Journal of Saintech Transfer (JST) Vol. 4, No. 1, 2021 | 1-9

JST
Journal of Saintech Transfer

Application of Liquid Organic Fertilizer from Beef Cattle Feces and Environmental Management in Suka Sipilihen, Karo Regency

Peni Patriani[1*], Eva Syahfitri Nasution[2], Uswatun Hasanah[1]

[1]Animal Husbandry Study Program, Faculty of Agriculture, Universitas Sumatera Utara, Medan, Indonesia
[2]Faculty of Law, Universitas Sumatera Utara, Medan, Indonesia

Abstract. Jaya Tani is a farmer group in Suka Sipilihen Village, Karo Regency. The members of Jaya Tani group partly farm the fields and raise livestock. The livestock has several problems, namely environmental waste pollution in the form of livestock manure. Based on the situation analysis through the preliminary survey, Jaya Tani group has difficulty in managing cow manure waste, causing environmental pollution and decreasing the health of livestock. Farmers also need to understand the importance of environmental protection in livestock waste management. This community service activity aimed to introduce the liquid organic fertilizer production and its application for organic vegetables which can increase the knowledge and skills of farmers by utilizing livestock waste. The purpose of this activity is to provided socialization and education to farmers on the importance of environmental protection based on Law Number 32 of 2009. The methods used are interviews, approaches, and empowerment on the introduction and application of technology. Implementation in this activity provides practical training, counseling, and assistance to group members anggota. The result of this activity is an increase in the skills of farmers in the application and manufacture of liquid organic fertilizer from beef cattle feces on organic vegetables so that farmers comply with Law Number 32 of 2009 and the efficiency of fertilization costs.

Keywords: Environment, Farmers, Liquid organic fertilizer, Beef cattle feces

Abstrak. *Jaya Tani merupakan kelompok tani yang berkembang di Desa Suka Sipilihen, Kabupaten Karo. Anggota kelompok Jaya Tani sebagian bertani dan beternak. Peternakan yang berkembang menyisakan beberapa permasalahan yaitu pencemaran limbah berupa livestock manure. Berdasarkan analisis situasi melalui survai awal bahwa kelompok Jaya Tani kesulitan menangani limbah kotoran ternak sapi sehingga menimbulkan pencemaran lingkungan dan menurunnya kesehatan*

*Corresponding author at: Departement of Animal Husbandary, Faculty of Agriculture, USU, Medan

E-mail address: penipatriani@usu.ac.id

Journal Homepage: https://talenta.usu.ac.id/jst

ternak-peternaknya. Selain itu, peternak juga membutuhkan edukasi agar memahami pentingnya tanggung jawab untuk menjaga lingkungan hidup untuk pengelolaan limbah peternakan. Tujuan pengabdian masyarakat ini adalah mengenalkan teknologi pembuatan pupuk organik cair serta aplikasinya untuk sayuran organik sehingga dapat meningkatkan pengetahuan dan keterampilan petani, kebersihan lingkungan, efisiensi biaya pemupukan dan perbaikan struktur tanah. Kegiatan ini bertujuan sebagai sarana edukasi pada peternak tentang pentingnya menjaga lingkungan hidup berdasarkan Undang-Undang Nomor 32 Tahun 2009. Metode yang dilakukan dalam program pengabdian masyarakat adalah melalui wawancara dan pendekatan kemudian dilanjutkan pemberdayaan kelompok Jaya Tani dengan pola diskusi mengenai pengenalan dan penerapan teknologi, memberi praktik pelatihan, penyuluhan dan pendampingan antar anggota kelompok terlibat aktif. Hasil kegiatan pengabdian masyarakat ini adalah adanya peningkatan keterampilan peternak dalam aplikasi dan pembuatan pupuk organik cair dari feses sapi pada sayuran organik sehingga peternak mematuhi Undang-Undang Nomor 32 Tahun 2009 dan efisiensi biaya pemupukan.

***Kata Kunci**: Lingkungan, Petani, Pupuk organik cair, Feses sapi potong*

Received 27 November 2020 | Revised 01 December 2020 | Accepted 09 January 2021

1. Introduction

Suka Sipilihen is a village located in Tigapanah Sub-District, Karo Regency, North Sumatra Province. Currently, agriculture is growing rapidly with various commodities such as cabbage, carrots, potatoes, and plantation crops such as coffee. In 2019, Tigapanah Sub-District had 789 cows, 98 buffalo, and 1353 goats [1]. This livestock has various problems, especially livestock manure waste which has not been fully utilized. The utilization of livestock manure waste can be performed by producing liquid organic fertilizer as a decomposer, increasing plant nutrients, and improving soil structure. Livestock manure cannot be used directly because it can damage plants due to hot temperatures during decomposition, causing plants to wither. The use of livestock manure as fertilizer requires the appropriate technology, namely fermentation in liquid organic fertilizer production.

