



Implementation of hybrid tomatoes as an effort to increase tomato harvest production

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ABSTRACT

Tomatoes are a horticultural commodity that is widely cultivated, especially in Bandung Regency. Tomato plants are widely cultivated because they have a fairly high economic value and are in demand by the community because of their many health benefits, among them are vitamin and antioxidant content. Currently, tomato production is declining, so education and assistance are needed to increase the potential for results. The target of this activity is tomato farmers in four sub-districts in Bandung Regency. The purpose of this activity is to increase farmers' knowledge in cultivating hybrid tomatoes at various altitudes. The activity started with counseling, field practice, and evaluation of the results of the activity. As a result of this activity, farmers have additional knowledge in appropriate technology for tomato plants in their respective locations. After the evaluation process, tomato production increased significantly, both in terms of quantity and quality, so it had a positive impact on the economic welfare of farmers.

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1. INTRODUCTION

Tomatoes (*Solanum lycopersicum*) are one of the horticultural commodities that are widely cultivated in Indonesia, including in Bandung Regency. Tomato plants are widely cultivated because they have high economic value so they can be used as an alternative source of income for farmers (Scarano et al., 2020; Septiadi & Nursan, 2021). Tomatoes to be used as food ingredients or side dishes (Nurroniah et al., 2023). Tomatoes are a source of vitamins A and C and also contain several minerals needed by the body such as potassium, phosphate, and calcium. Tomatoes have a very strong antioxidant effect called lycopene (Gholami et al., 2021; Hadi, 2023). Lycopene's function is to effectively regulate free radicals which helps prevent cardiovascular disease (Górecka et al., 2020). The many uses and benefits of tomatoes increase demand every year.

Partners in this activity are tomato farmers located in four sub-districts in Bandung Regency, namely Ciwidey District, Arjasari District, Paseh District, and Solokan Jeruk District. Ciwidey District and Arjasari District are at an altitude of 1,262 masl and 909 masl respectively (highland category), while Paseh District and Solokan Jeruk District are at an altitude of 689 masl and 670 masl respectively

(medium plain category). Tomato cultivation at partner locations has decreased. The decrease in tomato yields due to Tomato Yellow Leaf Curl Virus (TYLCV) attacks occurs in partners, differences in altitude and lack of assistance can be one of the causes of decreased tomato production. The increase in demand for tomatoes is inversely proportional to production. According to data from the Badan Pusat Statistik (2024), production results from tomato plants in the last 4 years between 2020-2023 periods have decreased every year with annual figures of 299,267 tons, 292,309 tons, 272,961 tons, and 268,073 tons. Apart from decreasing production, farmers also experience problems with tomato cultivation, namely pathogen attacks and one of them is the Tomato Yellow Leaf Curl Virus (TYLCV), which is included in the Gemini Virus group.

A decline in tomato production needs to be anticipated so that people's needs for tomatoes can still be met. One of the crucial things that needs to be paid attention to is farmers' habits in using varieties of tomato seeds. The use of superior varieties is one of the keys to success in increasing production on the same land area. Superior varieties are a reliable innovative technology for increasing plant productivity, through increasing production potential and tolerance to biotic and abiotic stresses (Barokah et al., 2021). One of the recommended superior varieties is Mito F1. Mito F1 is a tomato cultivar released by PT. Prabu Agro Mandiri. This cultivar is capable of producing up to 3 kg of fruit per plant or up to 90 tons per hectare if a population of 30,000 plants per hectare is used. Apart from the high level of production, this tomato plant is claimed to have good resistance to yellow virus attacks which often attack tomato plants. Resistance to this virus provides an advantage for the Mito F1 cultivar in maintaining high yields at the field level so that the desired production potential can be achieved.

This activity aims to increase farmers' knowledge in cultivating hybrid tomatoes at various altitudes. It is hoped that increased knowledge can help farmers increase tomato yield potential and meet market demand.

2. METHODS

This activity was carried out from April to June 2024. The methods used in this activity were discussion, counseling, field practice, and activity evaluation (Sartika & Cahyani, 2023). The location of the activity is in Ciwidey District, Arjasari District, Paseh District, and Solokan Jeruk District, Bandung Regency (Figure 1).

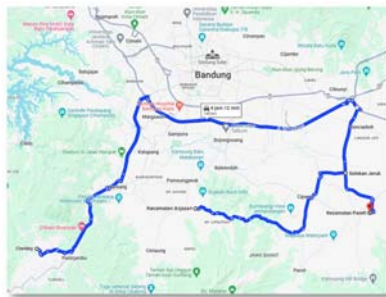


Figure 1. Partner location map

Discussion, counseling, field practice, and activity evaluation activities are carried out in each sub-district. Data collection activities were carried out in discussions, counseling, and field practice activities at designated sub-district locations in Bandung district. Each activity at the partner location was attended by twenty tomato farmers.

