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PERCEIVED IMPACT OF THE SUN SHADED AGRO-FORESTRY PROJECT ON THE LIVELIHOODS OF COCOA FARMERS IN THE WESTERN NORTH REGION OF GHANA

SALIFU AWINI YAKUBU

2024

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PERCEIVED IMPACT OF THE SUN SHADED AGRO-FORESTRY PROJECT ON THE LIVELIHOODS OF COCOA FARMERS IN THE WESTERN NORTH REGION OF GHANA

BY

SALIFU AWINI YAKUBU

Thesis submitted to the Department of Agricultural Economics and Extension of the School of agriculture, College of Agriculture and Natural Science, University of Cape Coast, in partial fulfilment of the requirement for the award of Master of Philosophy degree in (Agricultural Extension)

JULY 2024

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DECLARATION

Candidate's Declaration

I hereby declare that this is the result of my original research and that no part of it has been presented for another degree at this university or elsewhere.

Candidate's Signature ………………………….. Date …………….

Name: Salifu Awini Yakubu

Supervisor's Declaration

I hereby declare that the preparation and presentation of the thesis were supervised following the guidelines on supervision of the thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature …………………….. Date ……………..

Name: Dr. Albert Obeng Mensah

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ABSTRACT

Cocoa rehabilitation (CR) for restoring damaged, old, and moribund trees to raise yields and revenue from production is one of the current initiatives to increase Ghana's cocoa bean output. Cocoa cultivation has a crucial economic and social role in Ghana. The study examined the perceived impact of the Sun Shaded Agro-Forestry (SCAFS) project on the livelihood of cocoa farmers in the Western North Region of Ghana. The study was carried out (using a descriptive survey design) in the Essam and Adabokrom cocoa districts using 200 farmers. Both closed, and open-ended interview schedules were used to elicit responses from the farmers. Also, most of the SCAFS beneficiaries had been small-scale (less than 1.0ha for cocoa rehabilitation) farmers for at least ten years. Farmers suggested that strengths of the project were the provision of economic trees, monitoring of project farm and extension, provision of cocoa seedlings, and cutting and treatment of cocoa farms while weaknesses were late arrival of fertilizer, unreliable and inadequate source of rain, inadequate inputs, land tenure constraints and untimely provision of planting material. However, the farmers suggested the early arrival of fertilizer, provision of irrigation schemes, adequate provision of inputs, payment of compensation to farmers, reduction in the cost of inputs, provision of soft loans, and stakeholder engagement on land tenure barriers as some solutions to the problems. The project was perceived to have had a moderate impact on the livelihoods of the farmers. Also, socio-demographic/farm-related characteristics accounted for 17% of the variations in beneficiary farmers' livelihoods impact of the project, with the sex of the respondent as the best predictor.

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ACKNOWLEDGEMENTS

I would like to convey my sincere gratitude to my primary supervisor, Dr. Albert Obeng Mensah of the Department of Agricultural Economics and Extension, for his direction, superb supervision and suggestion, inspiration, and support throughout the composition of my thesis work. My gratitude and sincere thanks go to, Mr. Pieter Spaarman, who is the county's director of SNV and Mr. Divine Appiah who is also the multi country project manager of SNV.

I would also like to express my heartfelt gratitude to the Ghana Forestry Commission and Ghana Cocoa Coard especially the Cocoa Health and Extension Division for assist in providing relevant data for this study.

I would like to sincerely thank the agricultural economics and extension lecturers, especially the Head of the Department, Prof. Ernest L. Okorley, for their inspiration, helpful criticism, and encouragement in shaping the thesis proposal and the final draught. I am also grateful to Stephen Yeboah, Emmanuel Anobir Mensah, Paul Ayekorok Abowen, Geaten Anyeembey, and Abdoni Emmanuel for their assistance during the data collection, analysis, and editing of the thesis.

