AgriHealth
Journal of Agri-food, Nutrition and Public Health
ISSN 2722-0656 (Print) 2722-0648 (Online)

AgriHealth: Journal of Agri-food, Nutrition and Public Health. 3(1), 39-46, 2022
URL: https://jurnal.uns.ac.id/agrihealth/article/view/60187
DOI: http://dx.doi.org/10.20961/agrihealth.v3i1.60187

Horticultural Crop Cultivation based on Verticulture with Utilization of Waste Materials in Jati Village, Sumberlawang Sub-district, Sragen Regency

Pinasti Dwi Utami[1*], Hilda Putri Mauludiyah[2], Bramesvia Ravinka[3], Arisma Ria Ramadhani[4], Damian Paska Santyo Brahman[5], Dea Ramadani[5], Dwi Indah Lestari[6], Bayu Ardhy Putra[7], Chusnul Khotimah[8] dan Evi Gravitiani[9]

[1]Department of Soil Science, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Indonesia; [2]Department English Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia; [3]Department of Interior Design, Faculty of Art and Design, Universitas Sebelas Maret, Surakarta, Indonesia; [4]Department of Development Economics (Transfer), Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia; [5]Department of Civil Engineering, Faculty of Engineering, Universitas Sebelas Maret, Surakarta, Indonesia; [6]Department of Biology Education, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia; [7]Department of Animal Science, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Indonesia; [8]Department of Indonesian Literature, Faculty of Cultural Science, Universitas Sebelas Maret, Surakarta, Indonesia, [9]Department of Development Economics, Faculty of Economics and Business, Universitas Sebelas Maret, Surakarta, Indonesia

Received: March 20, 2022; **Accepted**: April 16, 2022

Abstract

Meeting food needs is one of the main problems for a country. Cultivation of horticultural crops with verticulture techniques is one form of activity that can be a way to meet food needs. The crop yield can be used for personal consumption and sold as a source of additional income for households. The verticulture is made from waste which are used as containers or pots and then planted with chili and mustard plants. This activity aims to improve skills, creativity, meet food needs and use empty land that can add aesthetic value. Participants consisted of 27 heads of neighborhood, the women's association for family welfare development (Pembinaan Kesejahteraan Keluarga, PKK) and Youth Organizations in Jati Village, Sumberlawang District, Sragen Regency, Sragen, with 46 participants of various ages. The activity was guided and carried out by the UNS 65 KKN team with enthusiasm and enthusiastically welcomed by the participants. The evaluation was carried out by interviewing several participants. The response showed that the activity was carried out well and the knowledge conveyed was also well received. Based on the results of these interviews, it can be seen that around 85% of participants can understand the socialization and practice of verticulture cultivation well.

Keywords: agricultural extension; agriculture; demonstration; food; planting

* ***Corresponding author****:* dwipina99@student.uns.ac.id

Cite this as*:* Utami, P. D., Mauludiyah, H. P., Ravinka, B., Ramadhani, A. R., Brahman, D. P. S., Ramadan, D., Lestari, D. I., Putra, B. A., Khotimah, C., & Gravitiani, E. (2022). Horticultural Crop Cultivation based on Verticulture with Utilization of Waste Materials in Jati Village, Sumberlawang Sub-district, Sragen Regency. *AgriHealth: Journal of Agri-food, Nutrition and Public Health*, *3*(1), 39-46. doi: http://dx.doi.org/10.20961/agrihealth.v3i1.60187

Budidaya Tanaman Hortikultura berbasis Vertikultur dengan Pemanfaatan Barang Bekas di Desa Jati, Kecamatan Sumberlawang, Kabupaten Sragen

