

Smart Seed Dibber

**Mohd Najib Janon^{1*}, Mahmod Abdul Hakim Mohamad¹,
M. Izzul Hakimi¹, M. Naquib Khamis¹, Abdullah Wagiman¹**

¹ Sustainable Product Development Research Group (SusPenD),
Department of Mechanical Engineering, Centre for Diploma Studies,
Universiti Tun Hussein Onn Malaysia, Pagoh Higher Education Hub, KM 1, Jalan
Panchor, Muar, Johor, 84600, MALAYSIA.

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Abstract:

Nowadays, there are many agriculture tools have been developed to help farmers implement various farming activities. However, for small-medium farming scale, there are still some difficulties faced by the farmers, especially during the seeding process. Due to seeding machine are costly, most of the time this process need to be done by manual and consuming a lot of time, energy and patient. Besides, the farmer could suffer back pain because the seeding process requires the person to consistently bend down to ensure the seed is properly planted into the soil. Hence, in this project, various concepts of dibber are compared in many aspects and parameters. Concept and parametric design are developed and analyzed according to the performance, structure construction and development costing. These tools aim to be able to plant the seed without bend down, reduce time consumption and minimize required energy while using this dibber. Explanation of the design and development of the mechanism, drawing analysis, material selection, fabrication process and finally the data analysis through simulation were presented in this study.

Keywords: Seed Dibber Tool, Seed Spreading, Modern Agriculture

1. Introduction

Among the earliest conventional planting method that was used by a large number of farmers is seed spreading, which simply meant by spreading out the seeds to the ground by hand and hoping they would sprout. However, this method still not effective due to the possibility the seeds are eaten by birds and the location of seed placement is random making it's difficult during harvesting time.

Most of the farmer nowadays use the Seeding Method which is commonly known as Direct Seeding, which refers to farming systems that operate by fertilizing and plant directly into untouched soil in one field operation, or else two separate operations of fertilizing and planting.

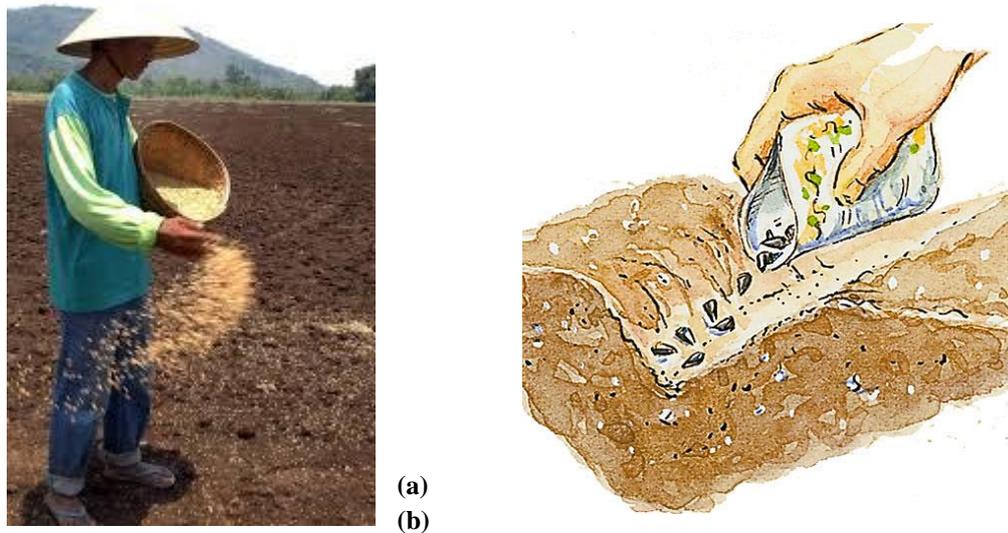


Figure 1: Conventional planting method, (a) Spreading seed (b) Direct seeding

Seed dibber is an agriculture tool used for direct seeding at the agriculture farm to reduce the use of manual energy and the time taken to transplant seedlings. The however current issue of the most productive in the market cannot cover up the root bowl after the plant is dropped, where the farmer needs to bend down to cover up the seed with soil for each seeding process. Thus a lot of energy and time will be used to make sure the seed seeding process is successful and also there is a high possibility the farmer could suffer back pain due to this repetitive bend down posture.