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DEDICATION

To my lovely father, Mr. Salifu Awini

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LIST OF ABBREVIATIONS AND ACRONYMS

AEA	Agricultural Extension Officers
ANOVA	Analysis of Variance
BoG	Bank of Ghana
CFSNS	Comprehensive Food Security and Nutrition Survey
CHED	Cocoa Health and Extension Division
CHIP	Cocoa High Technology Programme
CIPP	Context, Input, Process, and Product
COCOBOD	Cocoa Board Ghana
CODAPEC	Cocoa Disease and Pests Control
CRIG	Cocoa Research Institute of Ghana
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSSVD	Control of the Swollen Shoot Virus Disease
CSSVDCU	Cocoa Swollen Shoot Virus Control Unit
DFID	Department for International Development
GDP	Gross Domestic Product
ICCO	International Cocoa Organization
IDS	Institute of Development Studies
ILO	International Labour Organization
JHS	Junior High School
KASA,	Knowledge, Attitudes, Skills, and Aspirations
LBC	Licensed Buying Companies
MoFA	Ministry of Food and Agriculture
ODF	Open-Defecation Free (ODF)

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PEP's	Productivity Enhancement Programmes
SCAFS	Sun Shaded Agro-forestry
SD	Standard Deviation
SHS	Senior High School
SLA	Sustainable Livelihood Approach
SNV	Stichting Nederlandse Vrijwilligers
SPSS	Statistical Package for the Social Sciences
SRL	Sustainable Rural Livelihood
SSS	Senior Secondary School
SWA	Solidaridad West Africa
TOP	Targeting Outcomes of Programmes
USAID	United States Agency for International Development
VIF	Variance Inflation Factor
VSLA	village savings and loans
WCF	World Cocoa Foundation

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CHAPTER ONE

INTRODUCTION

Chapter one of the study presents the general background of the study, the statement of the problem, general and specific objectives, research questions, and the significance of the study. This chapter presents the delimitations and limitations that define the scope of the inquiry and the potential setbacks, the definition of key terms, and the organisation of the study. The last part of this chapter is the organization of the study.

Background to the Study

Although cocoa beans were first cultivated in South America, most of the world's supply comes from Africa. Africa is the largest cocoa producer in the world, with an estimated 3.7 million tonnes of dry cocoa beans produced in the 2019/2020 harvest season. Côte d'Ivoire and Ghana were the top cocoa bean producers in West Africa, with Côte d'Ivoire producing 2.2 million tonnes and Ghana producing 1.1 million tonnes in 2022 (International Cocoa Organization, 2023). Wessel and Quint-Wessel (2015) stated that almost 70% of the world's cocoa production comes from the 6 million hectares of cocoa fields in West Africa. Therefore, Africa must maintain or enhance its cocoa supply for local and international markets to keep up with demand from a rapidly expanding global population and burgeoning industrial economy.

Millions of smallholder farmers in more than 50 nations spanning Africa, Latin America, the Caribbean, and Asia rely on the cocoa tree crop for their livelihood (Ayambire, Amponsah, Peprah, & Takyi, 2019). About half of all jobs in Ghana are provided by the agricultural sector, the vast majority of which are held by smallholder farmers (GSS, 2019). According to the Institute

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for Statistical, Social and Economic Research (ISSER), in 2019, agriculture contributed over 18% to the GDP and employed over 50% of the country's workforce. Eighty percent of Ghana's agricultural exports come from cocoa cultivation, and the business supports the livelihoods of approximately 800,000 families (Mabe et al., 2020). Two-thirds of the revenue for cocoa farmers comes from this industry, sustaining the lives of around 4 million agricultural families (GSS, 2015).

Eastern, Ashanti, Central, Brong-Ahafo, Western North, Western South, and Volta Regions are Ghana's seven (7) Cocoa Regions with seventy-two cocoa districts (Food and Agriculture Sector Development Policy Sector, 2014). About 1.6 million small farmers in Ghana's Ashanti, Brong-Ahafo, Central, Eastern, Western, and Volta regions grow cocoa on plots of less than three hectares (Naminse, Fosu & Nongyenge, 2012).

