

# Capacity building for goat livestock business “GIBRAN FARM” through utilization of livestock waste for agriculture

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## ABSTRACT

The various problems farmers face in Kaliwedi Village include farmers' lack of knowledge in their farming practices, which impacts the condition of agricultural land saturated with chemicals. On the other hand, there is already a goat breeding business “GIBRAN FARM” managed by youths in Kaliwedi Village, with around 200 goats, and cattle belonging to farmers that have not been used for agriculture. The Community Partnership Program (PKM) is carried out as an effort to solve problems in the form of: (1) Sheep farming management training; (2) Training on making kohe fertilizer; (3) Business management and marketing of kohe fertilizer; (4) A demonstration plot of the application of kohe fertilizer to chili plants. Program partners are GIBRAN FARM sheep breeders and 10 millennial farmer groups. The results of this effort are: (1) Increasing livestock management knowledge; (2) The availability of kohe fertilizer which has been tested and is ready to be marketed; (3) Partners carry out business management and market kohe fertilizer; (4) There is a demonstration plot for applying kohe fertilizer to chili plants. It is hoped that this will increase the income of GIBRAN FARM sheep breeders and help farmers increase soil fertility, maintain plant health, reduce negative impacts on the environment, and realize sustainable agriculture.

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## 1. INTRODUCTION

The people of Kaliwedi Village generally work as farmers. In managing farmland, farmers are very dependent on the use of chemicals, both in the form of inorganic fertilizers and the use of other chemicals such as pesticides and the others. According to Rukka (2003) inorganic agricultural farmers are farmers who in an effort to cultivate paddy rice are carried out by using chemicals or pesticides on their land. Marzena et al. (2018) added that the majority of farmers only focus on increasing crop yields and improving the welfare of their families, using fertilizer without paying attention to the negative impacts, or using inorganic fertilizers that do not match the dose or plant needs. This causes farmland to become more saturated with chemicals which in turn has an impact on decreasing production.

Long-term use of chemical fertilizers can cause an imbalance of substances in the soil, which will cause various diseases in plants, will kill various beneficial organisms in the soil such as worms, fungi, bacteria so that the soil structure will become hard and quickly barren, the soil cannot store

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water anymore, nutrients in the soil will gradually disappear (Asnawi et al., 2022; Purwanto et al., 2023). Farmland that continues to be excessively fertilized only shows an immediate response, but has the impact of quickly depleting the soil’s organic matter and poisoning the soil so that the soil becomes “unhealthy” (Zamroni, 2010).



**Figure 1.** Farmland that has started to become unhealthy

Farmers are still very dependent on assistance or subsidies from the government. According to Nino et al. (2022) Subsidy policies aim to maintain price stability for goods and services, provide protection for low-income communities, increase agricultural production and provide incentives for the business world and society. Fertilizer is one of the elements to increase plant productivity, which plays an important role today. Farmers’ dependence on fertilizers, especially inorganic fertilizers, is still very high (Prayoga, 2016; Rambe & Yahumri, 2011). Meanwhile, subsidies from the government have begun to be reduced or even become non-existent. Farmers also do not have enough knowledge to do other businesses, which will further worsen the farmer’s economic level.

The people of Kaliwedi Village, apart from farming, usually also raising livestock as a side job to support the household economy. Side work is additional work that a person has, usually this work exists because the income obtained from the main job is not sufficient to fulfill basic needs (Rozali et al., 2019). Based on the 2022 Kaliwedi Village monograph, the number of livestock in the area reached 9,927 with 1,885 goats, 815 cows, 7,017 chickens and 210 ducks.

