

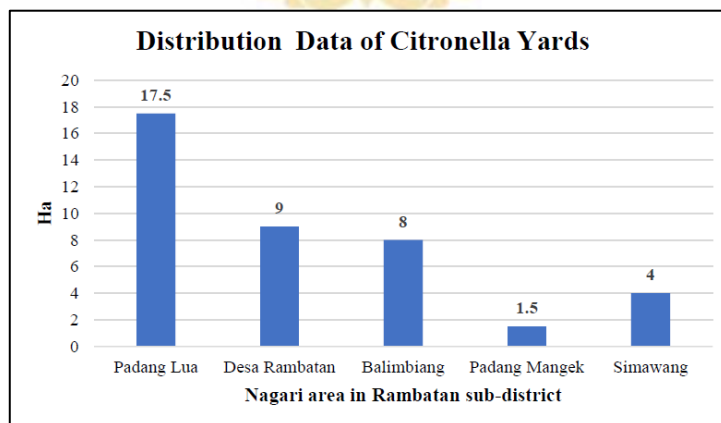
# CHAPTER I

## INTRODUCTION

This chapter contains the background, formulation of the problem, the purpose of the research, the limitations of the problem, and the systematics of writing.

### 1.1 Background

Citronella is a plant that quickly grows on marginal land areas. Marginal land itself is land that has low quality, such as sloping land. Therefore, even though this land is of low quality, it does not mean it cannot be used (Sulaswatty et al., 2019). One of the concentrations is planting citronella, which has the potential of citronella oil. One of the marginal lands is located in Tanah Datar Regency, Rambatan sub-district. The ground in the Tanah Datar Regency, especially the Rambatan sub-district, has much land that is not flat or has steep slopes. This is because Tanah Datar Regency's geographical condition is around the foot of Mount Merapi, Singgalang, and Sago, especially in Jorong Aua Sarumpun, where much marginal land has slope terrain. Therefore, prefer to plant citronella on marginal land. The following data on the distribution of citronella Yards can be seen in **Figure 1.1**.



**Figure 1.1** Distribution of Citronella Yards in Rambatan District  
**Source:** Farmer Economic Institutions in Rambatan District

The location of plantation is located in the vicinity of the factory. At the beginning of the construction, the Yard area used was one hectare with steep slopes. This Yard will be expanded to the bottom of the hill because it is marginal land. The manufacture of citronella Yards around the factory also functions as an obstacle to erosion in the vicinity of the factory land. The factory can also produce many raw materials with low transportation costs and reduce the cost of purchasing raw materials to manufacture citronella oil. But the sloping and steep terrain with a slope angle of around 20°, 36°, and 57° at several points around the plantation, with the distance from the lower end of the Yard to the top near the factory, is  $\pm 10$ m in **Figure 1.2** and **Figure 1.3** which is commonly found in marginal land areas. Farmers do it manually in the current harvesting process by transporting and standing on sloping land. Farmers usually transport an average of 30kg in a single haul with a labor force of 10 people for 1.3 tons of lemongrass for 8 hours when harvesting at an inclined slope. This is certainly not safe for farmers; there are many big risks of danger that farmers can experience. Also, this method is ineffective because it consumes large amounts of energy and takes a long time in harvesting activities.



**Figure 1.2** Citronella Plantation Area in Aua Sarumpun



**Figure 1.3** Citronella Plantation Area from Bottom of The Hill



**Figure 1.4** Citronella Plantation Area

**Source:** Google Maps

The condition of the citronella Yard, which has steep slopes, makes the production process run ineffectively, which requires a large amount of labor for workers, a large number of workers, and a high risk of work, especially on slippery slopes when it rains, causing the pitches to be unreachable by human labor without assistance, tools or machines. So, we need material handling facilities to facilitate workers' work in moving raw materials from the Yard into the storage warehouse or factory, especially from the bottom of the slope to the top near the factory. This

is very important because material handling facilities can solve problems in the production process of citronella oil, increasing production quantities, reducing labor, and saving costs.

Material handling facilities can be realized through the engineering design process. Engineering design, sometimes known as the engineering method, is a formal, rigorous, and systematic process of optimizing a problem. Problems are often expressed as a desire to solve a situation that has not been solved before or improvements on something already existing, whether a process, a device, or a concept. Consequently, by the very nature of this statement of problems, they are incomplete and ill-defined. Therefore, the engineering design process starts with defining and understanding the problem and what will be achieved. Thus, an engineering design will be carried out on suitable material handling equipment for steep slope conditions in the lemongrass Yard in Aua Sarumpun, Rambatan sub-district (Nassersharif, 2022).

## **1.2 Problem Formulation**

Based on the explanation through the background, the problem raised for this research is how to design material handling equipment in the process of harvesting citronella on steep slopes.

## **1.3 Research Objective**

The goal expected to be achieved in this study is to design a material handling facility concept design to facilitate the transfer of citronella harvest on steep slopes.



## 1.4 Research Scope

In achieving the research objectives, this research is limited to the following:

1. The prototype of the material handling solution will only be made up of a 3D model with SolidWorks.

## 1.5 Outline of Final Project Report

The writing systematics used in doing this final project are:

### CHAPTER I INTRODUCTION

Chapter I consists of the background of this research, problem formulation, research objectives, research scopes, and the outline of the final project report.

### CHAPTER II LITERATURE REVIEW

Chapter II consists of fundamental theories from literature to be used as references in solving problems in this research.

### CHAPTER III RESEARCH METHODOLOGY

Chapter III describes the stages and methods used in research systematically.

### CHAPTER IV PRODUCT DESIGN AND ANALYSIS

Chapter IV contains the stages of product design and Analysis.

### CHAPTER V CLOSING

Chapter V contains the conclusions and suggestions for the result.