Hence, this project aims to develop a Smart Seed Dibber capable to do seeding process effectively without requiring the user to repetitively bend down. The objective of this project is to identify influence aspects and parameter of seed dibber, to design and develop Smart Seed Dibber prototype as well as to analyze the prototype performance, construction structure and development costing. All process such as drawing analysis, material selection, fabrication process and finally the data analysis through simulation are implemented.

The scope of this project is firstly design improvement based on seed dibber- type Seedling Trans planter and the dibber capable to reclose hole of the soil after the planting process. The only mustard seed that sizes 1-2 mm is used as seed's reference size. The height of the tools is at least 1 meter from the ground, the material used for the tools must not easily bend or damage considering the minimum weight that can be handle by tools is 3 kg of mustard seeds.

2. Materials and Methods

2.1 Literature Review

There are a lot of efforts has been done to create a quick and effective working method of seeding. Among product sold in the market are Hand Seeder Tool, Seedling Trans planter, Seeder Template, Seed Dispenser, etc. [1]-[5]. In overall, although this product still contributes to the farmer during seeding activities, the situation for the farmer need to bend down for each process of seeding cannot be avoided except Seedling Trans planter.



Figure 2: Direct Seeding Tools examples in the market

Seedling Trans planter is dibber tools capable to plant the seed effectively into the soil providing with the long handle but the user still needs to bend to cover up the planted seed with soil for the effective germination process. Besides, researchers also continuing study the improvement design and improvement for the Direct Seeding Tools as Figure 4 below. [5]-[7]



Figure 3: Seedling Trans planter sold in the market [2]

2.2 Materials

The material selection process has been carried out by following the aspects outlined below for guidance. The materials for Smart Seed Dibber must be strong enough to penetrate to the ground, good corrosion resistance and difficult to bend during usage. After a few discussion has been made, the selected material is Aluminum. Because although both of them fulfilled as their ability to becoming a high corrosion resistance and not easy to be bend. Aluminium is a lot lighter than steel. This is because these tools are targeted the old farmer as it uses so that the user will be able to use it without any unnecessary obstacle.

2.3 Methods

As depicted in Figure 4, the Smart Seed Dibber has gone through design and development progress. The main methods do a literature review to the available product and registered patent either in the online (website) or offline (observation). Each product is evaluated and compared according to the material, weakness, strength, mechanism and price.

Besides that, this Smart Seed Dibber already assessed at a stage of Design Formulation, Concept Design, Embodiment Design and Parametric Design. This product parametric Design has been developed using Solid Work 2019.

2.4 Equations

In this study, the equation that involves in this project is spring. This is because the mechanism of the prototype is mostly involving with compression and decompression of the spring. The involved equation is shown below:

$$\text{Force Spring } (N) = K-x \quad \dots \dots \dots \text{Eq. 1}$$

$$\text{Potential Energy}(J) = \frac{1}{2}Kx^2 \quad \dots \dots \dots \text{Eq. 2}$$

$$\text{Work Done } (J) = \frac{1}{2}K \left(x_f^2 - x_o^2 \right) \quad \dots \dots \dots \text{Eq. 3}$$

