

Agriculture 2 in 1 Assisting Machine

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Abstract : Crop farmers use manual agricultural tools in farming or other agriculture-related activities such as break up and loosening hard, compact soil, crop boundary-making, fertilizing, pest/weeds control, which consumed much time and energy for them. The objectives of Agriculture 2 In 1 Assisting Machine are to facilitate the crop farmer's work in the early stages such as loosening the soil and boundaries making for the crop planting, also for fertilizing/pests and weeds control by combining different functions in 1 machine. The methodology of this design includes metal joining - welding for fabrication, electrical installation for spraying system and the power source connection for rechargeable batteries combined with solar panels as an environmentally friendly power alternative. In conclusion, the machine is able to loosen the soil and forming the boundaries simultaneously and to be used in fertilizing/pest control using a solar-powered battery. This will reduce time consumed, minimize human power and increase efficiency.

Keywords: Crop Farming, Agricultural Machinery, Solar Energy.

1. Introduction

Data released by the Department of Statistics Malaysia shows that the agriculture sector contributed 7.1 per cent (RM101.5 billion) to the Gross Domestic Product (GDP) in 2019 [1]. Oil palm was the major contributor to the agriculture sector at 37.7 per cent, followed by other agriculture (25.9%). Other agriculture here includes crops (fruits, vegetables and other crops) [2].

Crop farmers are using basic and manual agricultural tools in farming or other agriculture-related activities. Crop farming or other agriculture-related activities include loosening the soil, crop boundary-making, fertilizing, pests/weeds control and others. Most of these processes are performed manually which consumed much time and energy for the farmers. Widely used agriculture equipment are hand tools, power tools, machines or other farming machinery that are towed or operated.

Globally, the use of machinery has been adapted in various facets of agriculture as it helps to improve the farm practices of the farmers [3]. Relevant information on the environments the machine

is to be designed is the influencing factor in agricultural machinery design [4]. Meanwhile, various solar energy collecting systems have been developed and analyzed for agricultural applications such as solar crop dryers, solar water pumps and many more [5][6]. This innovation combines different functions to facilitate the agricultural process where it can be used for multiple tasks in crop farming.

2. Materials and Methods

The materials and methods section, otherwise known as methodology, describes all the necessary information that is required to obtain the results of the study. Figure 1 shows the flow chart of the design process.

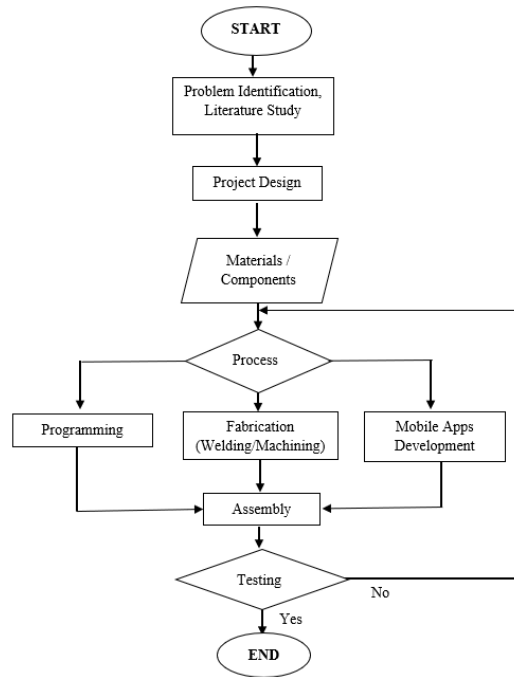


Figure 1: Flow chart of design process

2.1 Materials

The main parts and components needed in this design are metal for the main body frame, petrol engine and tiller blades for soil works. The spraying system consists of a pump, tank, hose and sprayer. Meanwhile for the solar powers system needs a rechargeable battery and solar panel.

2.2 Methods

The methodology of this innovation includes the metal joining MIG welding for fabrication and assembly of the mild steel main body frame, petrol engine and tiller blades. For the tiller blades which to break up the ground for planting, the shaft rotation is 2500 rpm with 4 blades with a diameter of 150mm. Figure 2 shows the fabrication process of the main body part. The electrical installation includes the connections for the fertilizing system which consists of spraying components and rechargeable batteries combined with a solar panel as an environmentally friendly alternative power source. Solar-powered 12V 9Ah rechargeable battery would last for 2 ½ to 3 hours while the fertilizer tank maximum capacity is 1.2 litre. Figure 3 shows the electrical and solar panel installation process. Project field testing later was executed as a critical stage and some modifications are made after being tested.

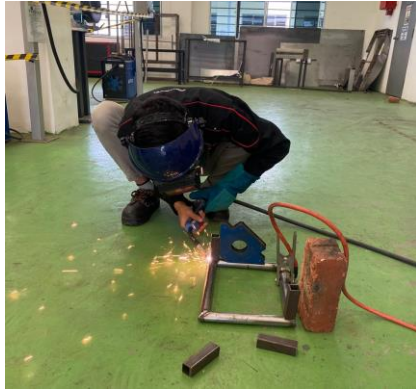


Figure 2: Fabrication process



Figure 3: Electrical & solar panel installation

3. Results and Discussion

3.1 Results

This innovation is aiming at combining different functions in a machine. The preparation stage in farming' i.e. loosening the soil and crop boundary-making can be done simultaneously and also for fertilizing/pest control using a solar-powered mechanism system, Therefore, the Agriculture 2 in 1 Assisting Machine was being tested to test the functionality. Figure 4 shows the field test where the machine can break up and loosen the hard, compact soil while forming the boundaries for the crop planting simultaneously. In Figure 5, the spraying system using a pump and solar-powered battery is used for fertilizing and pest/weeds control.



Figure 4: Field test



Figure 5: Fertilizing system

3.2 Discussions

Test run conducted during the development process is to measure the capability and functionality of this innovation. The test run data in Table 1 show a 40 per cent reduction of the processing time to break up, loosen the compact soil and boundary-making using Agriculture 2 In 1 Assisting Machine as compared to manual tools. Thus, this multi-function machine helps to facilitate agriculture-related activities, reduce time with minimum human power required. Figure 6 shows the assembled Agriculture 2 In 1 Assisting Machine.

Table 1: Field Test Data

Distance of crop boundary (m)	Time Taken (mins)	
	Manual tools	Agriculture 2 in 1 Machine
1	2	1.5
5	6	3.5
10	10	6



Figure 6: Agriculture 2 in 1 Assisting Machine

A group of crop farmers in Selangor has tested this machine on their crops. Figure 7 shows the feedback from users who tested the Agriculture 2 in 1 Assisting Machine. From the figure, 27.3 per cent strongly agree that this machine will be helpful to farmers and the agricultural industry.

5.This machine will be helpful to farmers and agricultural industry
33 responses

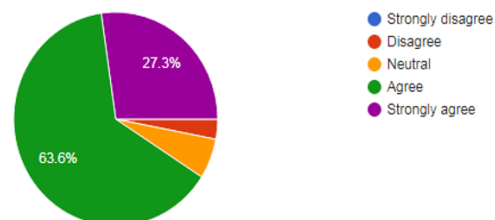


Figure 7: Users feedback

4. Conclusion

Therefore, this innovation benefits the agriculture sector and farmer’s community by facilitating crop farming activities. It combines multiple functions in a machine which will reduce activities time and increase productivity. This will also serve as another development in technology for the Malaysian agricultural industry, further enhancing the agricultural sector in the production of crops (fruits, vegetables and other crops) and increases the export of food products such as fruits and vegetables.

Acknowledgement

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