Livestock management by farmers mostly still uses traditional methods. Livestock manure has not been utilized optimally. Management with traditional methods causes an unhealthy cage environment and causes bad smells. This is supported by the opinion of Zuroida & Azizah (2018) that dairy farmers are at risk of experiencing health complaints caused by dairy cow waste that is not managed properly, which can have an impact on the health of the livestock and their owners. According to Blum’s theory, the level of human health can be influenced by four main factors, namely environment factors, genetic factors, behavioral factors, and health service factors (Hapsari et al., 2009). Environment factors that can influence human health include the physical environment and the biological environment. Livestock waste is a source of disease from the biological and physical environment. This unhealthy environment can affect the lives of housewives or farmers, who spend most of their time on domestic matters. Livestock manure has the potential to be used as organic fertilizer which is very useful in supporting the cultivation of agricultural crops in that location. Utilization of livestock waste as a source of organic fertilizer is certainly very beneficial to support the agricultural and plantation sectors.

In Kaliwedi Village, there is already a goat farming business that was just established in November 2021 named “GIBRAN FARM” which is managed by young farmers, currently has 200 goats. In addition, as the data in Table 1 above shows the number of livestock in the village, so livestock waste is sufficiently

available, and has not been used as organic fertilizer. Almost every farmer has 2 - 3 goats or cows, which causes unpleasant smells, so it is very necessary to have technology that can overcome this problem.

This "GIBRAN FARM" livestock business, in addition to having a goat livestock business, is also a pioneer for young farmers who are expected to be a driving force for farmers in their village. Through this program, knowledge transfer will be carried out, especially in the utilization of livestock waste as an ingredient for making Kohe fertilizer, the results of which can later be used for farming businesses and can be purchased by farmers in the village. Apart from that, the goat farming business "GIBRAN FARM" has not yet applied feed technology to make it more efficient in time and energy, so far the goats have only been given forage from the surrounding area, so there is also a need for feed technology that can be efficient in the business. According to [Gustian & Permadi \(2015\)](#) Feed technology is a method or technique for making feed by utilizing fiber sources and protein sources which are mixed to become homogeneous through physical treatment and supplementation which is then packaged in a certain form making it easier to store and more efficient in feeding to livestock.



**Figure 2.** Sheep and their waste at "GILBRAN FARM"

Based on the conditions that exist in "GIBRAN FARM" Sheep Breeding Partners and those experienced by farmers, especially farmers in Kaliwedi Village, it is a source of inspiration to be able to apply appropriate technology for "GIBRAN FARM" Sheep Farmers to increase capacity in their business and improve their abilities farmers to be able to carry out farming well so that it is hoped that community income can ultimately increase. Through the *Program Kemitraan Masyarakat (PKM)* Institute for Research and Community Service, *Universitas Sebelas Maret* can be a way to overcome the problems faced by farmers. Through this program, knowledge transfer will be carried out, especially in the application of technology for the utilization of livestock waste and agricultural waste as materials for making organic fertilizer. Utilizing livestock waste and agricultural waste which can be obtained easily from farmers in the village location is one form of utilizing local wisdom to restore the condition of land which is increasingly saturated with chemicals.

The application of feed technology and the processing of agricultural waste into organic fertilizer can help overcome the main problems in the livestock business. Due to the presence of livestock manure which causes an unpleasant smell. Livestock produce waste in the form of manure in large quantities. In cattle, the amount of manure that can be produced every day is around 12 percent of their body weight ([Farid, 2020](#); [Sukamta et al., 2017](#)). If not treated properly, livestock waste can cause environmental pollution, due to the compounds it contains. Livestock manure is often used as fertilizer, but its use and processing is not optimal because there are many obstacles that cannot be overcome. Especially during the rainy season, discomfort occurs because of the smell of accumulated livestock manure. The selling value of the manure is also very low, so it doesn't attract people's interest to sell it. This really

requires a technological application that can be used for processing organic fertilizers so as to increase the capacity of farmers in their livestock business and increase the ability of farmers to improve soil nutrients. For this reason, managing animal or livestock waste as organic fertilizer independently can be an alternative solution for residents to deal with this problem. Utilizing animal waste as organic fertilizer can reduce the negative impact of environmental pollution from livestock waste, and the results can help restore the stability of nutrient elements in the soil, and reduce the use of chemical fertilizers so that they are not used excessively (Isnaini et al., 2022)