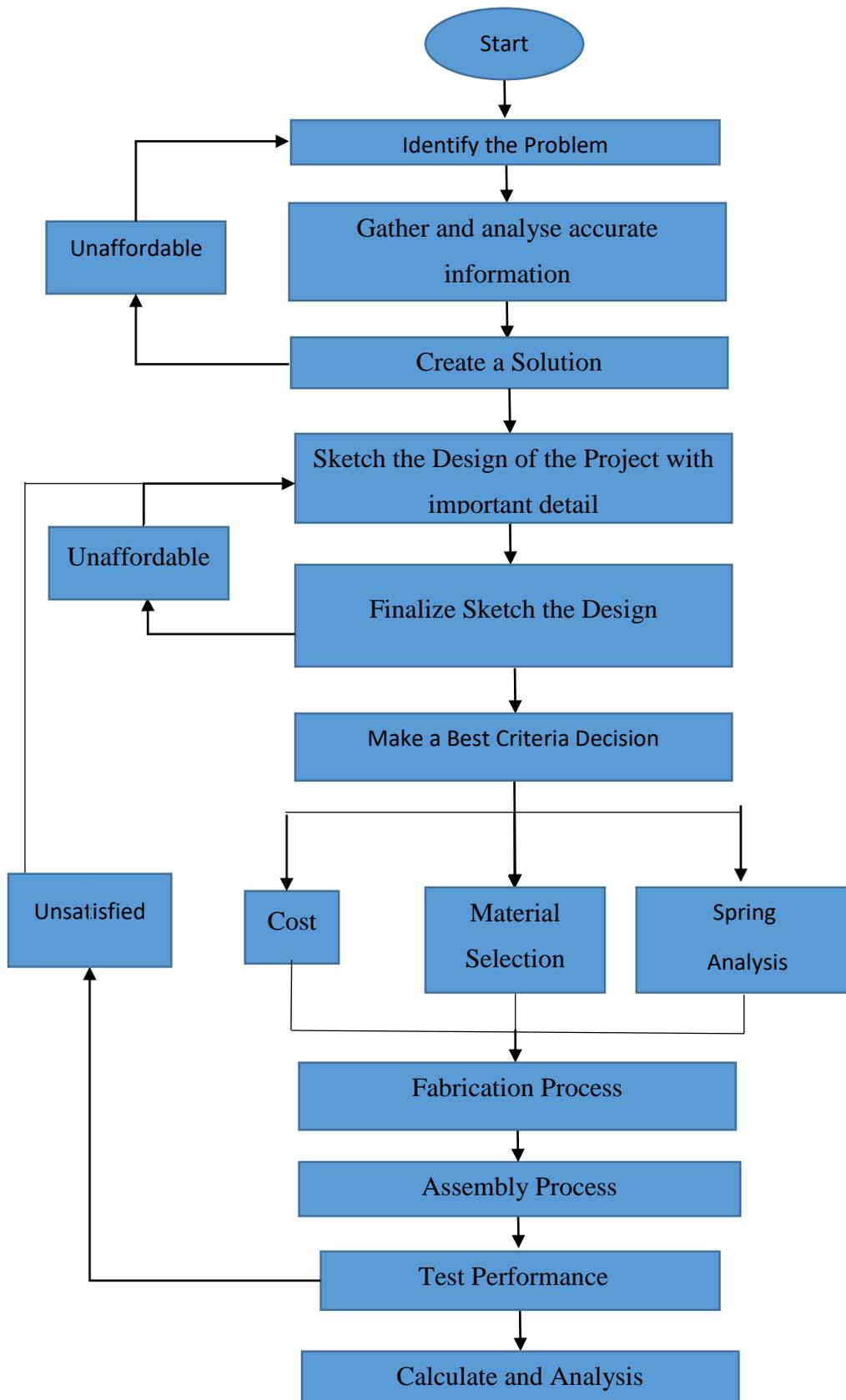


Figure 4: Project Flow Chart

3. Results and Discussion

As shown by Figure 5 the full assembly and main component of the Smart Seed Dibber. The main components are Stick, Seed Station Shell, Stepper Slot and Pointer.

