

CHAPTER

3

MULTIPURPOSE CORN SEED SOWING JIG

Hairul Anuar Abdullah and Zulaikha Haibir

3.1 INTRODUCTION

Farming is a vital but tedious activity. A large-scale farming requires many workers to manage a plantation productively. Agricultural machines can be instrumental to the labourers used tractors the labour work needed. Conventionally, they used tractors to plough the land before labourers manually conduct the seeding process. The plantation was not easy to manage as labourers are required to do physical demanding work under a scorching sun. Hence by developing a multipurpose corn seed sowing jig would help farmers to reduce the physically demanding management of a corn plantation.

3.1.1 Problem Statement

The basic process of sowing operation is to plough the land, dig holes in the soil, plant the seeds in rows at desired depth and spacing, cover the holes with soil and provide proper compaction over the seeds. The suitable plant bed spacing and depth of seed placement vary from crop to crop and for different agricultural and climatic conditions to achieve optimum yields.

When dropping the seeds, they have to bend to drop the seeds in the holes accurately. This process is also tedious as they can only complete one acre of land per day with 20 workers. Furthermore, the process consumes a lot of time. The multipurpose cord seed sowing jig would reduce the number of workers and increase the time of the sowing process.

3.1.2 Objective

The objective of this study is to design a multipurpose corn seed sowing jig that can reduce manpower and work time while producing the same or larger rate of productivity.

3.1.3 Scope

The scope of this study is focusing on:

- (1) Background study on existing product, patent and standards.
- (2) Three concept generation of multipurpose corn seed sowing jig.
- (3) Final design selection of multipurpose corn seed sowing jig.
- (4) Computer-aided design (CAD) modelling of the final design for multipurpose corn seed sowing jig using Solidworks.
- (5) Detailed design including of design for manufacturing assembly (DFMA), failure mode effect analysis (FMEA), engineering drawing, and engineering analysis.
- (6) Fabrication of multipurpose corn seed sowing jig prototype.
- (7) Functionality testing of the prototype.

3.2 DESIGN PROCESS

This section explains the conceptual design process.

3.2.1 Problem Identification

Problems are identified by performing critical background research and by understanding concepts from similar products. The focus is on the whole process of corn plantation, the difficulties of conventional management, and available solutions.

3.2.2 Product Design Specification

To get the best solution of the multipurpose corn seed sowing jig (MCSSJ), a product design specification (PDS) needs to be constructed to be a guideline for the design specification of the MCSSJ. Table 3.1 shows the PDS for this study.

Table 3.1 Product design specification

Specification	Description
Product features	Maximum size: 3.5m wide x 1m high. Maximum weight: 140 kg. Attachable to a 12 hp tractor.
External body and material	Light material with loading capacity 1kg of seeds. Coated to prevent corrosion. Able to work in harsh condition and resistant to dust, dirt, rainwater, etc. Can withstand small operational heat and vibration.
Cost	Maximum manufacturing cost is RM2,000.00.
Safety	No sharp edges. All rotating parts are covered.
Ergonomics	Portable, easy to set up and to operate.
Environmental-friendly	Does not contribute to air pollution. Noise is at minimum.
Maintenance	Routine maintenance in every six months and can be easily conducted by the owner. No special tool needed.
Product life	5 years
Performance	The seeds are to be placed in every 3 ft distance and 1 ft away from adjacent row. Only two seeds are at most allowed to be planted in each hole. The hole depth is 4 inch. The machine can plough the soil. The machine can sow minimum 5000 corn seeds per day.