According to Van Vliet, J. A., & Giller, K. E. (2017), Ghana's cocoa fields are struggling, with average annual yields hovering around 300–400 kilograms (kg)/ha. This is 56% lower than Côte d'Ivoire's average yield (800 kg/ha) and 79% lower than Malaysia's average production (1,700 kg/ha). Problems with pests and diseases, lack of maintenance, insufficient soil fertility, lack of shade, and insufficient inputs have been documented as some of the causes of lower yield of cocoa (Roth et al., 2017; Enriquez et al., 2020). Compared to the average cocoa yield in the two-above scenario, Ghana's output per hectare is clearly below the belt and requires immediate improvement.

When solving the development problems farmers face, innovation is defined as introducing novel technology, goods, services, practices, and institutional structures that significantly increase production. According to

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Chavas and Nauges (2020), innovation in modern agriculture is crucial since it accelerates a country's economic growth. Various mechanical and electronic machinery, tools, procedures, and instruments are used in the cocoa industry. Because of technical development and suitable innovation, agricultural labour and activity in most developed nations typically yield around 50 percent more than in the poorest countries. Chavas and Nauges (2020) propose that the invention and implementation of contemporary agricultural technology in emerging nations is the primary cause of this massive productivity gap. Some socio-demographic parameters (such as age, education level, sex, yield, years of farming experience, etc.) contribute to Ghana's poor adoption rate of acceptable technology and innovation.

Ghana's High Forest Zone constitutes a major cocoa production area; however, most cocoa farms have aging trees with declining yields and are highly vulnerable to climate-related shocks such as drought. With limited access to land, farmers often encroach upon protected forest areas to raise cocoa and food crops, increasing deforestation and CO_2 emissions. This is because many cocoa farmers have limited capacity to manage and adapt to challenges that negatively impact crop yields, and they are also faced with a lack of planned approaches to effectively rehabilitate and rejuvenate aging cocoa farms. These issues increase the likelihood that farmers will expand cocoa production into protected forest areas.

The good news is that Stichting Nederlandse Vrijwilligers (SNV), a non-profit foundation, has arrived to assist cocoa farmers in rehabilitating old cocoa farms with new resistant varieties as part of the cocoa rehabilitation project under the SCAFS project to increase production.

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Following the policy objectives of the government of Ghana and the newly adopted sustainable development goals (SDGs), SNV works with national partners to advance economic, institutional, social, and environmental progress while simultaneously reducing poverty. The primary goal of SNV's capacity-building work with local actors in Ghana is to decrease poverty and boost sustainable economic development. In addition to providing advice, SNV facilitates information sharing, uses data to advocate for change, and seeks to improve value chains. Agriculture, energy, water, sanitation, and hygiene are the primary areas where SNV concentrates its efforts. Gender equality, youth empowerment, good governance, and a conducive policy climate are all topics SNV addresses in its interdisciplinary programming. The SNV project (SCAFS) aims to improve cocoa yields, secure farmer livelihoods without encouraging expansion, reduce emissions from deforestation in protected and off-reserve areas, and ensure biodiversity conservation and enhanced carbon stocks.

As of 2021 when this study was conducted, empirical evidence showing whether the objectives of the SNV SCAFS project have been realized had to come by. Therefore, this study seeks to investigate the impact of the SCAFS project on cocoa farmers' livelihoods. Thus, the study sought to prove whether the SCAFS project has enhanced the livelihood of the cocoa farmers in the Western North Region in Ghana who partook in the project.

Statement of the Problem

Across rural Africa and Ghana, a high percentage of the population relies on agriculture for their livelihood (Akudugu, Millar, &Akuriba, 2021). In rural Ghana, 90% of the population is projected to rely on agricultural and agro-related activities for financial support (GSS, 2020). When given a chance,

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small-scale agriculture in the developing world may provide a viable and lucrative alternative to the spread of large-scale, capital-intensive, labor-reductive corporate farming (Howard et al., 2008).

Many nations are implementing climate-smart initiatives to combat the difficulties caused by climate change and other external factors, such as providing farmers with resistant and hybrid seedlings and access to irrigation technology so that crops can be grown even in the dry season (Akudugu et al., 2021). 15% of smallholder cocoa farmers can produce more than 650 kg/ha yearly (Asante-Poku & Angelucci, 2013).