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Komar Bahtiar, Resti Fajarfika, Hanny Hidayati Nafi'ah

Discussion

Discussion is a method carried out to exchange information and also convey opinions between partners and servants. Discussions were held before the extension activities were carried out. Discussions were held to absorb information and problems experienced by farmers as partners.

Counseling

The extension activity was attended by 20 farmers. Extension is based on the results of discussions on problems faced by farmers and the presentation of material related to solving these problems. Counseling is carried out through demonstration, namely explaining the cultivation of hybrid tomatoes at various altitudes verbally, accompanied by pictures and practice so that it is easier for the target to understand the material provided by the instructor or service provider.

Field Practice

Field practice was carried out on one of the farmers' land with a land area of around 1400 m². Field practice begins with cultivating the land at the same time as sowing tomato seeds. Next, planting, maintenance, and harvesting of tomatoes are carried out. During field practice, farmers are given education regarding maintenance methods, including fertilization, irrigation, weeding, and integrated control of plant pest organisms. Field practice was carried out during one tomato growing season.

Evaluation of Activities

Evaluation of activities is carried out in the same place as counseling is carried out for this activity, farmers are invited to discuss what they got during field practice activities.

3. RESULTS AND DISCUSSION

The extension activities at each location were attended by 20 tomato farmers (Figure 2). Locations for discussions are usually held on farmers' land. The farmers who attended were very enthusiastic in discussing and conveying what obstacles they encountered in tomato cultivation in particular. From the results of the counseling, data on the majority of obstacles during cultivation were obtained as listed in Table 1.



Figure 2. Discussion activities with tomato farmers

Table 1. Results of discussion of obstacles during cultivation

Location	Constraints during tomato cultivation
Ciwidey District	Leaf curl virus attack and flower loss
Arjasari District	Leaf curl virus attack and flower loss
Paseh District	Leaf curl virus attack and flower loss
Sokan Jeruk District	Curly virus attack

The obstacle experienced by farmers is the attack of the leaf curl virus which is spread through vectors such as the whitefly *Bemisia tabaci* (Hidayat et al., 2020). This pest is the main pest of tomato plants which is always present in crops, especially during the dry season. The conditions of planting areas with heterogeneous commodities such as chilies, potatoes, cucumbers, eggplants, and beans plus different plant ages make it difficult to control whitefly pests. This is because the status of the pest in each plant is different so farmers also apply different control methods and strategies making it difficult to break the cycle of this pest. Coupled with the ability to move or migrate between regions, countries, and even continents (Crossley & Snyder, 2020). This pest can appear suddenly in tomato planting areas.

Field practice activities are carried out at each location with a land area of around 1400 m². In the field practice process, farmers are taught about handling seeds, applying fertilizer, controlling pests, how to prune stems and fruit, and how to harvest well (Figures 3 and 4). This field practice activity produced tomatoes which can be seen in Table 2.



Figure 3. Process of caring for tomatoes

Figure 4. Tomatoes ready to harvest

Table 2. Average potential yield per tree (kg) at different altitudes

Subdistrict	Altitude (m Above Sea Level)	Yield per Tree (Kg)
District Ciwidey	1,262	2.50
District Arjasari	909	2.50
District Paseh	689	2.40
District Orange Soak	670	2.90

Evaluation of activities carried out after field practice can be seen in Table 3. This evaluation activity was carried out at each location. Evaluation is carried out by looking at farmers' abilities and knowledge in aspects of cultivation, especially in handling seeds and maintaining plants, so that tomatoes with high yield potential are obtained.

Implementation of hybrid tomatoes as an effort to increase tomato harvest production

Komar Bahtiar, Resti Fajarfika, Hanny Hidayati Nafi'ah

Table 3. Evaluation of activities to increase potential tomato yields

Subdistrict	Indicator(s)	Result(s)
District Ciwidey	Understanding of seed handling	Very good
	Understanding fertilizer application	Good
	Understanding of controlling pests	Good
	Understanding how to prune stems and fruit	Very good
	Understanding how to harvest well	Very good
District Arjasari	Understanding of seed handling	Very good
	Understanding fertilizer application	Very good
	Understanding of controlling pests	Good
	Understanding how to prune stems and fruit	Good
	Understanding how to harvest well	Very good
District Paseh	Understanding of seed handling	Good
	Understanding fertilizer application	Good
	Understanding of controlling pests	Good
	Understanding how to prune stems and fruit	Very good
	Understanding how to harvest well	Very good
District Solokan Jeruk	Understanding of seed handling	Very good
	Understanding fertilizer application	Very good
	Understanding of controlling pests	Very good
	Understanding how to prune stems and fruit	Very good
	Understanding how to harvest well	Very good

