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Increasing The Availability of Manure with Automatic Manure Mixer and Refining Media in Sukodono Sidoarjo

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Abstract:

In everyday life, the process of making manure manually requires a longer time and extra effort. This is an obstacle for farmers to increase the availability of organic fertilizers as a mixture in the fertilization process of plants. Therefore, a breakthrough is needed so that farmers can increase the availability of organic fertilizers. One of the areas where farmers need to increase the availability of organic fertilizers is farmers in RT 09 RW 03 Sukodono Village, Sidoarjo Regency. In January 2024, mentoring activities will be carried out to increase the availability of organic fertilizers. Some innovations that can be done are by using a fertilizer mixer and smoother with the main drive being an electric motor because electric motors have several advantages that motors with internal combustion do not have, such as electric motors are very easy to control and operate, have good durability, are environmentally friendly, and save energy. This tool uses an electric motor with a direct current motor type at a working voltage of 24 Volts equipped with a planetary gearbox applied to manure-making equipment. This service activity has been carried out well, and the farmers of RT 09 RW 03 Sukodono Village, Sidoarjo Regency can apply this tool optimally to increase the availability of organic fertilizers.

Keyword: Organic fertilizer, Manure processing, Electric motor, Planetary gearbox, Agricultural innovation, Community service

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Introduction

As an agrarian country, Indonesia has great potential in the agricultural sector, apart from its rich nature, this is also inseparable from the role of farmers who actively contribute to the development and cultivation of crops with export commodities or only to meet market needs and domestic consumption. Every plant planted on agriculture or plantation by farmers cannot be separated from the basic needs of the plant itself because every plant has the same need for survival including the need for water, the need for sunlight, the need for air or CO2 and O2, and finally the need for nutrients obtained from the soil. Indonesia as an agrarian country has the 4 elements that are needed by these plants starting from water, air, nutrients or fertile soil, and abundant sunlight, but to create agricultural engineering that can accelerate plant growth and better growth, farmers need to provide additional food for plants or commonly known as fertilizers.

Fertilizer is a nutrient for plants, or it can also be said to be an additional food. Some of the benefits of fertilizer for plants are that it can increase and accelerate the growth and development of cultivated plants, can increase and accelerate plant production, can increase the fertility of cultivated plants so that plants are more resistant to various kinds of pests and diseases, can manipulate the environment around plants so that they are suitable for plant growth and development and can stimulate root growth, stems and leaves of plants.

Fertilizers are classified into 2 categories based on their source, namely natural fertilizers and artificial fertilizers, natural fertilizers are fertilizers made from materials derived from nature. Examples of natural fertilizers are compost, compost, etc., Artificial fertilizers are fertilizers made by factories by engineering materials from nature through physical and chemical processes. Examples of artificial fertilizers are Urea fertilizers, TSP fertilizers, ZA fertilizers, etc. Meanwhile, based on the compound, fertilizers are also divided into 2, namely organic fertilizers and inorganic fertilizers. Organic Fertilizer is a fertilizer that has the content of organic compounds. Organic fertilizers are mostly derived from nature and are processed naturally or by engineering. Examples of organic fertilizers are compost, manure, guano fertilizer, etc. Inorganic Fertilizers are fertilizers that have inorganic compounds. Most inorganic fertilizers are artificial fertilizers, as well as natural fertilizers made from chemicals. Examples of inorganic fertilizers are NPK fertilizers, Urea fertilizers, TSP fertilizers, ZA fertilizers, etc. There are many other classifications of fertilizers, for example, based on their form, nutrients, application, nutrient release, and physiological reactions. Meanwhile, in most plantations and agriculture in Indonesia, our farmers, in addition to using inorganic fertilizers that can be purchased on the market made by local fertilizer manufacturers, also often add organic fertilizers obtained from nature and most of them come from a mixture of livestock manure and decay from other nutrients, for example, the result of composters, dry leaves and wasted food waste. However, there are several obstacles for farmers RT 09 RW 03 Sukodono Village, Sidoarjo Regency in making organic fertilizer itself in the process of making organic fertilizer farmers there still use manual methods such as the process of stirring and smoothing the processed manure, because the process used is still manual, this is one of the obstacles to the availability of manure made by farmers themselves becomes difficult to fulfill due to time The process takes a long time and also requires more labor during the manufacturing process so that most farmers still prefer to buy inorganic products available on the market even though this means that it will increase the cost of crop production and will have an impact on crop income for farmers financially.