Increasing cocoa output means more money coming in from exports. The international cocoa trade still brings over $2 billion annually, a huge boon to the country's economy and government coffers. Over 2 million people are projected to be employed directly in cocoa growing in Ghana, with another 6.3 million (or 26 percent of Ghana's total population) relying on the industry (Ghana Cocoa Board, 2018; Peprah, 2015). Cocoa is the backbone of the Ghanaian economy, but it is dropping in production despite rising demand from local and foreign industrial businesses. Low yields are a problem in cocoa fields throughout Ghana owing to several factors, including the advancing age of cocoa farmers, a lack of preventative maintenance, pests and disease, insufficient soil fertility, inadequate shade, and insufficient inputs (O'Sullivan & Vanamali, 2020).

About two-thirds of the blighted cocoa in Ghana, representing some 214,000 hectares were found in the Western North Region. This region once produced 330,000 tonnes in the 2010/2011 crop season is now producing below 150,000 tonnes (COCOBOD, 2020). Most of the cocoa in the Western

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North part of Ghana is over 40 years old and has exceeded its active economic life span. Infectious or stale cocoa accounts for almost 40 percent of the country's supply (COCOBOD, 2020). This amounts to around 700,000 hectares (or 40%) of the country's total cocoa stock of 1.9 million hectares. Most of these trees are very tall making harvesting difficult and too old stems with many scars result in less fruiting. When farmers see a drop in revenue owing to poor yield per unit area, they often abandon their old, uneconomic farms in favour of more forested places.

SNV's Full to Sun Shaded Agro-forestry (SCAFS) project was developed to address these issues and more through measures such as the rehabilitation of old farms, the reduction of deforestation caused by farm expansion, and the increase in yields and income experienced by the vast majority of cocoa farmers.

Many cocoa plantations in Ghana use ancient trees that are not very productive. Most cocoa farms are owned by elderly farmers with neither the means nor the will to restore them. The loss in productivity of cocoa plants begins around the 20-year mark, and the fact that most cocoa farmers are beyond 55 only worsens the situation. Most farmers don't bother replanting because they are too old or weak and believe that doing so is too expensive compared to sustaining existing trees. The swollen shot disease is spreading rapidly and has already affected around 40% of the nation's cocoa stock, drastically limiting cocoa output. The SNV Full is targeting younger farmers in the region to Sun Shaded Agro-forestry (SCAFS) initiative, which aims to remove societal obstacles to replanting and promote its advantages.

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The complete impact of the SCAFS project on the cocoa farmers who benefit from it is not fully understood due to some knowledge gaps. In-depth research on the longer-term economic viability of higher yields and incomes is one of these, as is a more thorough examination of the wider social effects on gender roles and community cohesion (SNV, 2018). Furthermore, further investigation is necessary to have a deeper comprehension of the variables impacting the implementation of agroforestry techniques and the obstacles related to expanding these practices throughout various farmer demographics (SNV, 2020). Furthermore, the robustness of these systems under a range of climatic circumstances and environmental advantages like carbon sequestration and improved soil fertility are not fully quantified by empirical data. More evaluation is required to determine the efficacy of farmer training programs, particularly how well knowledge is retained and applied. Lastly, additional study is required to determine how enhanced yields and sustainable farming methods impact farmers' market accessibility and integration into the cocoa supply chain (SNV, 2018; SNV, 2020).

Based on the aforementioned knowledge gap, the purpose of this study is to evaluate the efficacy of the SNV Full to Sun Shaded Agro-forestry (SCAFS) project on the lives of farmers by looking at how it has changed their income and productivity as their perspectives on the project's success.

Objective of the Study

General Objective of the Study

The study's main objective was to examine the perceived impact of the SNV's Full to Sun Shaded Agro-forestry (SCAFS) project on the livelihood of beneficiary cocoa farmers in the Western North Region of Ghana.