## 2. METHODS

Based on the problems faced by the “GIBRAN FARM” goat farm and the people in Kaliwedi Village, Gondang District, Sragen Regency, the service method that has been carried out is as follows: (1) Coordinate and social participate with the implementation team, local government, GIBRAN FARM sheep breeders and farmers who are prospective users of animal manure fertilizer; (2) Identify the needs needed to carry out the design activities carried out for the manufacture of Kohe fertilizer and its application. Conditions and area of land that requires the use of fertilizers; (3) Preparation of materials and equipment needed to produce animal manure fertilizer. Determining the manufacturing location and anticipating the use of materials that cannot be met or cannot be obtained from the surrounding environment. Designing the formulation for making livestock manure fertilizer, the need for organic chemicals from the product produced. Manufacturing is carried out by partners and operational assistance is provided from the service team and partners; (4) Description of the technology implemented by partners, namely animal waste fertilizer processing technology. Implementation of technology can produce animal waste fertilizer products that are ready to be used and ready to be sold/commercialized to the general public; (5) Conduct education for GIBRAN FARM sheep breeders through training on making Kohe fertilizer and providing appropriate technology (*teknologi tepat guna*) in the form of 1 unit of Kohe fertilizer grinding machine with a capacity of 3 quintals per hour, and other supporting facilities such as tarpaulins to cover the fertilizer manufacturing process, sack sewing machines, sealer, packaging sacks that already have labels, facilitate fertilizer testing, and apply Kohe fertilizer to horticultural plants. Apart from that, the necessary materials are also facilitated, namely biostarter; (6) Education and facilitation of demonstration plots for the application of agreed animal waste fertilizer for planting chilies, using drip irrigation technology. The facilities provided include a set of equipment for making drip irrigation, seeds and mulch.

Then, (7) The procedure for making animal manure fertilizer technology, sheep manure mixed with sheep urine in wet conditions, is removed from under the drum. Then make it almost dry. After that, it is then processed with a starter, previously the biostarter given was developed first with various damaged fruits added with sugarcane molasses, then allowed to stand for approximately 2 days, so that the microbes reproduce properly. How to make animal manure fertilizer, especially sheep manure: (a) Prepare the necessary materials and tools, namely: sheep dung, cultured biostrater, molasses (cane sugar drops), dolomite, husk charcoal (if available), water, *srintil* animal dung grinding machine, sieve, tarpaulin, sack, sealer for plastic packaging, shovel, hoe, scales, hand sprayer, labeled sacks and plastic packaging, sack sewing machine and sewing thread; (b) Ingredients are weighed according to requirements; (c) The dry sheep manure is mixed with the other ingredients and then mixed thoroughly, then the starter that has been made is added, and the molasses is added, by spraying it on the material until it is evenly distributed and looks moist; (d) Covered with tarpaulin; (e) Temperature is controlled according to procedures; (f) Leave it for 3 weeks, and every week it is back and forth, if it is finished then it is ground so that it is in powder form; (g) The animal waste fertilizer that is produced is ready to be used in sow form; (h) Animal waste fertilizer is packaged according to the type of packaging produced.

After that, (8) Applying animal manure fertilizer on demonstration plot land together with breeders as organic fertilizer producers and farmers on 500 m<sup>2</sup> land on village land; (9) Conduct livestock business management training for goat breeders "GIBRAN FARM" and other breeders in Kaliwedi village; (10) Partner participation in program implementation. Partner participation in implementing this program really supports the success of the program achieved. Active partners provide information and are ready to discuss plans to be implemented. Partners play an active role in every activity, starting from program outreach activities, counseling, training and implementing organic fertilizer production. Partners can use every form of technology provided and become pioneers in the use of organic fertilizer from agricultural waste so as to create a healthy ecosystem in the lives of society in general; and (11) Evaluation of program implementation, namely monitoring and coaching groups in carrying out businesses that have been initiated and evaluating the economic value obtained from this activity. It is hoped that this program for implementing appropriate technology can improve the welfare of society in general.