Nowadays there are also manure-making tools on the market, but the use itself is preferable for industrial scale, even if there are those used for the home scale, there are still some weaknesses including prices that are too expensive for some small farmers, operational costs that are also not cheap because they use a combustion motor as the main driving force, namely diesel engines fueled by diesel, the operation is more complicated than using an electric motor drive, an environmental problem (because it uses a diesel motor).

Based on some of the problems faced by farmers in RT 09 RW 03 Sukodono Village, Sidoarjo Regency mentioned above, this service team made a manure mixer smoother using a 24 V DC gearbox motor. So it is hoped that later it can be easier for farmers to work during the process of making their organic manure. As for the process of making the design itself, the service team chose to use a 24V DC motor because it is easy to operate and the DC motor has several advantages needed in the middle manure-making tool compared to the use of large-dimensional motors such as 3-phase induction electric motors.

Some of the solutions offered to overcome the problems faced by farmers in RT 09 RW 03 Sukodono Village, Sidoarjo Regency, among other things, provide training in the use of manure mixer and smoother using a 24 V DC gearbox motor. It is hoped that farmers RT 09 RW 03 Sukodono Village, Sidoarjo Regency will Apply this tool in Optimal depth to increase the availability of organic fertilizers.

Method

RT 09 RW 03 Sukodono Village farmer, in addition to using inorganic fertilizers that can be purchased in the market made by local fertilizer manufacturers, also often add organic fertilizers obtained from nature and most of them come from a mixture of livestock manure and decay from other nutrients, for example, the result of composters, dry leaves, and wasted food waste. The manufacture of organic fertilizer itself still uses manual methods such as when the process of stirring and smoothing the processed manure, because the process used is still manual, this is one of the obstacles to the availability of manure made by farmers themselves becomes difficult to fulfill due to the long processing time and also.

Training implemented on September 8, 2024 with speaker team PKM implementers and assisted by students. Apart from team implementer, materials are also provided by practitioners as many as 2 people. In the activity This time, there were 2 students involved in training and mentoring. Involvement student the implemented through the MBKM (Freedom to Learn) program Independent Campus) with converted 6 credits.

Results and discussions

Results achieved after observation in Farmers RT 09 RW 3 Sukodono Village, Sidoarjo Regency are as follows. Farmers see manure-making tools as interesting tools to use as manure makers, so they are interested in using the tool, the obstacle is the condition of those who are the majority of them with minimal education who are not familiar with this tool, making it difficult for them to operate the tool. The solution is that assistance is needed to oversee the training process for the use of the tool as well as to overcome technical problems in the field.

There are several efforts made to be able to increase the availability of organic fertilizers farmer RT 09 RW 03 Sukodono Village, Sidoarjo Regency, among others, designed and made manure mixers and smoothers using a 24 V DC gearbox motor and provided assistance in the use of the tool.

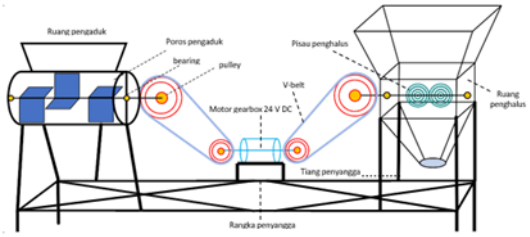

Figure 1. Parts of Fertilizer Mixer and Smoother Enclosure using 24 V DC Motor

The stirring chamber has a *mixer* shaft or stirring shaft made of iron with a repellent-plate design to allow the mixing of materials during the stirring process. Then in the smoothing room, there are two *grinder* eyes with a grated texture as the main tool in the manure refining process after the mixing process is completed. The main drive in this tool is a 24 V DC motor which is connected using *a pulley* and *a v-belt* as a transmission ratio that connects the motor shaft to the stirring shaft and the smoothing shaft.

