, Klungkung regency also hold the role as the area for Bali cattle breeding. Cattle's population in Klungkung Regency achieved 42.745 heads or 7,85% of the population total. On other hand, farmers related raised their Bali cattle traditionally and handled the livestock waste management by unstandardized system therefore it can degrade the environment on and off the farm even though they have been done cage cleaning periodically [7]. The untreated solid waste may create negative seriously impacts to environment and human health such as land and water pollution, infectious livestock diseases, initiate the toxic certain chemical release, etc [8, 9]. Reference [10] stated that Bali cattle capable to produce 7.28 kg/day of their solid waste. The high solid waste produced (± 300 ton/kg/day for 42.745 head of Bali cattle) can potentially harmful to the environment if the system for storage and handling are unstandard. Meanwhile, this solid waste produced is one of good organic matter source for cattle breeding in Klungkung Regency. According to assumption of these causative factors, the implementation of ICM technology particularly manure fertilizer dosage and silver-on-black plastic mulch during cayenne pepper cultivation in Klungkung Regency is necessary to disseminate to the farmers related. This study aims to find out the implementation effect of manure fertilizer dosage and silver-on-black plastic mulch to the vegetative and generative growth performance of cayenne pepper crops.

2 Materials and methods

Research location was determined purposively namely in Subak Kacang Dawa, Gelgel Village, Klungkung District, Klungkung Regency, Bali Province by considering that this area is one of the selected areas for development of cayenne pepper horticultural commodities in Bali Province. Study was conducted in July to December 2020 by forming cooperation with related farmers in terms of utilization of their lands (0.3 Ha) and research implementation (*on farm research)*. This study utilized number of items namely cayenne pepper seeds, organic fertilizer, dolomite, N-P-K chemical fertilizer, silver-on-black plastic mulch, straw mulch, insecticide, organic pesticide and others.

Collected data consisted of primary data were obtained from observational study in experimental field namely agronomy performance of cayenne pepper crops such as plant height, stem diameter and number of branches measured during vegetative phase (30 and 60 Days After Plantation) and 5 fruits weight. Length fruit and diameter fruit during generative phase.

Table 1. Component of ICM technology for cayenne pepper cultivation in Subak Kacak Dawa, Gelgel Village, Klungkung District, Klungkung Regency, Bali in 2020.

Items	Component of technology
Variety	Klungkung local variety (Bontok)
Soil management	10-30 ton/ha of manure fertilizer were mixed with 2 ton/ha of dolomite at 1-2 weeks before planting. Seedbeds were formed with the width was 1-1,2 meter and height was 40-50 cm. N-P-K chemical fertilizer was used as basic fertilizer. Silver-on-black plastic mulch and straw mulch were applied on seedbeds
Planting system	Usually, farmers related practice intercropping system cayenne pepper crops with mustard green crops or balsam flowers. Farmers have cultivation habit by directly seed planting. Seed treatment was introduced to farmers namely seeds were soaked into insecticide liquid for 1 hour before planting. Seeds were planted with 70 cm x 50 cm of planting spacing
Fertilization	10-30 ton/ha of manure fertilizer and 300 kg/ha of N-P-K chemical fertilizer were applied before mulch application. Then, 300 kg/ha of liquid formed N-P-K chemical fertilizer was given once every 7-10 days on 2-2,5 months after planting
Pest Management	Practicing the seed treatments as described above, implementation of organic pesticide made from *Mirabilis jalapa* leaf extract to cayenne pepper crops on 1 month after planting, installation the yellow trap
Harvest and post-harvest management	Harvest was done gradually and only perfectly mature fruits were harvested which marked by the red completely of fruit

Study was arranged by Factorial Randomized Block Design replicated for three times to observe the agronomy performance of cayenne pepper crops with the treatments consisted of dosage of manure fertilizer (10 ton/ha; 20 ton/ha and 30 ton/ha) and mulch types (straw and silver-on-black plastic mulch) namely:

P1: 10 ton/ha of manure fertilizer dosage and straw mulch application

P2: 20 ton/ha of manure fertilizer dosage and straw mulch application
P3: 30 ton/ha of manure fertilizer dosage and straw mulch application
P4: 10 ton/ha of manure fertilizer dosage and silver-on-black plastic mulch
P5: 20 ton/ha of manure fertilizer dosage and silver-on-black plastic mulch
P6: 30 ton/ha of manure fertilizer dosage and silver-on-black plastic mulch

Cayenne pepper cultivation in this study was done by implementation of ICM technology as described in Table 1.