Abstract

Pemenuhan kebutuhan pangan menjadi salah satu permasalahan utama bagi suatu negara. Budidaya tanaman hortikultura dengan teknik vertikultur menjadi salah satu bentuk kegiatan yang dapat menjadi cara dalam pemenuhan kebutuhan pangan. Hasil pangan yang dipanen dapat dimanfaatkan untuk konsumsi pribadi begitu pula dapat diperjualbelikan. Hasil dari jual beli tanaman tersebut menjadi salah satu sumber pendapatan tambahan bagi rumah tangga. Praktek pembuatan vertikultur ini berbahan dasar barang bekas yang dijadikan wadah atau pot kemudian ditanami tanaman cabai dan sawi. Kegiatan ini bertujuan untuk meningkatkan keterampilan, kreativitas, pemenuhan kebutuhan pangan, pemanfaatan lahan kosong dan menambah nilai estetika. Kegiatan diikuti oleh 27 ketua RT, perkumpulan ibu PKK (Pembinaan Kesejahteraan Keluarga) serta Karang Taruna Desa Jati, Kecamatan Sumberlawang, Kabupaten Sragen. Kegiatan dihadiri oleh 46 peserta yang terdiri dari berbagai umur. Kegiatan dipandu dan dilaksanakan oleh tim KKN UNS 65 dengan semangat dan disambut antusias peserta kegiatan. Evaluasi dilakukan dengan mewawancarai beberapa peserta kegiatan dengan respon bahwa kegiatan terlaksana dengan baik dan ilmu yang telah disampaikan dapat diterima dengan baik pula. Berdasarkan hasil wawancara tersebut dapat diketahui sekitar 85% peserta dapat memahami sosialisasi dan praktek budidaya vertikultur dengan baik.

Kata kunci*: demonstrasi; pangan; penanaman; penyuluhan pertanian; pertanian*

INTRODUCTION

The demand for vegetable commodities in Indonesia continues to increase. Population growth affects the increase in consumption per capita (Kusmiati and Solikhah, 2015). Furthermore, the public wants high-quality horticulture products that are suitable for human consumption. The issue of food security resurfaced when hit by prolonged natural disasters such as the dry season, the water crisis and rainy season floods so food insecurity will happen. Still, concern it is quite safe and controllable (Rusdiana and Maesya, 2017). The increasing production of vegetables abroad and the rise of imports of food, especially vegetables, indicate that the fulfillment of market demand for vegetables in the territory of Indonesia is still lacking or has not been able to be fulfilled by producers (Utami et al., 2020). If this continues without a resolution, Indonesia will continue to depend on horticulture imports from abroad. Vegetable consumption in Indonesia in 2010 was 37.30 kg capita^{-1} year^{-1}. This is still lower than the minimum requirement recommended by FAO, which is 65 kg capita^{-1} year^{-1}. On the other hand, vegetable production is still lower than consumption, which is 35.30 kg capita^{-1} year^{-1} (Directorate of Horticulture, 2011). According to BPS (2014), food production results are produced by farmers in each region in Indonesia. Farmers are the spearhead progress of the nation. If farmers do not do business and agricultural land productivity ones are decreasing. In that case, the Indonesian people will be more impoverished, so that food insecurity more will happen. Estimated food insecurity in Indonesia in 2013 was around 45% and in 2045 around 50% (Rusdiana and Maesya, 2017). Based on this, it can be seen that the production of horticultural crops is still wide open to meeting the food needs of the Indonesian people (Prabowo, 2016). Therefore, as an agrarian country where most of the population works in agriculture, Indonesia depends on the farmers' success to support food security in Indonesia (Suratha, 2015).

Agricultural development has a strategic role in anticipating unemployment. The role of all family members in the farming process is an absolute effort to prevent unemployment (Puspitasari et al., 2013). The role of women in sustainable agriculture is very compatible with the application of easy and environmentally friendly agriculture. Utilization of narrow land and recycled waste can be used for cultivation activities. One technique that can be applied is verticulture. Verticulture can be interpreted

as a vertical plant cultivation technique or it can be said as a form of stratified planting. The Verticulture system does not require a large area of land (Kusumo et al., 2020). Verticulture techniques can be applied to a narrow home page (Dwiratna et al., 2017).

This verticulture planting technique allows for gardening by utilizing space efficiently and adding aesthetic value with various colors of plants (Oelviani, 2015). Some people think that the verticulture is complicated, but in fact this cultivation technique is very simple. The level of complexity of the verticulture depends on the model used. Simple verticulture models usually also use simple and accessible materials to obtain.

Horticultural crops are suitable for cultivation using verticulture techniques. Some horticultural crops usually have a high selling value, short-lived or annual crops and have a root system that is not extensive (Rauf and Rahmawaty, 2013). Planting seeds for this verticulture technique is not much different from conventional way. Before the planting process, it would be better to know the characteristics of the plant.