In the *pulley* and *v-belt* parts, the selection is based on the value of loading or weight based on the unit of Kg. Calculation of the rotation of *the pulley is* theoretically or is theoretically calculated based on the rotation of the motor obtained from the *tacho meter reading.* (Sumarno, 2019)

For the support frame, the service team chose to use elbow iron material that is connected by welding so that it can withstand the load of the components used more firmly and reduce *vibration* when the tool is operated.

How to making Mixers and Manure Smoothers:

a. A stirring chamber that serves as a place to mix fertilizer materials with other materials such as lime, husk, water, etc.
b. The bearing on the stirring shaft functions as a retainer as well as a friction force elimination on the structural frame that will inhibit the rotation rate of the shaft. (Kurniawan, 2019)
c. The reversing bearing bearing, functions as a retainer when the stirring chamber is reversed to take fertilizer materials that have gone through the mixing process.
d. *Pulley* of the mixing shaft, as the ratio of rotation transmitted from the motor to the mixing shaft.
e. *The* mixer pulley is one-way, like *a general pulley* but the service team adds a one-way bearing to the shaft of *the pulley* so that this part will only rotate in one direction.
f. Main shaft *bearings*, these bearings are used for rotation holding rather than main shafts.
g. The milling chamber has a shape like an inverted triangle that allows users to more easily pour the fertilizer material to be ground, in which there is a shaft connected to a *grater* knife so that the incoming fertilizer material will be directly ground by the knife.

The retaining frame is the main structure of this manure-making tool made of 4x4 elbow iron with a thickness of 2 mm. The control panel functions as a control center on the tool made of iron plate with a thickness of 1.2 mm with a size of 30x20x15 in which there are several electrical components (Rahmad Riyanto, 2017), in Figure 3 it can be known that the components used by researchers in testing manure making tools include the following.

a. Box panels, as a protector of electrical components.
b. meter, as an indicator of voltage and current when the appliance is in operation
c. Pilot lamp, as an indicator light that indicates that the motor is working or in a standby position.
d. Push button, functions as a button to operate the tool.
e. MCB (miniature circuit breaker), as a safety for short circuits and overloads.
f. Change over switch, to change the pole of the voltage source that enters the motor so that the motor can change the direction of rotation.
g. Relay, which functions as an automatic switch.
h. Speed controller, functions as a motor speed regulator by increasing and decreasing the supply voltage on the motor.

Figure 2. Equipment and control panel

Farmers see manure-making tools as interesting tools to use as manure makers, so they are interested in using the tool, the obstacle is the condition of those who are the majority of them with minimal education who are not familiar with this tool, making it difficult for them to operate the tool. The solution is that assistance is needed to oversee the training process for the use of the tool as well as to overcome technical problems in the field. The next step, which currently cannot be done, is to collaborate with the Agriculture Service Laboratory to obtain a table of nutrient content in the manure produced. So that in the future, the results of this manure can also be sold on the public market.

Conclusion

From the results of observations in the field, it was obtained that farmers of RT 09 RW 03 Sukodono Village, Sidoarjo Regency are in dire need of organic fertilizers obtained from nature and most of them come from a mixture of livestock manure and decay from other nutrients such as the results of dry leaf composters and wasted food waste. The manufacture of organic fertilizer itself still uses manual methods such as when the process of stirring and smoothing the processed manure, because the process used is still manual, this is one of the obstacles to the

availability of manure made by farmers themselves becomes difficult to fulfill due to the long processing time and also. Therefore, as a breakthrough, manure-making and refining tools were introduced. Due to the limitations of farmers in RT 09 RW 03 Sukodono Village, Sidoarjo Regency does not have initial skills in operating manure-making and refining tools, so the next step is always to hold training assistance to improve the ability to operate the tool.

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