### 3. RESULTS AND DISCUSSION

#### Preparation and Implementation of Activities

Socialization and coordination activities with the partners took place at the village head's house which was attended by representatives of members of the *Sumber Rejeki* farmer group, the village head, *Mas Gilang* as owner of "GIBRAN FARM", and a team of public service consists of lecturers and students. The main event in this activity is socializing community service activities and coordinating the implementation. The results of the meeting agreed that GIBRAN FARM's livestock business activities would begin in May 2023. The results of the agreement to implement activities include livestock business management training, training on making Kohe fertilizer on June 12 2023, counseling on the application of Kohe Srintil fertilizer, and training on packaging Kohe Srintil fertilizer on July 10 2023 and packaging training which is planned to be held in mid-July 2023, and the last week Juli created a demonstration plot for applying Kohe fertilizer to chili plants, using a drip irrigation system.



**Figure 3.** Coordination and socialization of community service activities

#### Livestock Management Training and Manufacture of Animal Manure

Training on livestock business management and manure production June 12, 2023, was held in Kaliwedi Village, Gondang District, Sragen Regency in Joglo which was in the Village stables. Previously, the UNS service team departed from UNS at 07.30 WIB. The training on livestock business management and the manufacture of animal manure was attended by 20 participants including breeders, farmers, *PPL*, *Dinas* and Kaliwedi Village officials, besides that, it was also attended by 4 teams of service lecturers and 3 students, as well as 1 person from outside UNS who is a practicing Kohe fertilizer producer. The training began with remarks by the head of the activity and the Head of Kaliwedi Village.

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**Figure 4.** Speech by the head of the activity and speech by the Head of Kaliwedi Village

After the greeting speech, the event continued with the implementation of livestock business management training and the manufacture of animal manure starting at 09.00 WIB until 14.00 WIB. The first presentation of material was given by the resource person, Mrs. Dr. Ayu Intansari Spt.msc, who is a Lecturer at the Faculty of Animal Husbandry, *Universitas Sebelas Maret*, continued with a discussion and question and answer session. The training material presented is about livestock business management. After that, it was followed by the delivery of material and direct practice of making fertilizer from animal manure by Mas Ari as a practitioner of Kohe organic fertilizer producer. The materials used in practice are ground animal (goat) dung, decomposer, papaya, potatoes. Dried animal (goat) manure is first crushed by grinding and then mixed with a mixture of biostarter and damaged fruit to make starter. The mixture is left for approximately 2-3 days, after which it is used to make Kohe fertilizer as a starter, with the aim that the microbes can multiply.



**Figure 5.** Provision of livestock management materials and practice of making starter and Kohe Fertilizer

All training participants were enthusiastic in carrying out livestock business management training and making animal manure. This can be seen from the enthusiasm of the group to participate in activities from start to finish. Participants also actively held discussions and asked questions to the speakers. After the training, many participants were motivated to use animal manure as fertilizer which can be used for agriculture. At the end of the training, 1 unit of fertilizer grinding machine, 2 large tarpaulins, 1 unit of sealer, and 1 unit of sack sewing machine were handed over.

### Counseling on the Application of Srintil Fertilizer

Furthermore, the service team with a partner agreement conducted counseling on the application of Kohe Srintil fertilizer. The counseling was carried out on July 10, 2023. The counseling was carried out in the joglo which was in the village's sheep pen which was attended by 14 people consisting of

breeders, farmers, and PPL and also attended by 4 teams of lecturers service and 3 students and 1 person as a resource person in the counseling. Extension activities start at 09.00 until 13.30 WIB. The implementation of the counseling began with a speech by the chairman of the event, Mrs. Dr. Suminah, M.Si and continued by providing counseling material by Dr. sc. agr. Rahayu, S.P., M.P and Dr. Sapja Anantanyu, M.Sc.