This vertical horticultural cultivation technique has not been applied by the women or people of Jati Village, because the local people do not know about the technique. The application of this cultivation technique is very beneficial for families, including reducing household expenses in meeting food needs (Surtinah and Nurwati, 2018). Based on these conditions and situations, we provide training and assisting the people in making verticulture media along with several horticultural plants. This is expected to create the skills of local people in utilizing waste materials and using narrow land. In addition, farm management is also needed that can be carried out through counseling so that follow-up activities can continue to be carried out (Kurniasih et al., 2013).

This activity aims to improve the skills and creativity of participants in carrying out planting activities properly and can provide benefits and good aesthetic value. This activity can be carried out easily so that participants are very interested in applying verticulture techniques. Planting horticultural crops is considered capable of generating the community's economy if appropriately managed. The low cost of manufacture and maintenance adds to the positive points in implementing the verticulture. It is hoped that the community will continue to apply this cultivation in order to reduce the market demand for horticultural crops for food (Abu and Soom, 2016).

MATERIAL AND METHODS

The socialization activity and practice of verticulture-based horticultural cultivation by utilizing waste materials as planting media was carried out in Gulan Hamlet, Jati Village, Sumberlawang Sub-district, Sragen Regency. This activity involved participants from various ages, such as 27 heads of neighborhoods in Jati Village, representatives from women's association for family welfare development (*Pembinaan Kesejahteraan Keluarga, PKK*) of 14, 15, 16 and 17 neighborhoods Hamlet of Gulan, Jati Village, Sumberlawang Sub-district, Sragen Regency and 15 youth organization members of Sendangrejo Hamlet. This activity was held on Saturday, February 5, 2022.

The cultivation of verticulture-based horticultural crops by utilizing waste materials is carried out by socialization and demonstration methods. The UNS 65 KKN team had already distributed invitations to participants who targeted of this socialization and practice activity. There are 3 stages in the implementation of this activity. The first stage is the preparation stage, where the UNS 65 KKN team surveyed the location of the activity, surveyed horticultural seeds that are suitable for Jati Village, observed and interviewed village apparatus regarding the implementation of the activity and collected data on local people who targeted this activity. The second stage is the implementation of activities with socialization. The socialization was carried out by one of the UNS 65 KKN team from the Department of Soil Science. The socialization activity contains the delivery of material, including the definition of verticulture, the benefits of verticulture and examples of verticulture implementation, which have been widely developed by the community (Oelviani and Utomo, 2015).

The third stage is demonstration. The demonstration method is one of the learning strategies by showing how the process and how things work (Melyaniet al., 2017). This demonstration activity is making vertical designs by using waste materials such as plastic bottles and planting vegetable seeds. The design and

planting of vegetable seeds were carried out by several representatives of the participants.

This activity was attended by 46 participants, where this number is the maximum limit that has been set, considering this activity was carried out during a pandemic. Activities are carried out by implementing strict health protocols. Participants who attend must wear masks, wash their hands first, spray with hand sanitizer and check body temperature. participants who attended were given education about the tools and materials to be used. The equipment includes plastic bottles, shovels, buckets, wire, planting media (soil, manure) and plant seeds, such as chili and mustard. The UNS 65 KKN team then displayed a collection of photos used as examples of how to apply verticulture using used plastic bottles. The steps in this activity are explained orally and then practiced by the UNS KKN team before being followed by participants. The success of the activity can be seen in the number of invitees who attended. The activity's success was also assessed from interviews with several participants, the results of which were used as material for evaluating activities. The interview relates to the participant's ability to understand the process of horticulture cultivation using verticulture and its benefits.

RESULT AND DISCUSSION

Jati Village is located in Sumberlawang Sub-district, Sragen Regency, Central Java. The location of the village is quite strategic because it is close to Sumberlawang, Gabugan, and Tanon as economic, administrative and public health centers. This village has complete supporting facilities, such as Village Office, Village Hall, Kindergarten, Elementary School, Junior High School, Mosque, etc. Access to the center of Sumberlawang Sub-district is only 10 minutes from the village. The livelihoods of the Jati people in general are farmers, vegetable traders and small entrepreneurs. This strongly supports the cultivation of horticultural crops using the verticulture system.