Data of cayenne pepper crops agronomy performance were calculated by using analysis of variance (ANOVA) and advance test by using *Duncan Multiple Range Test* at 5% significance level (5% DMRT) if P value > 0.005.

Then, revenue cost (R/C) ratio was analysed by following this equation:

$$\text{Revenue cost ratio} = \frac{\text{Income total (IDR)}}{\text{Total of production cost (IDR)}} \quad (1)$$

If R/C ratio > 1, it can be said that farming system related is feasible to be developed and if R/C ratio < 1, it is not benefited to be developed. Then, if R/C ratio = 1, farming system related is on break event point.

3 Result and discussion

3.1 The vegetative phase growth of cayenne pepper crops

Vegetative growth performance of cayenne pepper crops were observed twice namely 30 Days After Planting (DAP) and 60 DAP. Implementation of manure fertilizer dosage and different mulch types significantly effect on the growth of cayenne pepper crops during vegetative phase (Table 2) and generative phase except fruit diameter (Table 3). Application the 20 ton/ha of manure fertilizer and silver-on-black plastic mulch capable to greatly improve the crops growth performance namely plant height, stem diameter and number of branches up to 60 DAP (Table 2). At 30 DAP, cayenne pepper crops treated by P1, P2, P3 and P6 treatments had equal growth responses in plant height variable however they were significantly lower than cayenne pepper crops treated by P4 and P5 treatments. P5 treatments capable to increase the cayenne pepper growth therefore it created the highest of plant height up to 60 DAP (Table 2). In addition to plant height, P2 and P3 treatments consistently caused the cayenne pepper crops had the lowest of stem diameter and number of branches up to 60 HST (Table 2).

The cayenne pepper crops with P5 treatment showed the best growth responses to characteristic of stem diameter and number of branches up to 60 DAP however it produce the lowest of branches number at 60 DAP. The application of 30 ton/ha of manure fertilizer dosage precisely reduce the agronomy performance observed up to 60 DAP (Table 2). Plant height effect the branches level and number of branches formed [11]. Cayenne pepper crops were installed the silver-on-black plastic mulch showed the better growth responses than straw mulch (Table 2 and 3). Many studies have been reported the positively effect of silver-black plastic mulch application to the growth of horticulture crops compared to other mulch types such as study by Reference [12] which comparing with other coloured plastic mulch also organic mulch by Reference [13]. Increasing the crops growth performance by utilization of silver-on-black plastic mulch also occurred in potato crops and tomato crops [14, 15]. Silver-on-black plastic mulch capable to maintain the optimal soil temperature by reducing the rate of soil evaporation therefore soil moisture is maintained [16]. The temperature of soil under plastic mulch relies on the thermal properties of particular

material such as transmittance, absorptivity or reflectivity in relation to incoming solar radiation.

The use of silver black plastic mulch where the silver colour on the upper surface can reflect back incoming solar radiation to the crops canopy therefore the photosynthesis rate was increase. Black colour in silver-on-black plastic mulch absorbs most UV, infrared and visible light wavelengths of incoming solar radiation and re-radiates absorbed energy in the form of wavelength infrared radiation or thermal radiation. Most of the solar energy absorbed by black colour is loss to the atmosphere through radiation [17]. Reference [18] stated that silver-on-black plastic mulch is able to modify the balancing of soil nutrient and water required by crops and enhance the organic matter containing also slows down soil surface run off allowing longer infiltration time therefore water infiltration rate is increase and soil moisture will be higher. Root mass, root and shoot dry weights were significantly increased by plastic mulch which attributed to the resultant increase in nutrient uptake. Furthermore, plastic mulches can act as barrier against weeds, erosion, pest and disease incidence [11].

Table 2. Vegetative growth of cayenne pepper crops cultivated at Subak Kacang Dawa, Gelgel Village, Klungkung District, Klungkung Regency, Bali Province in 2020.