Liquid organic fertilizer can be produced by fermentation using effective microorganism 4 (EM4) as an activator in accelerating the composting process [2]. In addition, community service is related to environmental preservation. Continuous socialization and assistance on the importance of environmental preservation are also carried out, so that the community is responsible for health and environmental

preservation in farms in compliance with Law Number 32 of 2009 on Environmental Protection and Management.

The purposes of the community service activity were (1) to socialize the use of livestock waste, especially beef cattle feces to become liquid organic fertilizer to improve environmental health, (2) to improve skills on the application and use of liquid organic fertilizer in organic vegetable farming to improve soil structure, (3) to provide guidance and knowledge of farmers about the importance of responsibility for protecting the environment in compliance with Law Number 32 of 2009, (4) to low the fertilization costs by replacing chemical fertilizers with organic fertilizers.

2. Methods

Based on the problems in Jaya Tani Farmer Group, the community service team held a seminar on the use of beef cattle feces as liquid organic fertilizer as well as socialization on the importance of Law Number 32 of 2009 on Environmental Protection and Management. The community service team also provided guidebooks, activity leaflets, banners as educational tools, and equipment packages to support activities as conducted by previous studies [3]-[5]. The community service activity used group learning as a learning medium and mentoring through the adult learning method Andragogy, discussions, questions and answers, and seminars.

In the community service activity, the team conducted observations or surveys to find out problems and find solutions faced by farmers [6]-[7]. Then, the team conducted interviews with farmers to find out their willingness to solve problems through questionnaires. After that, the introduction to liquid organic fertilizer production was conducted. In this stage, the detailed time and schedule of activities were agreed. The core activities were lectures and demonstrations of liquid organic fertilizer production and its application on organic vegetables. In the last stage, there were mentoring and monitoring of liquid organic fertilizer application as well as carrying out the final stage questionnaire on community service activities.

3. Results and Discussion

Based on the questionnaire, the 6-month community service activity had a positive impact on the Jaya Tani farmer group. The management of waste, especially beef cattle feces, can be realized through regular liquid organic fertilizer production and applied to organic vegetables in Suka Sipilihen, Karo Regency. The results of the 6-month community service activity are as follows.

3.1 Utilization of beef cattle feces for liquid organic fertilizer to improve environmental health

There were only 15 farmers. Although not all of them using beef cattle feces, the number of farmers increased after 4 and 6 months of activity from 15 members, respectively. Based on the questionnaire at the end of the activity, farmers utilize beef cattle feces to maintain environmental quality. Farmers feel that the use of beef cattle feces as liquid organic fertilizer can improve environmental health, especially the health of farmers and livestock.

The use of liquid organic fertilizer on organic agriculture raises awareness that the fertilizer can improve environmental health and hygiene which affects farmers and livestock. After 6 months of activity, based on questionnaires and interviews with 15 members during mentoring, 13 members realized that the consistent application of liquid organic fertilizer can improve environmental hygiene so that the environment is healthier. 2 members understood the impact of liquid organic fertilizer on the environment while 1 person did not yet understand the impact of liquid organic fertilizer on environmental health (Figure 1).

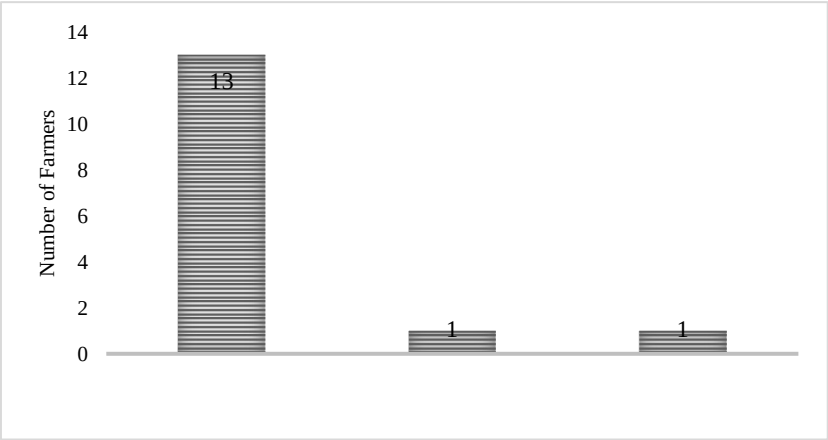

Figure 1. Number of farmers utilized beef cattle feces as liquid organic fertilizer and knows the impact on environmental health after community service

According to [8] stated that in the process of adoption-innovation in society, there are 2 possibilities, namely acceptance and rejection. Rejection can occur in innovation recipients, when other communities have accepted the innovation first. Older groups aged 70 years and over may resist innovation due to difficulties in applying technology [9]. Based on observations, the cowshed became clean and the number of flies was reduced. Farmers agreed that liquid organic fertilizer production can reduce livestock waste.