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Specific Objectives

i. To examine the following socio-demographic/farm-related characteristics of cocoa farmers namely, Age, educational level, years of experience, household size, size of cocoa farm and size of cocoa farms affected by the project.

ii. To ascertain the perception of beneficiary farmers on the effectiveness of the SCAFS project in terms of its components.

iii. To examine the level of impact of the SCAFS project on beneficiary farmers' livelihoods.

iv. To determine farmers' suggested problems and strengths of the project and how the problems may be solved.

v. Determine the socio-demographic/farm-related characteristics of farmers influencing the perception of livelihood impact of the SCAFS project.

Research Questions

i. What are the socio-demographics and farm-related characteristics of the farmers?

ii. What are the perceptions of farmers on the effectiveness of the SCAFS project on the main components?

iii. What is the level of perceived impact of the SCAFS project on the livelihoods of cocoa beneficiary farmers?

iv. What are the problems, strengths, and suggested solutions of the SCAFS project as perceived by the farmers?

v. What farmers' socio-demographics/farm-related characteristics influence the livelihood impact of the SCAFS project?

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Research Hypotheses

i. Ho: There are no relationships between farmers' socio-demographics/farm-related characteristics and the SCAFS project's perceived effectiveness.

H1: There is a relationship between the socio-demographic/ farm related characteristics of farmers and the perceived effectiveness of the SCAFS.

ii. H0: There are no relationships between the socio-demographic/ farm related characteristics of farmers and the perceived impact of the SCAFS project.

H1: There are relationships between the socio-demographic/ farm related characteristics of farmers and the perceived impact of the SCAFS.

Variables of the Study

Dependent Variable:

The dependent variables in the study are the effectiveness and the impact of the SCAFS project.

Independent Variable

This research uses the socio-demographic/farm-related characteristics of SCAFS recipients as independent variables.

Significance of the Study

This research holds significant importance for enhancing economic stability, promoting environmental sustainability, and improving social well-being among cocoa farmers. By examining the socio-economic and environmental benefits of agroforestry practices, this study aims to provide insights into how these practices enhance farm productivity and economic

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resilience. The findings can inform policy-makers and stakeholders in formulating strategies to improve income levels, ensure sustainable agricultural practices, and foster community cohesion and overall quality of life for farmers.

This research fills critical gaps in the existing literature by providing a localized, perception-based analysis of agroforestry impacts. While previous studies often focus on quantitative metrics and short-term outcomes, this study adds a qualitative dimension by exploring farmers' perceptions and experiences, offering a deeper understanding of socio-cultural factors influencing agroforestry adoption. It also assesses the long-term sustainability of these practices, providing valuable data on their extended impact on livelihoods. By considering economic, environmental, and social dimensions, this comprehensive evaluation can lead to more integrated and effective policy recommendations and development strategies.

Delimitation of the Study

The research evaluated how SCAFS affected the livelihoods of cocoa farmers who participated in the initiative but not all cocoa producers in the study region. The study was carried out using a descriptive survey design in the Essam and Adabokrom cocoa district using 200 farmers. Also, most of the farmers had been small-scale (less than 1.0ha for cocoa rehabilitation) for at least ten (10) years.

Limitations of the Study

The study was hindered by some restrictions despite the smooth flow of the process. This study originally relied on farmers' memory recall abilities during the data gathering since farmers did not maintain proper records. Also, only two of the three cocoa districts in the Western North Region that benefitted

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from the SCAFS initiative were included in the research because of resource, time, and financial constraints.

Definition of Terms

This section provides the operational definition of the terms used in this study.

Challenges: Tasks that are challenging and put the key participants in creating and executing cocoa rehabilitation to the test.

Cocoa Rehabilitation: is the transformation of old, diseased, moribund, abandoned, or semi-abandoned cocoa farms into productive, money-earning enterprises.

Cocoa Region: is a territory that the COCOBOD has designated depending on the volume of produce or production from that area. Despite sometimes having similar names and borders, Ghana's political and administrative regions are distinct from cocoa regions. There are now seven (7) cocoa-growing areas in Ghana.

Cocoa District: cocoa districts are defined by the COCOBOD and vary from the political and administrative districts in Ghana; they may share the same names, but their boundaries are different. Currently, there are seventy-two (72) cocoa districts in Ghana.