**Figure 6.** Enthusiastic participants asked questions and handed over equipment  
**Figure 7.** Training participants



**Figure 8.** Presentation of material by Dr. sc. agr. Rahayu, S.P and Dr. Sapja Anantanyu, M.Sc.  
**Figure 9.** Training participants who will apply Kohe Fertilizer

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Counseling given by Dr. sc. agr. Rahayu, S.P. about what ingredients are in the fertilizer needed by plants. So that in the manufacture of fertilizers must be in accordance with what is needed by the plant. Dr. Sapja Anantanyu, M.Sc. also participate in providing counseling regarding business and group management, because group cooperation is often carried out with groups and not individually. The training participants followed closely and enthusiastically, at the end of the material there was a discussion and question and answer session. All training participants were enthusiastic in participating in counseling regarding the application of srntil fertilizer. This can be seen from the enthusiasm of the group to participate in activities from start to finish. Participants also actively held discussions and asked questions to the speakers. After the training, participants became aware of how to apply fertilizers and what plants really need.

### Creating a Demonstration Plot for Application of Kohe Fertilizer

The demonstration plot for the application of Kohe fertilizer was carried out on village-owned land managed by lineal farmers assisted by MBKM students. The demonstration plot for the application of Kohe fertilizer with chili plants was carried out using drip irrigation and mulch technology so that the results can be maximized. The implementation of the demonstration plot begins with cultivating the land, after the land is tracted it is then given coded fertilizer and left for 2 days, then mulch and drip irrigation are installed, and then chilies are planted.



**Figure 10.** Making a demonstration plot of applying Kohe Fertilizer to chili plants

### Training on Kohe Fertilizer Business Analysis and Kohe Fertilizer Packaging

The business analysis and packaging of Kohe fertilizer training will be held on August 4, 2023, from 08.00 to 12.00. After packaging, all costs used for the production of Kohe fertilizer up to marketing are calculated, both fixed costs calculated using the depreciation formula and operational costs. Business analysis training as the resource person is Mrs. Dr. Ir. Suminah, M.Sc. Packaging was carried out in 3 packaging sizes, namely 20 kg, 10 kg and 5 kg of Kohe fertilizer, then marketing was carried out by MBKM students. Figure 11, 12, and 13 are the results of the Kohe fertilizer packaging.

## 4. CONCLUSION AND RECOMMENDATIONS

Capacity building activities carried out by GIBRAN FARM sheep breeders and millennial farmer groups require assistance and continued empowerment as well as support from the government and community so that they can develop animal manure fertilizer that can be bought and sold. The community service activities that have been carried out are only a stimulant and an example of activities that village communities can develop themselves.





**Figure 11.** Packaging of Kohe Fertilizer that has been produced

**Figure 12.** Kohe Fertilizer packaging 20 kg, 10kg, and 5kg

**Figure 13.** Packaged Kohe Fertilizer

The community service activities that have been carried out are carried out with great enthusiasm by partners in carrying out all activity programs. This can be seen from the good participation of farmers, including responsiveness to each training activity by providing training venues, providing raw materials for fertilizer production training and providing time and energy to attend training and counseling, even partners to build Kohe fertilizer production houses. Partners and also farmers/breeders are very active and serious about implementing empowerment programs to increase their capacity.

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## REFERENCES

Asnawi, A. R., Latief, A., & Gifari, H. A. (2022). Pendampingan pembuatan pupuk organik dari kotoran sapi di Dukuh Ngemplak, Sriti, Sawoo, Ponorogo Tahun 2022. *ADARMA*, 9(1), 55-59.