3.2 Application of liquid organic fertilizer for organic agriculture to improve soil structure

The number of farmers applied liquid organic fertilizer to organic agriculture was increasing after 6 months of activity. From 15 farmers, at 4 months of activity, there were 13 members and at 6 months of activity, there were 13 members applied liquid organic fertilizer to organic land (Figure 2). Based on the questionnaire, liquid organic fertilizer can improve soil structure.

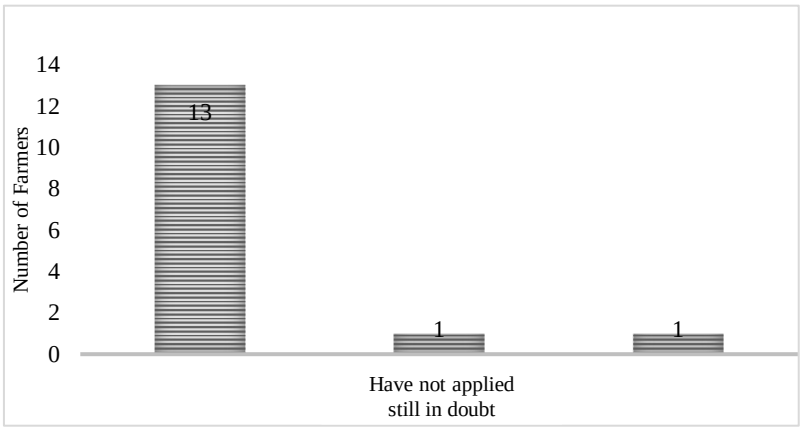

Figure 2. Number of farmers applied liquid organic fertilizer on organic agriculture after community service

Farmers can benefit from the use of liquid organic fertilizer because the soil structure becomes moister. Damaged soil structure can be caused by excessive use of chemical fertilizers, so that to restore the soil structure, organic fertilizers both solid and liquid can be applied. This is in line with a statement by [10] that the application of organic fertilizers, both solid and liquid, is optimal for soil porosity and plant growth. Soil porosity is an indicator of soil fertility and the porosity can be improved by adding organic matter. Liquid organic fertilizer can be used directly on the soil and absorbed directly by the roots, so that the nutrients can be benefited by the soil. Several members of Jaya Tani stated that the usage of excessive chemical fertilizers caused the hard and poor soil structure. However, after several months of applying liquid organic fertilizer, the soil was more loose and moist. The application of liquid organic fertilizer to vegetables resulted in satisfactory yields [11].

3.3 Increasing knowledge of farmers on environmental protection

Based on questionnaires, interviews, and questions and answers after the final stage of community service, it was found that the farmers understood the environmental protection and health needed to be maintained, especially such as beef cattle feces and excessive use of chemical fertilizers. After 6 months of activity, 15 members understood environmental protection related to Law Number 32 of 2009 (Figure 3). They started to

maintain the environment, especially livestock waste, so that it is optimally utilized and not pollute the environment. Environmental pollution due to livestock can also cause odor pollution and the spread of germs by flies. The pollution can cause an unhealthy impact on both farmers and livestock. One solution is to use livestock waste, especially beef cattle feces, to become fertilizer. Liquid organic fertilizer can improve the physical and chemical properties of the soil.

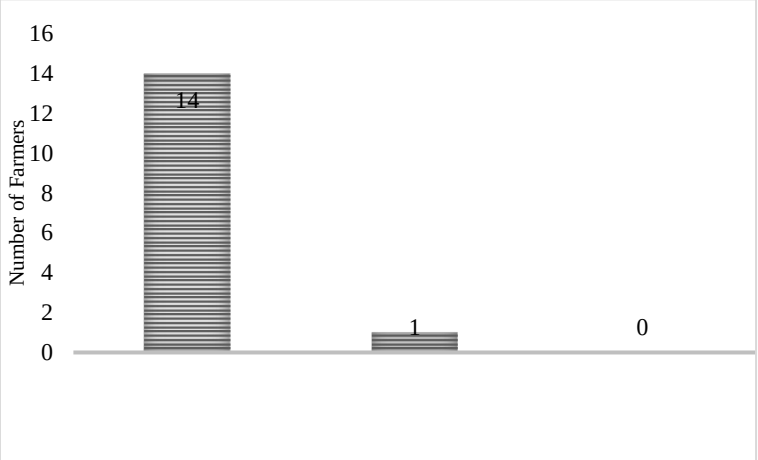

Figure 3. Number of farmers understood environmental protection after community service

