The Innovation Of Corn Seed Planting Tool Using Centrifugal Mechanics Pressure Method

Didi Muno Irawan 1*, Xander Salahudin 1
1Mechanical Engineering Department, Engineering Faculty, Universitas Tidar, 56116, Indonesia
*Corresponding author, Email Address: didimunoirawan@gmail.com

Abstract

Alat Tanam Biji Jagung Otomatis called ALTABATIS which uses the Centrifugal Mechanics Pressure Method is an innovation that provides a solution to the problem of corn farmers in Blengorwetan village. The purpose of this study was to determine the performance of tools with test variables, namely land area and time. So we get the value of time efficiency and operational costs of the tool by comparing conventional workmanship. This research consists of several methods, namely the design method, method of making tools and testing methods. Testing using simulation or experimental methods in the village of Blengorwetan. From the test results obtained that using ALTABATIS can save time and operational costs by 78%.

Keyword: altabatis, blengorwetan village, corn seeds, planting tool, efficiency

1. Introduction

Purwanto (in Wahyudin et al., 2016) Corn is a strategic and economically valuable serelia and has a great opportunity to be developed because corn is the main source of carbohydrates and protein after rice as a source of food. Indonesia is a tropical country that has two seasons, namely the rainy season and the dry season (Nofiana et al., 2018). One of the areas that planted corn was Blengorwetan village, Ambal District, Kebumen Regency. Recorded in the development of the Ambal District, Regional Profile Information System Data (SIPD) (2015), Blengorwetan village farmers usually plant corn in the dry season, with average corn production of 20,000 kg with a planting area of 325,420,000 m².

During the dry season, it is difficult for paddy fields to become farmers in the process of planting grain, farmers must use a piece of wood made with sharp edges (called ponjo in javanese) to make holes, and ash to cover the seeds placed in the hole. Counseling Center of Ambal District (in Rivayani D, 2017), mentions the type of soil in Blengorwetan Village is alluvial hidromok and alluvial gray, so that the method or procedures for the grower are commonly used there.

With the conventional planting process, it certainly takes a lot of time and money. In addition, the average farmer level of the economy there is middle to lower, so farmers can not keep up with technological developments due to cost constraints (SIPD, 2018).
Some existing tools that have been there before, Sitorus (2015) made a prototype of maize planters and fertilizers integrated with groove type tillage. Development is carried out using the tractor wheel shaft as a fertilizer and seed dropping shaft drive. But the innovation of these tools is quite burdensome for farmers because the costs are large enough to buy them. Hidayat (2015) also made a corn and soybean planting machine with an injection system on land without tillage. This plant is designed to plant three grooves rows with spacing in rows for 50 cm corn and 25 cm soybean. Some innovations exist, on average using large machines that require fuel and are economically less affordable to farmers. This innovation not only requires a large cost, but also a large construction so it is not practical. So this tool cannot be applied in Blengorwetan Village.

Muhammad and Mahesh (2018), modifying the seeder on a two-wheeled tractor (commonly known as a power tiller) is by adding a corn conversion kit for seeder. The modified seeder is evaluated is evaluated in the field with the results of seed distance (20 cm) and gives the higher yields than the conventional way (8.31 ton/ha). But this tool requires a large cost. Senthilnathan et al., (2018), designed a seed sower machines using the IoT (Internet of Things) system, by modifying the choosing of micro processor to connect the connectivity between the machines and controllers. Processing Sowing processes are carried out automatically using IoT by achieving regular distances between row and seed row. This tool is already sophisticated using the internet, but the Blengorwetan village farmers do not use internet technology on average, because it is indeed remote.

Thorat, Madhu, Patil and Rajkumar (2018), making sower machines that is operated manually so that increase the efficiency and reduce problems that occur without using a machine. This machine can achieve the distance and height control and can be used for various types of seeds. However, this tool is not suitable for application in Blengorwetan Village, with different soil types and processing. Then Pradip et al., (2017), design and develop a planting machine that is suitable for ridge and groove methods and also planting the seeds at a certain distance with a certain amount and reduce seed requirements per unit area. The innovation of this tool requires a considerable purchase cost. Finally from Shahzad and Choudhary (2015), making design of the seed sowing machine that will be beneficial by placing the right seed at the desired level, the distance between rows with special features to change the linear distance between seeds, spreading the right fertilizer, and compaction of soil. The manufacture and production of this design will be aimed to fulfill the intended aims and objectives of local farmers. However, this tool requires a large enough cost and is not in accordance with the needs of the process of planting corn in Blengorwetan Village.

Some of the existing device innovations on average use large machines that require fuel so that it is economically less affordable. Then the method of planting the existing tools is not suitable with the needs of farmers in Blengorwetan Village with the soil conditions and how to plant there. Based on some of the above problems, by adjusting the needs of farmers in Blengorwetan Village, a solution is needed that can help farmers to grow corn so that the maximum yield is obtained and the innovation of semi-automatic corn seed planting tools with Alat Tanam Biji Jagung Otomatis (ALTABATIS) with the Centrifugal Mechanics Pressure Method can be one of the alternative. Mean of Centrifugal Mechanics Pressure Method that is, a work method that utilizes compressed mechanical power on a rotating wheel to produce a hole. Where the wheel is spinning there is a centrifugal force at work. To determine the performance of this tool, the authors conducted a study by testing the performance of the tool with a variable area of land and time. So we can know the value of the effectiveness and operational costs of ALTABATIS by comparing conventional work in Blengorwetan Village.