Farid, M. (2020). Pendampingan pengelolaan limbah kotoran sapi menjadi pupuk organik kepada peternak sapi di Desa Pandanarum Kecamatan Tempeh Lumajang. *Khidmatuna/ : Jurnal Pengabdian Masyarakat*, 1(1), 59. <https://doi.org/10.54471/khidmatuna.v1i1.998>

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Suminah Suminah, Sapja Anantanyu, Emi Widiyanti, Ayu Intan Sari

- Gustian, E., & Permadi, K. (2015). Kajian pengaruh pemberian pakan lengkap berbahan baku fermentasi tongkol jagung terhadap produktivitas ternak sapi PO di Kabupaten Majalengka. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, 17(1), 12–18. <https://doi.org/10.25077/jpi.17.1.12-18.2015>
- Hapsari, D., Sari, P., & Pradono, J. (2009). *Pengaruh lingkungan sehat, dan perilaku hidup sehat terhadap status kesehatan*. National Institute of Health Research and Development, Indonesian Ministry of Health.
- Isnaini, J. L., Thamrin, S., Husnah, A., & Ramadhani, N. E. (2022). Aplikasi jamur Trichoderma pada pembuatan Trichokompos dan pemanfaatannya. *JatiRenov: Jurnal Aplikasi Teknologi Rekayasa Dan Inovasi*, 1(1), 58-63. <https://doi.org/10.51978/jatirenov.v1i1.375>
- Marzena, E. L., Hermon, D., & Wilis, R. (2018). Perilaku petani dalam pemakaian pupuk anorganik untuk pertanian di Nagari Salimpaung Kabupaten Tanah Datar. *Jurnal Buana*, 2(4), 405-458. <https://doi.org/10.24036/student.v2i5.247>
- Nino, K. H. E., Fallo, Y. M., Taena, W., & Sipayung, B. P. (2022, September). Preferensi penggunaan pupuk bersubsidi petani padi sawah di Kecamatan Biboki Moenleu Kabupaten Timor Tengah Utara. In *Prosiding Seminar Nasional Pembangunan dan Pendidikan Vokasi Pertanian*, 3(1), 220-236. <https://doi.org/10.47687/snppvp.v3i1.308>
- Prayoga, A. (2016). Produktivitas dan efisiensi teknis usahatani padi organik lahan sawah. *Jurnal Agro Ekonomi*, 28(1), 1. <https://doi.org/10.21082/jae.v28n1.2010.1-19>
- Purwanto, E., Navitasari, L., & Nisa, U. (2023). Desain penyuluhan pembuatan pupuk organik dari kotoran sapi di Gapoktan Kertotani Desa Nglawak. *AGRIEKSTENSIA*, 22(1), 79–85. <https://doi.org/10.34145/agriekstensia.v22i1.2864>
- Rambe, S. S. M., & Yahumri, Y. (2011). Efisiensi penggunaan pupuk dan lahan dalam upaya meningkatkan produktivitas padi sawah. In *Prosiding Seminar Nasional Budidaya Pertanian; Urgensi dan Strategi; Pengendalian Alih Fungsi Lahan Pertanian*, 180-188.
- Rozali, A., Widodo, S., & Nugraheni, I. L. (2019). Karakteristik Sosial Ekonomi Keluarga Buruh CV Bumi Indah Kelurahan Garuntang 2018. *Jurnal Penelitian Geografi (JPG)*, 7(2).
- Rukka, H. (2003). *Motivasi petani dalam menerapkan usahatani organik pada padi sawah (Kasus di Desa Purwasari Kecamatan Dramaga Kabupaten Bogor Provinsi Jawa Barat)* (Thesis, IPB University). IPB University.
- Sukamta, S., Shomad, M. A., & Wisnujati, A. (2017). Pengelolaan limbah ternak sapi menjadi pupuk organik komersial di Dusun Kalipucang, Bangunjiwo, Bantul, Yogyakarta. *Berdikari: Jurnal Inovasi dan Penerapan Ipteks*, 5(1), 1-10. <https://doi.org/10.18196/bdr.5113>
- Zamroni, M. I. (2010). Perubahan sosial-budaya petani organik di Yogyakarta. *Jurnal Masyarakat dan Budaya*, 12(1), 71-92. <https://doi.org/10.14203/jmb.v12i1.164>
- Zuroida, R., & Azizah, R. (2018). Sanitasi kandang dan keluhan kesehatan pada peternak sapi perah di Desa Murukan Kabupaten Jombang. *Jurnal Kesehatan Lingkungan*, 10(4), 434-440.
-