Based on the questionnaire, 14 farmers applied liquid organic fertilizer and realized the use of livestock waste to overcome the problem of waste pollution in compliance with applicable regulations. It can also be seen that after 6 months of activity, odor pollution began to decrease, beef cattle feces around the cowshed also decreased, so that the fly population was also reduced. Based on the interview, farmers stated that the use of liquid organic fertilizer provides the right solution (Figure 3). The use of liquid organic fertilizer has an impact on reducing livestock fecal waste pollution leading to a healthier environment. According to [12] stated that Law Number 32 of 2009 stipulates that everyone has the right to a good and healthy environment. Regulations on the right to a good and healthy environment are also balanced with obligations on the environment. The regulation of rights and obligations to the environment is accompanied by community participation in environmental management. This means a healthy environment needs a shared role between communities.

3.4 Number or farmers stated application of liquid organic fertilizer is more efficient and cheaper

Based on the questionnaire, after 6 months of community service activity, the application of liquid organic fertilizer had a positive impact on the efficiency of fertilization costs (Figure 4). The price of chemical fertilizers is usually Rp

90,000-112,500 per 50 kilograms, the right solution for farmers is the application of liquid organic fertilizer. Beef beef cattle feces is available on the farm so it can be used to make liquid organic fertilizer to reduce the cost of chemical fertilizers. The liquid organic fertilizer contains beef cattle feces, molasses, rice straw, bran, water, and EM4 bacteria starter to make it faster fermented for 1 week, then aerated.

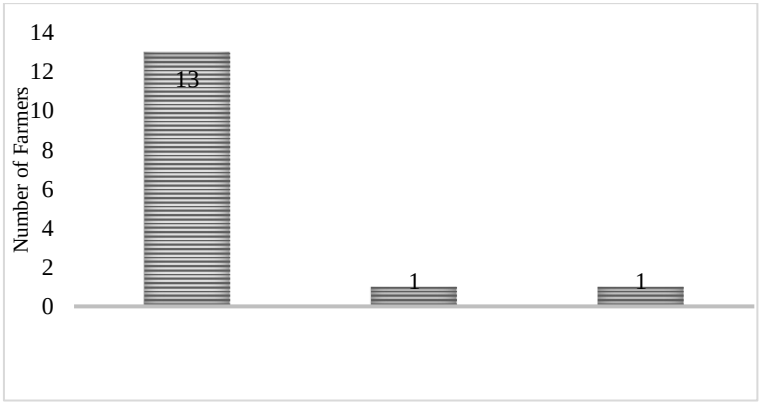

Figure 4. Number of farmers stated application of liquid organic fertilizer is more efficient and cheaper

The use of liquid organic fertilizer is relatively easy, which is diluted with a ratio of 1:10 and then sprayed using an agricultural sprayer on organic vegetables. Chemical fertilizers are sometimes not available continuously and the price of fertilizers such as urea continues to increase from IDR 1800 to IDR 2,250 per kilograms. According to [13] the substitution of liquid organic fertilizers is one of the right solutions to increase income by saving on fertilization costs. Based on questionnaires and interviews, after 6 months of community service activity, 13 farmers felt the benefits of liquid organic fertilizer on the efficiency of agricultural crops. In addition, the use of livestock waste for liquid organic fertilizer makes it more efficient because the waste is abundant and the farmers do not have to spend money to get beef cattle feces. The use of livestock waste is a form of zero waste management, where usually, beef cattle feces are disposed of without being used. Currently, beef cattle feces can be used to make liquid organic fertilizers, thus reducing the cost of chemical fertilizers.

4. Conclusions

The utilization of beef cattle feces has the potential to be applied as liquid organic fertilizer for vegetable farming in Jaya Tani. The utilization of beef cattle feces into liquid organic fertilizer provides benefits to improve soil structure and efficiency of fertilization costs on agricultural land. In addition, this community service activity opens up insights and improves the skills of farmers on the production and application

of liquid organic fertilizer, increasing knowledge of environmental protection and health. The application of liquid organic fertilizer in reducing livestock waste implies that the technology adoption process is very effective. This also has an impact on farmers in other villages who apply liquid organic fertilizer to agricultural crops.