Treatments	30 DAP			60 DAP		
	Plant height (cm)	Stem diameter (cm)	Number of branches	Plant height (cm)	Stem diameter (cm)	Number of branches
P1	24.98±1.63a	5.58±0.44b	3.4±0.53bc	54.38±2.49a	16.01±1.42a	11.96±1.49a
P2	20.71±2.09a	4.82±0.63a	2.6±0.42ab	53.68±5.35a	15.87±0.32a	13.30±1.28ab
P3	20.92±2.70a	4.88±0.38a	2.1±0.24a	54.01±5.57a	15.84±0.63a	13.22±1.72ab
P4	29.62±5.37b	6.37±0.28c	5.62±1.17d	80.45±8.47c	20.55±0.87b	14.73±2.23c
P5	34.36±2.44c	7.63±0.17d	5.37±0.79d	94.28±10.50d	23.18±1.99c	12.52±1.59ab
P6	23.02±2.03a	6.11±0.61bc	3.95±0.41c	68.50±7.83b	20.29±1.72b	12.05±0.49a
Dosage factor						
10 ton/ha	27.29±4.14b	5.97±0.50b	4.51±1.36b	67.41±4.11ab	18.28±2.48a	13.34±2.14a
20 ton/ha	27.53±7.10b	6.22±1.46b	3.98±1.49b	73.97±1.54b	19.52±3.85a	12.91±1.30a
30 ton/ha	21.97±2.31a	5.49±0.75a	3.02±0.97a	61.25±2.33a	18.06±2.49a	12.63±1.24a
Mulch type factor						
Straw	22.20±2.72a	5.08±0.55a	2.70±0.64a	54.02±4.06a	15.90±0.79a	12.82±1.44a
Silver-on-Black mulch	28.99±5.60b	6.70±0.74b	4.98±1.04b	81.07±3.10b	21.34±1.90b	13.08±1.81a

Note: P1: 10 ton/ha of manure fertilizer and straw mulch; P2: 20 ton/ha of manure fertilizer and straw mulch; P3: 30 ton/ha of manure fertilizer and straw mulch; P4: 10 ton/ha of manure fertilizer and silver-on-black plastic mulch; P5: 20 ton/ha of manure fertilizer and silver-on-black plastic mulch; P6: 30 ton/ha of manure fertilizer and silver-on-black plastic mulch. Numbers followed by the same letters in same column were not significantly different at DMRT 5%.

3.2 The generative phase growth of cayenne pepper crops

In generative phase, parameters observed were 5 fruits weight, fruit length and fruit diameter. The heaviest of 5 fruits weight can be found in the cayenne pepper crops treated by P4 treatment followed by P5 treatment meanwhile the lowest belong to P1, P2, P3 and P6 treatments which tend to equal to each other. Chilies produced by the cayenne pepper crops with P5 treatment had significant lowest length than chilies by P2 and P6 treatments

(Table 3). The treatments combination applied was not affect to characteristic of fruit diameter of cayenne pepper crops meanwhile the differences of manure fertilizer dosage applied greatly affected to 5 fruits weight which the heaviest of fruits weight was created by application of 10 ton/ha of manure fertilizer dosage (Table 3). Fruits growth by cayenne pepper crops covered with silver-on-black plastic mulch were better than covered by straw mulch (Table 3). The use of silver-on-black plastic mulch can improve the physical, chemical and biological properties of the soil which will positively impact on the supplying of nutrients to plants for fruit formation and development [11].

Table 3. Generative growth of cayenne pepper crops cultivated at Subak Kacang Dawa, Gelgel Village, Klungkung District, Klungkung Regency, Bali Province in 2020.

Treatments	Parameters		
	5 Fruits weight (gram)	Fruit length (cm)	Fruit diameter (cm)
P1	7.91±0.66a	32.53±3.58ab	11.74±0.08a
P2	7.58±0.53a	36.51±0.46b	14.32±0.36a
P3	7.51±0.66a	30.34±1.99a	12.54±2.41a
P4	11.66±0.25c	34.84±1.68ab	13.69±0.91a
P5	10.14±0.54b	30.70±2.74a	12.82±1.67a
P6	8.40±0.45a	36.51±0.95b	13.09±1.41a
Dosage factor			
10 ton/ha	9.79±1.94b	33.68±3.58a	12.36±1.95a
20 ton/ha	8.86±1.39a	33.60±4.14a	13.54±1.35a
30 ton/ha	7.95±0.71a	33.43±4.00a	12.34±1.75a
Mulch type factor			
Straw	7.67±0.46a	33.12±4.06a	12.41±2.05a
Silver-on-Black mulch	10.07±1.47b	34.02±3.71a	13.09±1.41a

Note: P1: 10 ton/ha of manure fertilizer and straw mulch; P2: 20 ton/ha of manure fertilizer and straw mulch; P3: 30 ton/ha of manure fertilizer and straw mulch; P4: 10 ton/ha of manure fertilizer and silver-on-black plastic mulch; P5: 20 ton/ha of manure fertilizer and silver-on-black plastic mulch; P6: 30 ton/ha of manure fertilizer and silver-on-black plastic mulch. Numbers followed by the same letters in same column were not significantly different at DMRT 5%.