Figure 1. Preparation of verticulture's tools and materials

The realization of activities from the UNS 65 KKN team includes the preparation of tools and materials (Figure 1), socialization of verticulture manufacture (Figure 2), as well as demonstrations and evaluations of verticulture (Figure 3). In preparing tools and materials, the things needed include plastic bottles, shovels, buckets, wire, planting media (soil, manure) and plant seeds (chili and mustard greens) (Munthe et al., 2018). The use of plastic waste aims to reduce the amount of waste that is generally difficult to decompose so that it pollutes the environment (Sofiana, 2010; Abdillah et al., 2015; Grigore, 2017). Use plastic bottles measuring 1 l and make a rectangular hole

on the side of the bottle. On the opposite side, make small circular holes as irrigation channels so that water does not stay longer in the planting medium. This is so that there is air exchange in the planting medium. After that, make a hole at the end of the bottle that serves as a hole so that it can be linked to other used bottles using wire or rope.

The socialization was delivered by one of the UNS KKN 65 team who studied at Department of Soil Science, Universitas Sebelas Maret. Socialization includes definitions, objectives, examples, advantages, planting media and types of plants in verticulture (Andrianyta and Mardiharini, 2015). Socialization using PowerPoint, which displays pictures of tools and materials, work steps for making verticulture that has been practiced by the UNS 65 KKN team 2 days before the activity takes place. The use of pictures and demonstrations in outreach activities encourages people to understand how to cultivate verticulture-based horticultural crops well. From the results of interviews with representatives of participants who attended, it was found that most of them had never known vertical farming techniques. After the socialization activity was over, they said that horticultural cultivation using verticulture from used bottles was easy to implement in their daily life.

Figure 2. Verticulture socialization

The next activity is a verticulture demonstration using the tools and materials prepared. This demonstration teaching method is expected to make it easier for participants to understand the knowledge. Because the method demonstrates how to make verticulture well, participants can easily imitate it (Sucipto, 2017). Representatives of residents from the heads of neighborhoods, women's association for family welfare development and youth organizations were invited to take part in an outdoor demonstration prepared by the UNS 65 KKN team. The demonstration began with distributing of chili and mustard seeds and plastic bottles to each participant. The UNS 65 KKN team then gave an example by inserting planting media and seeds into the bottle and the participants followed the step. Participants are welcome to ask questions directly if they have difficulty and will be assisted by the UNS 65 KKN team. The results of used bottles that have been filled with planting media and seeds are then arranged vertically using wire and placed on the fence of the house. The demonstration ended in an orderly manner and participants were able to practice verticulture without any problems directly.

The success indicators of this activity are the number of invited participants and percentage of understanding from the participants. Based on the invitations, 80% of participants attended the activity. Participants who attended

consisted of head of neighborhoods, women's association for family welfare development women and youth organization of Sendangrejo Hamlet in Jati Village. There were 46 participants who took part in this activity. The presence of 80% of participants shows an indicator of success. During the activity, the participants listened carefully to the presentation by one of the UNS KKN students, followed by a question and answer session. Several questions showed a high level of enthusiasm for the activity.

Figure 3. Verticulture demonstration

The percentage of participants in the activity is 80%. This value shows the success rate because it has exceeded 50% of the number of invitations that have been distributed in the Jati Village. The obstacles faced in this activity were the participants' lack of understanding about good and correct planting. The existence of these obstacles encourages to practice and provides good teaching. Participants who already understand can do the planting well and are sure to provide benefits and good aesthetic value.

Evaluation of activities is carried out by conducting interviews with participants. The UNS 65 KKN team asked several questions such as whether the participants could understand the presentation on horticultural plant cultivation with verticulture well and whether there was a desire to plant vegetables using verticulture techniques from waste materials. In this short interview, a total of 20 respondents agreed that the presentation was very easy to understand because it was presented coherently and supported by pictures from the verticulture manufacturing process. They also agree that verticulture cultivation using used goods is very easy to apply anywhere, including on narrow land. They are very interested in implementing verticulture cultivation in their house with seeds given by the UNS 65 KKN team during the activity.

