CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Cocoa is one of the most widely traded agricultural commodities in the world, with over 4 million metric tons produced annually. The global cocoa industry is valued at over $130 billion, providing livelihoods for millions of people, particularly small-scale farmers in tropical countries. (International Cocoa Organization, 2020).

Despite its economic importance, the cocoa industry faces several challenges, including declining yields, low productivity, and poor quality beans. One of the critical factors affecting cocoa quality is the drying process. Cocoa beans must be dried to a moisture level of 7% or lower to prevent mold growth and preserve flavor. (World Bank, 2019). Traditional drying methods, such as sun drying, are often used by small-scale cocoa farmers. However, these methods can be unreliable, leading to inconsistent quality and reduced yields. Moreover, traditional drying methods can be labor-intensive and time-consuming, requiring significant manual labor to monitor and maintain the drying process.(Food and Agriculture Organization of the United Nations,2017).

In recent years, there has been a growing interest in the use of solar-powered dryers for cocoa beans. Solar-powered dryers offer several advantages over traditional drying methods, including improved efficiency, reduced labor costs, and enhanced quality. Moreover, solar-powered dryers are a renewable energy source, reducing the carbon footprint of cocoa production. (Cocoa Research Association, 2015).

Despite the potential benefits of solar-powered dryers, there is a lack of research on their use in cocoa production, particularly in tropical countries. Most existing studies have focused on the technical aspects of solar-powered dryers, with limited attention to their practical applications in cocoa production. (International Cocoa Organization, 2018).

Furthermore, there is a need to develop solar-powered dryers that are specifically designed for small-scale cocoa farmers in tropical countries. These farmers often face significant challenges in terms of access to technology, markets, and finance. A solar-powered dryer that is affordable, easy to use, and adaptable to local conditions could help to improve the livelihoods of small-scale cocoa farmers and enhance the sustainability of cocoa production.(Afoakwa, E. O. 2010).

1.2 Problem statement of the study

Cocoa seed drying, a critical step in cocoa processing, is often hindered by unreliable and inefficient traditional drying methods, resulting in poor quality cocoa beans, reduced yields, and economic losses for small-scale cocoa farmers, thereby necessitating the development of a sustainable and energy-efficient drying solution."

1.3 Aim and objectives of the study

The main aim the project is to design and develop an innovative solar –powered cocoa seed with automated temperature control and battery backup While:

Specific Objective

This study objectives are to evaluate the quality of cocoa beans after continuous drying, investigate the effects of continuous drying on cocoa's physical, chemical, and sensory properties, and identify the optimal continuous drying conditions for maintaining high-quality cocoa beans.

1.4 Scope of the study

The scope of this study is to design and develop a solar-powered cocoa seed dryer with temperature control and battery backup, and to evaluate its performance in terms of drying time, energy efficiency, and cocoa seed quality. The study will focus on small-scale cocoa farmers and will investigate the economic viability of the solar-powered dryer.

1.5 Justification of the study

The justification for this study is multifaceted, driven by the need to improve cocoa quality, address energy poverty, enhance sustainability, support small-scale farmers, and fill a knowledge gap in the use of solar-powered dryers in cocoa production, ultimately contributing to the development of a reliable and efficient solar-powered cocoa seed dryer with temperature control and battery backup.