Financial capital: the financial resources (in the form of currency, credit/debt, savings, and other economic assets, including infrastructure and manufacturing equipment and technology) needed to implement a chosen means of subsistence.

Human capital: skills, knowledge, labour capacity, and health and physical competence crucial to pursuing alternative livelihood options.

Impact: how farmers feel the SCAFS program has improved or slowed their quality of life.

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Livelihood: A person's means of subsistence include their skills, possessions (including stocks, resources, claims, and access), and activities (Social Sci LibreTexts, 2022).

Natural capital: factors within a family's direct control that may be used for growth and improvement include the physical environment and natural resource stocks (KFF, 2022).

Perceived impact: one's judgment of the effect something has had on them.

Perception: farmers' interpretations of their own emotions and thoughts in relation to the SCAFS (NCAT, 2022; Frontiers, 2022).

Physical capital: encompasses both the household's physical, and economic infrastructure and the household's productive and other assets. Transportation and communication systems, ports, and power plants are all part of what is known as "the physical, economic infrastructure." (Bhattacharya, 2012).

Social capital: what individuals call upon while pursuing various livelihood strategies that call for concerted effort: their social resources (networks, social claims, social ties, affiliations, associations).

Organization of the Study

The study was organized into five chapters. "Chapter One, which captured the introduction, included the following; introduction, background to the study, statement of the problem, the purpose of the study, the research questions, significance of the study, delimitation, and limitation of the study definition of terms. Chapter Two of the study dealt with the review of related literature". Chapter Three elaborated on the study's methodology, which described the population, the sample, and the sampling procedure. The type of instrument that was used and how it was administered. Chapter Four discussed

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the findings, and chapter Five contained the study’s summary, conclusions, and recommendations.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

The chapter reviews the theories supporting the study, including the sustainable livelihood framework and the principle of perception, and discusses the underlying presuppositions, contributions, and relevance of the theories to the study. Finally, a conceptual framework was developed to act as a framework for the study based on the review of pertinent literature.

History of cocoa production in Ghana and throughout the world

Theobroma cacao, commonly known as cocoa, is a member of the Sterculiaceae family and comes in two main varieties: Criollo and Forastero. From the Criollo and Forastero hybrids sprang a third, hardier variety called Trinitario (Bosompem, 2015). The ancient Maya and Aztec civilizations drank the fruit much like modern-day coffee. This drink, which included a stimulant similar to caffeine, earned cacao the alternative moniker "Food of the Gods," or "Theobroma" in Greek. The development of transatlantic shipping routes allowed for increased commercial production of the fruit in Africa towards the end of the nineteenth century. Expansion of production has occurred to additional tropical countries located within a 15-degree latitude band both north and south of the equator. Cacao is still used as a beverage ingredient in certain cultures, but the vast bulk of it is now processed into the ever-popular chocolate confection (Young, 2007).

The Amazon basin in South America supplied cocoa to Ghana (Legg & Owusu, 1976). In the early nineteenth century, when the Dutch first came to Ghana, they brought cocoa. After their cocoa plants died from pests and worms,

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the missionaries gave up on the crop (COCOBOD Executive Diary, 2007). Tetteh Quarshie of Ghana introduced cocoa to Ghana in 1879 from Fernando Po, an island in Equatorial Guinea. Back in Ghana with cocoa pods was Tetteh Quarshie, who had gone to become a blacksmith in Fernando Po. Tetteh Quarshie established the first cocoa plantation in what was then the Gold Coast in Akwapim Mampong in the Eastern Region. Tetteh Quarshie's coca variety was the first to be planted for the country's forest region cocoa industry. Today, cocoa is cultivated in seven main regions throughout Ghana: Western North, Western South, Ashanti, Brong Ahafo, Central, Eastern, and Volta (Buxton, 2018).