The evaluation results in Table 3 show that the level of understanding of farmers with very good results in Ciwidey District, Arjasari District, Paseh District, and Solokan Jeruk District is 60%, 60%, 40%, and 100% respectively. The highest percentage is in Solokan Jeruk District, and the lowest is in Paseh District. Looking at the tomato yields obtained in Table 2, Solokan Jeruk District has the highest tomato yields, this is directly proportional to the farmers' understanding ability which shows very good results. Farmers who understand how to cultivate tend to increase the potential yield of plants. Apart from farmers' understanding, altitude also affects tomato yields (Tsagaye & Alemu, 2021). The height of the place affects the air temperature and light intensity. The temperature and light intensity will decrease with increasing height in the growing area (Istiawan & Kastono, 2019). Reduced temperature and light intensity can inhibit growth because the photosynthesis process is disrupted.

Apart from the suitability of the cultivation location to the genetic characteristics of the plants planted, plant pests are another factor that limits tomato production in the support area. One of the pest attacks that reduces tomato yields is a virus attack. Tomato Yellow Leaf Curl Virus (TYLCV) is a virus that attacks tomato plants, also called the Geminivirus. Geminivirus infection can cause significant yield losses in tomato plants in both tropical and subtropical regions throughout the world (Al-Abedy et al., 2021; H. El-Sappah et al., 2022). In Indonesia, Geminivirus infection in tomatoes is known as yellow leaf curl disease, the TYLCV infection rate is estimated to range between 90 -100% with an average of 85% (Mandali & Vijayalakshmi, 2020). Symptoms of TYLCV attack include stunted plants, the direction of branches and leaf stalks tend to be upright, small leaves, puckered and concave, and leaf edges with or without yellow color (Prahasti et al., 2024). TYLCV transmission is aided by a vector, namely the

whitefly *Bemisia tabaci* (Hidayat et al., 2020). Many control efforts are made against viral vectors using insecticides, but this method is less effective in suppressing disease attacks.

The use of resistant varieties is an integrated pest control method that has advantages compared to control using insecticides. Planting resistant varieties can not only reduce losses by pathogens but also reduce the cost of using insecticides. Reducing the use of insecticides can avoid environmental contamination with toxic chemicals.

Apart from the factors that influence the results above, farmers' understanding and knowledge play a role in producing high and quality tomato production. Based on a conventional point of view, farming can be studied partially by various agricultural sub-disciplines such as agronomy, soil science, pest science, agricultural technology, fisheries, animal husbandry, agricultural socio-economics, nutrition, and others. However, in contrast to academic knowledge which is partial/specialist and abstract, farmers' knowledge in carrying out their farming business is holistic and integrates all knowledge from these academic disciplines.

High knowledge influences productivity. Having good knowledge about something will encourage changes in behavior in individuals. Knowledge about the benefits of something will cause someone to behave positively towards that thing and vice versa. Knowledge about the existence of a technology is very important because when farmers know about it, there will be a willingness to apply it. This is closely related to the role of researchers, extension workers, and related agencies ranging from technology socialization to technology assistance in the field.

4. CONCLUSION AND RECOMMENDATIONS

This community service program aims to provide new skills and knowledge training to participants who are tomato farmers in Bandung district in the Ciwidey, Arjasari, Paseh, and Solokan Jeruk sub-districts. Community service activities for tomato farmers using the Mito F1 variety succeeded and achieved the expected results. There is an increase in farmers' knowledge and skills in more effective cultivation techniques. Through intensive training and assistance, farmers can optimize the use of this superior variety, which has proven to be more resistant to yellow virus attacks at altitudes that are more suited to tomato genetics. Tomato production increased significantly, both in terms of quantity and quality, thus having a positive impact on the economic welfare of farmers.

For future farmers and community servants, it is recommended to continue to increase collaboration in updating cultivation techniques and pest control through regular training and continuous monitoring. Farmers are expected to not only rely on the Mito F1 variety but also try other varieties to reduce the risk of crop failure. Community service should strengthen farmer groups, provide access to the latest technology, and involve the government in providing policy support and financial assistance. In addition, focusing on improving marketing and product distribution networks will help farmers sell their crops at more competitive prices so that their welfare can continue to increase.

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Implementation of hybrid tomatoes as an effort to increase tomato harvest production

Komar Bahtiar, Resti Fajarfika, Hanny Hidayati Nafi'ah

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