On other hand, result showed that application the manure fertilizer more than 20 ton/ha reduce the cayenne pepper crops growth performance (Table 2 and 3). It can be seen on the result of 5 fruits weight, fruits length and fruits diameter characteristic by application of 30 ton/ha of dosage manure fertilizer were significantly lower than 10 ton/ha namely 7.95 gram for 5 fruits weight; 33.43 mm for fruits length and 12.34 cm for fruits diameter and also all these characteristics were lower compared to 20 ton/ha of manure fertilizer dosage application even though it tends to equal based on statistics analysis (Table 3). This result as suitable with study by Hafizah [19] explained that 20 ton/ha was the best dosage of manure fertilizer to improve the growth and yield component of cayenne pepper crops. Soil nutrient requirement by crops depends on the availability of all the nutrients in the soil. The fertilization application should consider the aspects of the dose and nutrient balance, because if one nutrient is available in large amounts it can suppress the uptake of several other nutrients [20].

3.3 Economic analysis of cayenne pepper farming system

Economic analysis of cayenne pepper farming system in Klungkung Regency was found out that mostly farmers utilized Klungkung local varieties namely "Bontok" which made by their self from previous harvest. The utilization of cayenne pepper seeds required 15 kg of fresh fruits. It caused by the farmer's habits to directly plant the seeds into planting hole in seedbeds. These fresh fruits were dried until ready to be used as seed. Apart from seeds, farmers also used other farm inputs namely the manure fertilizer, chemical fertilizer, chemical pesticide and others.

The total of cayenne pepper farming system costs per hectare with the utilization of manure fertilizer (10 ton/ha) and silver-on-black plastic mulch was IDR 47,655,000,- consisted of farm inputs costs was IDR 27,855,000,- and labour honour was IDR 19,800,000,-. The high farming system costs was caused by the high farm input cost in form of 10 ton/ha manure fertilizer (IDR 1,300,-/kg). The productivity of cayenne pepper crops cultivated by implementation of 10 ton/ha manure fertilizer and silver-on-black plastic mulch was 5.92 ton/ha. With assumption that the price selling market of cayenne pepper was IDR 20,000,-/kg, cayenne pepper farming system cultivated by implementation of 10 ton/ha manure fertilizer and silver-on-black plastic mulch created the farming system income was IDR 118,400,000,- (Table 4).

Table 4. Analysis of cayenne pepper farming system per hectare with the utilization of manure fertilizer (10 ton/ha) and silver-on-black plastic mulch in Klungkung Regency.

No.	Components	Amount	Unit	Unit Price (IDR)	Total Cost (IDR)
I.	Farm Inputs				
1.	Fresh cayenne pepper seeds	15	kg	25,000	375,000
2.	Manure fertilizer	10,000	kg	1,300	13,000,000
3.	NPK fertilizer	400	kg	13,000	7,800,000
4.	Dolomite fertilizer	2,000	kg	1,000	2,000,000
5.	Silver-on-black plastic mulch	10	roll	450,000	4,500,000
6.	*Gandasil* trademark (foliar fertilizer)	4	pcs	45,000	180,000
	Total cost of farm input				**27,855,000**
II.	Labor costs				
1.	Seed nursery	-	Worker's day	70,000	-
2.	Tillage	100.00	Are	65,000	6,500,000
3.	Planting	25.71	Worker's day	70,000	1,800,000
4.	Weeding	42.86	Worker's day	70,000	3,000.000
5.	Fertilizartion	46.43	Worker's day	70,000	3,250,000
6.	Pesticide Spraying	6.43	Worker's day	70,000	450,000
7.	Harvesting	68.57	Worker's day	70,000	4,800,000
	Total cost of labor				**19,800,000**
III.	**Total input cost**				**47,655,000**
IV.	**Revenue**	**5,920.00**	**kg**	**20,000**	**118,400,000**
V.	**Profit**				**70,745,000**
VI.	**R/C Ratio**				**2.48**

Based on Table 4, the profit of cayenne pepper farming system per hectare with the utilization of 10 ton/ha manure fertilizer and silver-on-black plastic mulch was IDR 70,745,000,- and create the R/C ratio was 2.48 therefore it can be assumed that cayenne pepper farming system conducted in Klungkung Regency with the utilization of 10 ton/ha manure fertilizer and silver-on-black plastic mulch was feasible to be implemented. This result was suitable to study by Reference [21] that R/C ratio value in cayenne pepper farming system at Purwaja Village was 2.07 and categorized as feasible. The R/C ratio was 2.48 in these cayenne pepper farming system indicate that each IDR 1,000,- of investment expense will result in profit of IDR 1,480,-.