Global cocoa output is expected to reach a record high of 4.73 million tonnes in the 2019/2020 harvest year, significantly from the 1960s average of 1.28 million tonnes. However, in the 2019/2020 cocoa season, the output is predicted to fall by more than 1% to 4.784 million metric tonnes (Ghana Cocoa Board, 2019). Despite a seemingly unsustainable rise in output (nearly a million metric tonnes) during the 2020/21 cocoa season. In the 2019/2020 cocoa planting season, Africa will contribute around 3.7 million tonnes to global production. La Côte d'Ivoire, Ghana, Nigeria, Cameroon, Congo, Gabon, Guinea, and Togo are the top cocoa-producing nations in Africa. However, in the 2019/2020 cocoa season, La Côte d'Ivoire and Ghana's combined output accounts for more than 61% of global output (ICCO, 2020). After Ghana lost its status as the top cocoa producer to La Côte d'Ivoire in 1978, La Côte d'Ivoire has been at the top ever since.

Although Ghana's cocoa output has grown over time, the higher yields per acre planted are not largely responsible for the rise. Most of the growth has

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come from either current farms becoming larger or new farms being established, particularly in the Western Region of Ghana, where forest area is abundant (Appiah, 2004; CRIG, 2010). The rising global population and subsequent demand for cocoa products make raising and maintaining cocoa output critically important. Most of Ghana's cocoa output is sent elsewhere, so the responsibility for maintaining and enhancing the country's cocoa industry must be shared internationally.

COCOBOD has launched many initiatives over the years to increase national cocoa production. These initiatives include the Cocoa Rehabilitation Programme, the Cocoa Pests and Diseases Control Programme, the Soil Fertility Improvement Programme, the Enhanced Extension Support for Farmers Programme, the Youth in Cocoa Programme, the Child Education Support Programme, the Research Support Programme, the Rehabilitation of Cocoa Roads. Supporting COCOBOD's rehabilitation of cocoa plantations, other agencies, organizations, and foundations have also developed and executed projects. One such organization that has helped restore farms in Ghana is SNV.

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Causes of Decrease in Cocoa Yield in Ghana

Drought, old age of trees, pests and diseases, reduced soil fertility, poor pricing, and a lack of demand all contributed to a significant drop in cocoa production, notably during the 1960s and 1980s. Many cocoa estates in Ghana's Ashanti, Bono, Ahafo, Eastern, and Volta regions were lost to bushfires, the severe drought that followed in the early 1980s, and only a fraction of the lost land was ever replanted. In addition, scientists believe that the ancient age of cocoa trees accounts for around 30% of the land used for cocoa farming but contributes relatively little to the yields or farmers' profits. (International Cocoa Organization, 2020)

The disease caused by the Cocoa Swollen Shoot Virus cannot be stopped. Production fell because of Black Pod Disease and capsids, bad farm care practices, and low producer pricing in the 1980s. The soil nutrients in Ghana were depleted without being replenished with fertilizer, which contributed considerably to the reduction in cocoa output. The Cocoa Research Institute of Ghana (CRIG) has conducted an on-farm study. Among CRIG's many successes are the regulation of capsids, the identification of the virus that causes cocoa swelling shoot disease, the identification of mealy bugs as carriers of the virus, the eradication of affected trees, and the management of the disease via the production of early-bearing and high-yielding hybrids (Cocoa Research Institute of Ghana, n.d.).

In addition, CRIG's research efforts have contributed to this understanding. Two major efforts, the Cocoa Pest and Disease Control Programme (CODAPEC) and the Cocoa High Technology Programme (CODAPEC Hi-Tech), were launched by the government of Ghana in 201I;

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both contributed considerably, but neither was able to reverse the severe fall in cocoa output (Ghana Ministry of Food and Agriculture, 2019).

Challenges of Cocoa Production

Cocoa production issues in Ghana may be broken down into four categories: pests and diseases, environmental problems (poor soil fertility and climate change), marketing difficulties, and low productivity.

Productivity

Farmers, farms, infections (swollen shot disease), and aging cocoa trees have contributed to Ghana's poor cocoa yields in recent years (Laven, 2010). In addition, Baffoe-Asare, Danquah, and Annor-Frempong (2013) projected that more than 25% of the cocoa-tree stocks were older than 30 years. Despite estimates putting the potential production in Ghana at least 1000 kg/ha (MoFA, 2017), the average national yearly output was just 500 kg/ha. Compared to Côte d'Ivoire's 800 kg/ha or Malaysia's 1700 kg/ha (Appiah, 2004; Bosompem, Kwarteng, & Ntifo-Siaw, 2011), its yield is poor.