CONCLUSION

This activity has achieved its goal; providing education to people in Jati Village, most of whom work as farmers about verticulture-based horticultural crop cultivation. The knowledge of about 85% participants can increase their understanding of techniques for utilizing narrow land for farming and their creativity and skills can develop well in realizing the aesthetic value of verticulture-based planting. The use of used goods such as plastic bottles as a medium also provides new knowledge to people so that they can reuse the waste materials. With the many benefits of this activity, it is hoped that this activity can continue with innovations.

ACKNOWLEDGEMENT

The UNS 65 KKN team would like to thank the UPKKN LPPM Universitas Sebelas Maret which has facilitated the implementation of the Thematic Community Service activities for the period January to February 2022 and the people of Jati Village, Sumberlawang Sub-district, Sragen Regency who have supported and actively participated in community activities.

REFERENCES

Abdillah, W., Hartono, J., & Prabantini, D. (2015). *Partial Least Square (PLS): Alternatif structural equation modeling (SEM) dalam penelitian bisnis*. Yogyakarta: Penerbit Andi. Retrieved from http://www.library.usd.ac.id/web/index.php?pilih=search&p=1&q=0000129082&go=Detail

Abu, G. A., & Soom, A. (2016). Analysis of factors affecting food security in rural and urban farming households of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, *4*(1), 55–68. https://doi.org/10.22004/ag.econ.231375

Andrianyta, H., & Mardiharini, M. (2015). Sosial ekonomi pekarangan berbasis kawasan di perdesaan dan perkotaan tiga provinsi di Indonesia. *Jurnal Pengkajian dan Pengembangan Teknologi Pertanian*, *18*(3), 225–235. http://dx.doi.org/10.21082/jpptp.v18n3.2015.p%25p

BPS. (2014). *Sensus pertanian*. CV Budi Utama.

Directorate of Horticulture. (2011). *Pedoman pelaksanaan pengembangan hortiultura*. Jakarta: Ministry of Agriculture.

Dwiratna, S., Widyasanti, A., & Rahmah, D. M. (2017). Pemanfaatan lahan pekarangan dengan menerapkan konsep kawasan rumah pangan lestari. *Dharmakarya*, *5*(1), 19–22. https://doi.org/10.24198/dharmakarya.v5i1.8873

Grigore, M. E. (2017). Methods of recycling, properties and applications of recycled thermoplastic polymers. *Recycling*, *2*(4), 24. https://doi.org/10.3390/recycling2040024

Kurniasih, S. A., Setiani, O., & Nugraheni, S. A. (2013). Faktor-faktor yang terkait paparan pestisida dan hubungannya dengan kejadian anemia pada petani hortikultura di Desa Gombong Kecamatan Belik Kabupaten Pemalang Jawa Tengah. *Jurnal Kesehatan Lingkungan Indonesia*, *12*(2), 132–137. Retrieved from https://ejournal.undip.ac.id/index.php/jkli/article/download/8549/6985

Kusmiati, A., & Solikhah, U. (2015). Peningkatan pendapatan keluarga melalui pemanfaatan pekarangan rumah dengan menggunakan teknik vertikultur. *Asian Journal of Innovation and Entrepreneurship*, *4*(2), 94–101. https://doi.org/10.20885/ajie.vol4.iss2.art4

Kusumo, R. A. B., Sukayat, Y., Heryanto, M. A., & Wiyono, S. N. (2020). Budidaya sayuran dengan teknik vertikultur untuk meningkatkan ketahanan pangan rumah tangga di perkotaan. *Dharmakarya*, *9*(2), 89–92. https://doi.org/10.24198/dharmakarya.v9i2.23470

Melyani, N., Marmawi, R., & Yusuf, A. (2017). Studi komparasi metode demonstrasi dengan pemberian tugas terhadap kemampuan mengenal warna usia 5-6 tahun. *Jurnal Pendidikan dan Pembelajaran*, *4*(2). http://dx.doi.org/10.26418/jppk.v4i2.9075

Munthe, K., Pane, E., & Panggabean, E. L. (2018). Budidaya tanaman sawi (*Brassica juncea* L.) pada media tanam yang berbeda secara vertikultur. *Agrotekma: Jurnal Agroteknologi dan Ilmu Pertanian*, *2*(2), 138–151. https://doi.org/10.31289/agr.v2i2.1632