2. Material and Methods

In the process of designing this tool we carried out several stages, namely a field survey to Blengorwetan Village by taking the data needed, a study of existing corn seed planting equipment, determining the specifications of the equipment such as the size and components or materials needed, and the design process using AUTOCAD 2013. Then after the tool design process, the process of making tools is continued, beginning with preparing the tools and materials needed, then the process of making tools by assembling components and materials in accordance with the design that has been determined, after that testing whether the device functions properly as needed. After the tool is in accordance with the design and can operate, the
next step is to test the tool directly in the fields. The testing method that we did was by direct ALTABATIS simulation in the rice field of Blengorwetan Village, using the ruler and stopwatch. From this test we got ALTABATIS work data.

a. Design and Components the Altabatis
The following picture shows a complete picture of Altabatis,

![Figure 2 Design of Altabatis](Source: Personal Document)

Components of this tool are: (1) Hand Grip as a pedestal of the hand so it is not slippery, (2) Frame or body as a component holder, (3) Knock to move the gate lever, (4) Gate lever to open the gate reservoir, (5) Sweepers for levelin ash, (6) Bearings as bearings from wheels, (7) Shafts (shaft) as bearing and body pedestals, (8) Planting Mouth for making holes, (9) Face (face) as a body touch field with soil, (10) Storage tanks as seed and ash containers, (11) Transparent Mika body for monitoring seed and ash volume.

b. Tool Specifications
The following are the altabatis specifications presented in the table below.

<table>
<thead>
<tr>
<th>Tabel 1. Tool Specifications</th>
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<tbody>
<tr>
<td>Wheel diameter</td>
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<tr>
<td>Wheel width</td>
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<tr>
<td>Planting mouth diameter</td>
</tr>
<tr>
<td>Planting mouth length</td>
</tr>
<tr>
<td>Handlebar length (from shaft to hand grip)</td>
</tr>
<tr>
<td>Gate lever length</td>
</tr>
<tr>
<td>Knock diameter</td>
</tr>
<tr>
<td>Knock length</td>
</tr>
<tr>
<td>Container volume (25x45x13)</td>
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</tbody>
</table>

c. Work Mechanism
The working mechanism of this tool is to use wheel rotation and gravity to produce compressive power to the ground. When this tool is pushed, the bulge (planting mouth) will stick and press the ground to produce a hole. Simultaneously the knock process that is on the side of the body will bring up the gate lever so that the gate (door) of the seed container will open, and followed by opening the gate of the ash gate, then the
seeds will first fall followed in the ash that closes the seeds in the hole. The use of this tool will help three processes in planting corn seeds, namely making holes, inserting seeds and closing seeds with ash (three functions of the tool in one process).

d. Usage Procedure

The use of this tool as a whole does not use fuel or electricity, it only requires energy from farmers to be issued to encourage ALTABATIS. How to operate ALTABATIS:

- Corn kernels are put into a reservoir or reservoir to the left, entering corn is regulated because the valve for removing corn with different ash.
- Husk ash is put into the right reservoir or reservoir, inserting corn is regulated because the valve to remove the husk ash is different from the valve to remove corn. This affects the technique or laying of corn and husk ash.
- Make sure the filling is in accordance with the carrying capacity of the tool
- Push ALTABATIS so that the wheel rotates and the planting mouth on the wheel will make a planting hole. When the wheel rotates it will automatically go down and fall into the planting hole and follow it down rice husk ash that will close the planting hole.

![Figure 3. Albatis tool](image)

(Source: Personal documentation)

3. Results and Discussion

Researchers analyzed the time and cost data for 5,000 m² and 10,000 m² planted land with the assumption that it was carried out by 1 worker and 8 hours of work per day. The results are presented in Figure 4 and Figure 5.

![Figure 4. Result of Land Area toward Time](image)

Based on the picture above, we get the value of working time for an area of 5,000 m² and 10,000 m² for 2 days and 4 days, while without altabatis or conventional, we get a longer time value of 9 days and 18 days.
Furthermore, the ratio of area to cost is presented in Figure 5.

![Figure 5. Result Land Area toward Cost](image)

In Figure 5 shows that the cost with ALTABATIS land area of 5000 m² and 10000 m², amounting to 7,104 USD and 14,208 USD. Whereas without altabatis, a fee of 31,673 USD and 63,346 USD is obtained.

Based on the results above shows using Altabatis can shorten the processing time 4 times faster than conventional processing. Likewise with the cost 4 times more efficient using ALTABATIS. So that efficiency can be calculated both time and cost by 78%.

4. Conclusions

ALTABATIS Alat Tanam Biji Jagung Semi Otomatis with Pressure Centrifugal Mechanics Method which is an innovation of corn grower tools proven to help corn farmers to save more time and cost. The percentage of time and operational cost savings with the use of this tool is 78% with the processing time from 9 days using manual tools to 2 days and cost 14,208 USD to 7,104 USD for land area 5000 m², from 18 days to 4 days and cost 63,346 USD to 31,673 USD for land area 10000 m².

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References