Acknowledgments

Gratitude is expressed to Lembaga Pengabdian Kepada Masyarakat Universitas Sumatera Utara who have supported in community service activities funded by NON PNBP Universitas Sumatera Utara according to the community service agreement letter of Program Mono Tahun Dosen Muda 2020 Number: 291/UN5.2.3.2.1/PPM/2020, 9th June 2020.

References

[1] Ministry of Research, Technology and Higher Education Republic of Indonesia. 2013. Pangkalan Data Pendidikan Tinggi Kementerian Riset, Teknologi dan Pendidikan Tinggi. https://forlap.ristekdikti.go.id/perguruantinggi/homegraphpt (2013) [accessed on March 23, 2019].

[2] Badan Pusat Statistik "Kabupaten Karo Dalam Angka." [Karo District in Numbers] BPS Provinsi Sumatera Utara, 2019.

[3] N. D. Siswanti "Kajian Penambahan *Effective Microorganisms* (EM4) pada Proses Dekomposisi Limbah Padat Industri Kertas." [Study of Addition of Effective Microorganisms (EM4) in the Decomposition Process of Paper Industry Solid Waste]. *Jurnal Buana Sains* 9(1): 63-68, 2009.

[4] Hasnudi, P. Patriani, G. A. W. Siregar, dan S. Umar "Utilization of Kepok Banana Peel Waste Fermented Using EM4 as Sheep Feed in Medan Tuntungan Sub District." *Journal of Saintech Transfer (JST)* 2(2): 142-149, 2019.

[5] P. Patriani, N. Ginting, U. Hasanah, R. E. Mirwandhono "Application of silase waste fruit leather technology in Suka village, Kecamatan Tigapanah, Karo District." *Abdimas Talenta* 4(2): 192-199, 2019.

[6] P. Patriani, E. Mirwandhono, U. Hasanah, N. Ginting "Coffee Seed Waste silage technology as goat feed in Tigapanah Sub-district, Karo regency." *Journal of Saintech Transver (JST)* 3(2): 77-85, 2020.

[7] P. Patriani, Casdari, Iman Saptaji, dan Hasnudi "Socialization of the Animal Husbandry and Animal Health Act concerning slaughtering productive female livestock in Tebo Regency." *Journal of Saintech Transfer (JST)* 2(2): 150-157, 2020.

[8] H. Hafid, P. Patriani, S. H. Ananda, L. Aslan, dan Nuraini "The Implementation of Intensification Buras Chicken to Increase the Fishermen Income.*" Journal of Saintech Transfer* 2(2): 195-203, 2020.

[9] E. Khusnawati dan Y. E. Prasetyo "Difusi dan adopsi teknologi tepat guna padausaha mikro kecil menengah: Observasi pada kegiatan IPTEKDA LIPI di Kabupaten Subang." [Diffusion and adoption of appropriate technology in micro,

small, and medium enterprises: Observations on LIPI's IPTEKDA activities in Subang Regency] *Seminar Nasional IENACO*. 753-760, 2016.

[10] F. P. Meita, B. D. Prasetyo, dan S. Kanto "Komunikasi *Social Marketing* dalam proses difusi inovasi revitalisasi Banjar masyarakat Lombok." [Social Marketing communication in the process of diffusion of innovation in the revitalization of Banjar Lombok society] *Wacana* (16)3, 2013.

[11] I. Anastasia, M. Izatti, S. W. A. Suedy "Pengaruh Pemberian Kombinasi Pupuk Organik Padat dan Organik Cair Terhadap Porositas Tanah dan Pertumbuhan Tanaman Bayam (*Amarantus tricolor* L.)." [The Effect of Combination of Solid Organic Fertilizer and Liquid Organic on Soil Porosity and Spinach Plant Growth (*Amarantus tricolor* L.)] *Jurnal Biologi* 3(2): 1-10, 2014.

[12] E. I. Musnamar "Pupuk Organik: Cair & Padat, Pembuatan, Aplikasi. " [Organic Fertilizers: Liquid & Solids, Manufacture, Application] 9th Revised Penebar Swadaya: Jakarta, 2003.Nopyandri "Hak atas Lingkungan Hidup dan Kaitannya dengan Peran Serta dalam Pengelolaan Lingkungan Hidup dalam Perspektif Otonomi Daerah." [The Right to the Environment and Its Relation to Participation in Environmental Management in the Perspective of Regional Autonomy] *J. Inovatif* 7(3), 2014.

[13] T. Aminatun dan S. Umniyati "Pemberdayaan petani dalam pembuatan pupuk organik cair ramah lingkungan dari sumber daya hayatidi lingkunganya." [Empowerment of farmers in making eco-friendly liquid organic fertilizer from biological resources in their environment] *Inoteks* 15(2): 196-203, 2011.