Oelviani, R. (2015). Penerapan metode analytic hierarchy process untuk merumuskan strategi penguatan kinerja sistem agribisnis cabai merah di Kabupaten Temanggung. *Informatika Pertanian*, *22*(1), 11–19. https://doi.org/10.21082/ip.v22n1.2013.p11-19

Oelviani, R., & Utomo, B. (2015). Sistem pertanian terpadu di lahan pekarangan mendukung ketahanan pangan keluarga berkelanjutan: Studi kasus di Desa Plukaran, Kecamatan Gembong, Kabupaten Pati, Jawa Tengah. *Pros Sem Nas Masy Biodiv Indon*, *1*(5), 1197-1202. Retrieved from https://www.researchgate.net/profile/Renie-Oelviani/publication/300783095_Sistem_pertanian_terpadu_di_lahan_pekarangan_mendukung_ketahanan_pangan_keluarga_berkelanjutan_Studi_kasus_di_Desa_Plukaran_Kecamatan_Gemb

ong_Kabupaten_Pati_Jawa_Tengah/links/5ac6aeca4585151e80a37c59/Sistem-pertanian-terpadu-di-lahan-pekarangan-mendukung-ketahanan-pangan-keluarga-berkelanjutan-Studi-kasus-di-Desa-Plukaran-Kecamatan-Gembong-Kabupaten-Pati-Jawa-Tengah.pdf

Prabowo, R. (2016). Kebijakan pemerintah dalam mewujudkan ketahanan pangan di Indonesia. *Mediagro: Jurnal Ilmu-Ilmu Pertanian*, *6*(2), 62–73. http://dx.doi.org/10.31942/md.v6i2.881

Puspitasari, N., Puspitawati, H., & Herawati, T. (2013). Peran gender, kontribusi ekonomi perempuan, dan kesejahteraan keluarga petani hortikultura. *Jurnal Ilmu Keluarga & Konsumen*, *6*(1), 10–19. https://doi.org/10.24156/jikk.2013.6.1.10

Rauf, A., & Rahmawaty. (2013). Sistem pertanian terpadu di lahan pekarangan mendukung ketahanan pangan berkelanjutan dan berwawasan lingkungan. *Jurnal Pertanian Tropik*, *1*(1), 1–8. https://doi.org/10.32734/jpt.v1i1.2864

Rusdiana, S., & Maesya, A. (2017). Pertumbuhan ekonomi dan kebutuhan pangan di Indonesia. *Agriekonomika*, *6*(1), 12–25. https://doi.org/10.21107/agriekonomika.v6i1.1795

Sofiana, Y. (2010). Pemanfaatan limbah plastik sebagai alternatif bahan pelapis (*upholstery*) pada produk interior. *Humaniora*, *1*(2), 331–337. https://doi.org/10.21512/humaniora.v1i2.2874

Sucipto. (2017). Peningkatan pemahaman cara berwudhu melalui penerapan metode demonstrasi dan simulasi di sekolah dasar. *Briliant: Jurnal Riset dan Konseptual*, *2*(1), 25–31. https://doi.org/10.28926/briliant.v2i1.21

Suratha, I. K. (2017). Krisis petani berdampak pada ketahanan pangan di Indonesia. *Media Komunikasi Geografi*, *16*(1). 67–80. http://dx.doi.org/10.23887/mkg.v16i1.10172

Surtinah, & Nurwati, N. (2018). Optimalisasi Pekarangan Sempit Dengan Tanaman Sayuran Pada Kelompok Ibu Rumah Tangga. *JPPM (Jurnal Pengabdian dan Pemberdayaan Masyarakat)*, *2*(2), 193–199. https://doi.org/10.30595/jppm.v2i2.1882

Utami, A. D., Cahya, M. A. N., Elfatma, O., & Setiawan, K. (2020). Urban farming: teknologi vertikultur limbah plastik untuk mewujudkan sekolah dasar berbasis green school. *PRIMA: Journal of Community Empowering and Services*, *4*(2), 64–68. https://doi.org/10.20961/prima.v4i2.41402