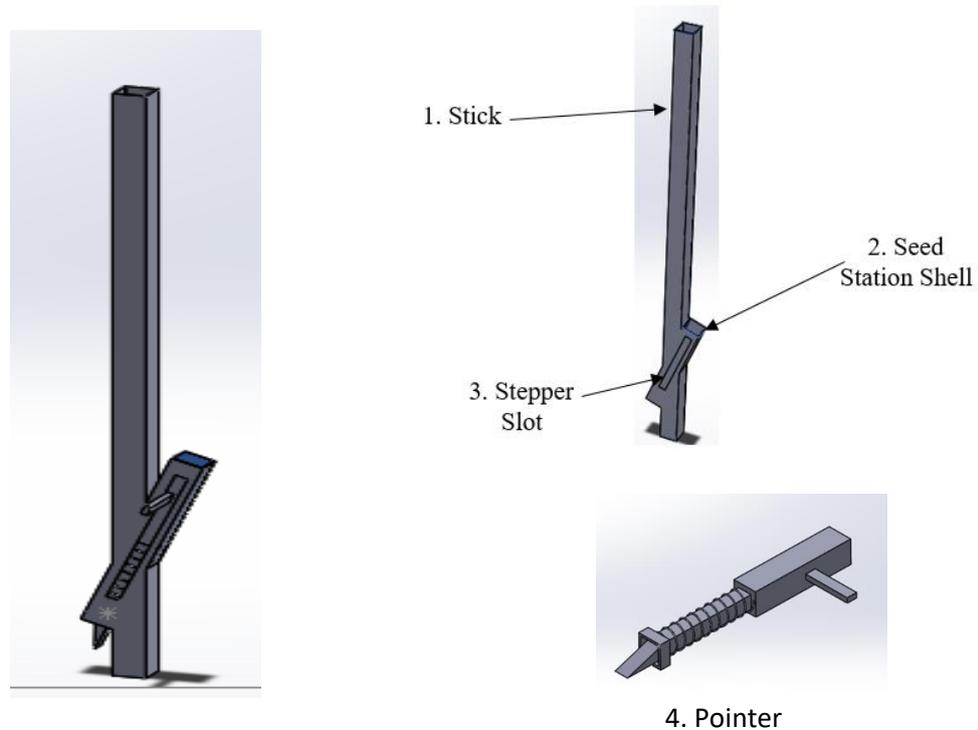


Figure 5: Full Assembly and Main Components

As Figure 6, the operating procedure for Smart Seed Dibber could be explained as below:

1. Insert the mustard seed into the insert hole.
2. The inserted seed will be drop into the Pointer's Seed Shell.
3. Push the down the stepper by using your foot.
4. The Pointer will penetrate to the ground as it carries the seed inside it.
5. The Seed will be placed inside the ground.

Table 1 list all the cost of every component that needs to create the prototype of the tools. The first component which is the 6061 Aluminum Square Hollow is used to create the Stick, Seed Station, Seed Station Shell and Pointer of the Prototype. The second component is the spring where is used to hold the Pointer to its original position as it pushes down to penetrate it to the ground. The third component is the rotator, where it uses to deploy a small number of seeds to the ground where the pointer has been reached.