Meanwhile, cayenne pepper farming system with the utilization of manure fertilizer (10 ton/ha) and straw mulch expensed IDR 40,571,000,- consisted of farm input costs was IDR 20,771,000,- and labour costs was IDR 19,800,000,-. The high farming system costs was caused by the high farm input cost in form of 10 ton/ha manure fertilizer (IDR 1,300,-/kg). The productivity of cayenne pepper crops cultivated by implementation of 10 ton/ha manure fertilizer and straw mulch was 3.55 ton/ha. With assumption that the price selling market of cayenne pepper was IDR 20,000,-/kg, cayenne pepper farming system cultivated by implementation of 10 ton/ha manure fertilizer and straw mulch created the farming system income was IDR 71,000,000,- (Table 5).

Table 5. Analysis of cayenne pepper farming system per hectare with the utilization of manure fertilizer (10 ton/ha) and straw mulch in Klungkung Regency.

No.	Components	Amount	Unit	Unit Price (IDR)	Total Cost (IDR)
I.	Farm Inputs				
1.	Fresh cayenne pepper seeds	15	kg	25,000	375,000
2.	Manure fertilizer	10,000	kg	1,300	13,000,000
3.	NPK fertilizer	400	kg	13,000	5,200,000
4.	ZA fertilizer	100	kg	2,500	250,000
5.	Straw mulch	10	Pick up	150,000	1,500,000
6.	Pesticides	7	Bottle	38,000	266,000
7.	*Gandasil* trademark (foliar fertilizer)	4	pcs	45,000	180,000
	Total cost of farm input				**20,771,000**
II.	Labor costs				
1.	Seed nursery	-	Worker's day	70,000	-
2.	Tillage	100	Are	65,000	6,500,000
3.	Planting	25.71	Worker's day	70,000	1,800,000
4.	Weeding	42.86	Worker's day	70,000	3,000,000
5.	Fertilizartion	46.43	Worker's day	70,000	3,250,000
6.	Pesticide Spraying	6.43	Worker's day	70,000	450,000
7.	Harvesting	68.57	Worker's day	70,000	4,800,000
	Total cost of labor				**19,800,000**
III.	**Total input cost**				**40,571,000**
IV.	**Revenue**	**3,550**	**kg**	**20,000**	**71,000,000**
V.	**Profit**				**30,429,000**
VI.	**R/C Ratio**				**1.75**

Based on Table 5, the profit of cayenne pepper farming system per hectare with the utilization of 10 ton/ha manure fertilizer and straw mulch was IDR 30,429,000,- and create the R/C ratio was 1.75 therefore it can be assumed that cayenne pepper farming system conducted in Klungkung Regency with the utilization of 10 ton/ha manure fertilizer and straw mulch was feasible to be implemented. The R/C ratio was 1.75 in these cayenne pepper farming system indicate that each IDR 1,000,- of investment expense will result in profit of IDR 1,750,- According to Table 4 and Table 5, it can be concluded that the utilization of silver-on-black plastic mulch obtained the higher profit than straw mulch, so do the R/C ratio therefore it more feasible to be implemented than straw mulch.

4 Conclusion

The growth performance of cayenne pepper crops both in vegetative and generative phase tend to decrease when it was applied with 30 ton/ha of manure fertilizer. Meanwhile, implementation the 10 ton/ha and 20 ton/ha of manure fertilizer effected equally to plant height, stem diameter and number of branches during vegetative phase and fruit length also fruit diameter during generative phase however it significantly affected to 5 fruits weight. Installation the silver-on-black plastic mulch create the greater growth performance of cayenne pepper crops than straw mulch. Furthermore, the cayenne pepper crops cultivation by implementation of silver-on-black plastic mulch was more feasible to be implemented than straw mulch and also create higher profit than straw mulch.

Based on result obtained, farmers were suggested to application the 10-20 ton/ha of manure fertilizer dosage and replace the straw mulch to silver-on-black plastic mulch in order to enhance the cayenne pepper crops productivity. Furthermore, the implementation of overall ICM technology component of cayenne pepper cultivation also was recommended to be implemented by farmers to obtain the maximum productivity of cayenne pepper crops.

Acknowledgement. We would like to thank Bali Assessment Institute for Agricultural Technology for funding this research.

Author contribution statement. All authors were main contributors in research implementation and creating the manuscript. Anella Retna Kumala Sari, Eko Nugroho Jati and Yusti Pujiawati contribute to the creating research design, research implementation, data collecting, data analysis, drafting the manuscript until officially published. Jemmy Rinaldi as people in charge of this research. I Ketut Mahaputra as field coordinator and Nyoman Ngurah Arya as co-field coordinator during research implementation. Ni Wayan Trisnawati contribute to help the tasks of people in charge of this research.

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