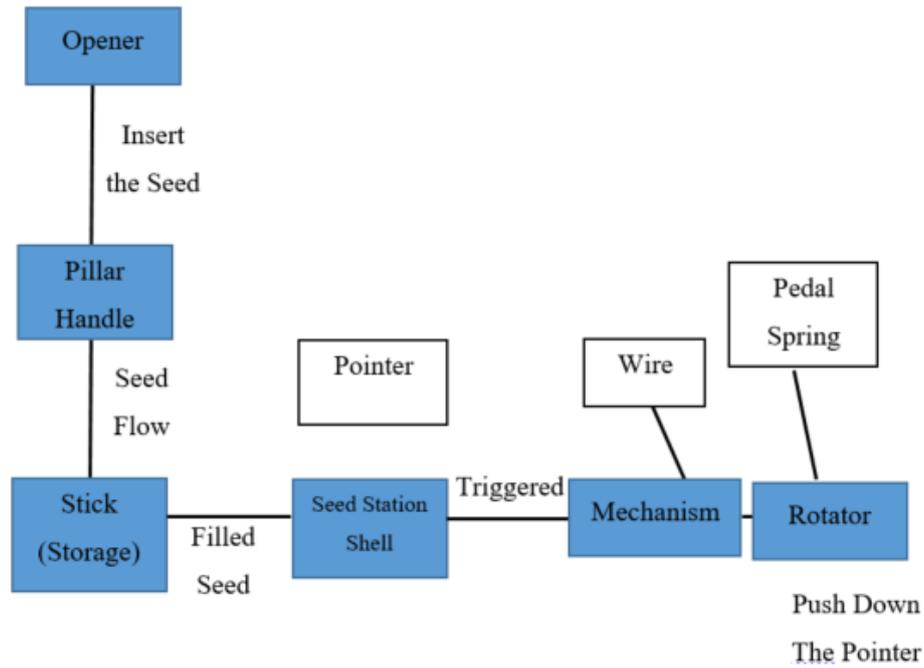


Figure 6: Operating Procedure for Smart Seed Dibber

Table 1: Material Cost

No	Component	Quantity	Unit Price (RM)	Total Price (RM)
1	6061 Aluminium Square Hollow (1m) (50*50)	2	15.10	30.2
2	6061 Aluminium Square Hollow (1m) (46*46)	1	10.50	10.50
3	6061 Aluminium Square Hollow (1m) (30*30)	1	8.60	8.60
4	Spring	1	21.44	21.44
5	Rotator	1	3.50	3.50
6	Welding	-	-	30.00
			Total =	104.24

The seed station can withstand a force of at least 5 kg, which is equal to 50 N. On it, the volume of the stick may be able to support a large number of seeds, where it can reach 30 N. For the seed station to penetrate the pointer to the ground, has been made in application solid work, this project shows its resilience in withstanding the strength that will be given by the user. In solid work, the force shown is 400 N and is very suitable for the force normally given by humans which is 200 lbs and the user can also produce a force between 300 N to 400 N. This shows that the Seed Station can function in good condition because of its ability to withstand produced by the user.

4. Conclusion

In conclusion, the objectives of this project have been achieved. From each of these components, Smart Seed Dibber can be developed to create the complete planting of mustard seed that work according to their needs. It also shows the Dibber Sophisticated Seeding Tools solve the problems that gardeners face. The body of dibber seeding tools is made from aluminium. This is a type of aluminium that can be treated with cold treatment. This can be used in situations where there is a high demand for anti-corrosion and oxidation. As a result of its good availability and its connectivity with super features, it is easy to present and has a good process.

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References

- [1] J.W. Jung Seed Company, "Seed Starting FAQ,". [Online]. Available: Jungseed, <https://blog.jungseed.com>. [Accessed May 31, 2020].
- [2] Taizhou Sky Machinery Co., Ltd., " Hand Held Transplanter For Tomato Vegetable Seed Planting Machinery,". [Online]. Available: <https://www.alibaba.com>. [Accessed Feb 1, 2020].
- [3] Earl Weber & Sandra Petersen, " Using the Sow EZ TO PLANT SEEDS,". [Online]. Available: <https://www.sowez.com/>. [Accessed Dec 24, 2019].
- [4] Xi'an Meishi Jinlin Import & Export Co., Ltd., " Corn Seed Planter Manual Seed Planter Seeder Hand Held Seed Planter,". [Online]. Available: <https://www.alibaba.com>. [Accessed March 1, 2020].
- [5] ALovableJunkster, "Seed Dispenser Garden Tool Seedmaster Vintage 1998 Interchangeable Baffles Handheld ,". [Online]. Available: <https://www.etsy.com>. [Accessed Sept 24, 2019].
- [6] Monica Hemingway, "Garden Stamp: Product Review,". [Online]. Available: <https://gardeningproductsreview.com> [Accessed Sept 25, 2019].
- [7] Hangzhou Sino-Shine Import & Export Co., Ltd., " Agricultural Hand-held Grass Seed Fertilizer Spreader Light and Useful Manual Seeder Spreader Plastic for garden,". [Online]. Available: <https://www.alibaba.com>. [Accessed March 1, 2020].