The loss in productivity of cocoa plants begins around the 20-year mark, and the fact that most cocoa farmers are beyond 55 only worsens the situation. Most farmers don't bother replanting because they are too old or weak and believe that doing so is too expensive compared to sustaining existing trees. The swollen shot disease is spreading rapidly and has already impacted around 40% of the nation's cocoa stock, drastically limiting cocoa output (Ghana Cocoa Board, 2021).

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Infectious or stale cocoa accounts for almost 40 percent of the country's supply (COCOBOD, 2020). This amounts to around 700,000 hectares (or 40%) of the country's total cocoa stock of 1.9 million hectares.

Pest and Diseases

Pests and diseases destroy 30–40% of the cocoa crop per year, according to ICCO (2010). Many diseases may affect cocoa crops, and it is estimated that each year, these diseases are estimated to wipe off 30–40% of global cocoa output (Basso et al., 2012). Pests such as mirids (capsids) stem borers, shield bugs, pod bearers, rats, and termites all prey on cocoa crops (Bosompem, 2015). Worldwide, mirids are the most significant pests of cocoa. By eating away at the cocoa tree's delicate tissues, they may cause the tree's death.

Chemicals have been developed to combat the cocoa mosquito, the pod-boring caterpillar (Marmara sp.), and the mealybug (Stictococcus sp.). They are all rather minor pests and illnesses. Pests and illnesses are major hindrances to cocoa farming in Ghana. Because clearing an old farm takes twice as long as clearing fresh forest areas (Kolavalli & Vigneri, 2011), farmers may find it more cost-effective to expand rather than transplant old and unhealthy trees. Mistletoe, a parasitic plant that attacks cocoa plants, prevents the trees from producing healthy and tasty fruit by killing off the young branches. Since the widespread infestation of the swollen shot disease of cocoa, it has become a serious canker of the cocoa industry in Ghana (Adu-Ampomah et al., 2020).

Environmental Concern

One of the fundamental biophysical restrictions limiting agricultural productivity is a lack of soil fertility, namely nitrogen and phosphorus (Ahenkorah, 1981). This is especially true in the chocolate industry. The results

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of a 1990 CRIG study indicated that almost no cocoa farmers in Ghana were using fertilizer applications or other methods of maintaining soil fertility in their farm management programs. The immature cocoa plants being cultivated by COCOBOD suffer from a lack of nutrients; thus, they must be fertilized (with Ammonia). The high expense of the project is a direct result of the poor seedling survival rate caused by the area's unreliable rainfall patterns.

Bunn, Castro-Llanos, and Schreyer (2018) argue that climate change will significantly impact cocoa adaptability, namely drought and increasing temperatures. In Ghana's high forest zone, deforestation and landscape fragmentation resulted from forestry and cocoa pressures, and extensive removal of shade trees from cocoa fields contributed to this problem. Between 2000 and 2015, an annual average of 138,000 hectares of forest disappeared in Ghana (Republic of Ghana, 2014; Republic of Ghana, 2017).

Marketing Challenges

The fluctuating value of cocoa significantly hinders Ghana's cocoa industry. COCOBOD assumes all risks in the near term since it converts the uncertainty of fluctuating worldwide cocoa prices into a stable price for the farmer. Since prices on the worldwide market are allowed to fluctuate, COCOBOD's promise of a stable price helps farmers weather any seasonal price fluctuations. Because of COCOBOD's 'forward sale' policy, the FOB price always differs from the global market price. As a result, the price at which cocoa was sold when it was sent to an overseas customer may not have been the same as the price at which it is now being sold (Dormon et al., 2004). Kwanashie, Gurba, and Ajilima (1998) state that the extent to which prices fluctuate is a big worry for the cocoa sector and that COCOBOD, LBCs, or

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farmers are defrauded as a result. Therefore, even if the price of cocoa on the global market rises dramatically, the producer price may not follow suit (Bosompem, 2015). The inability of many LBCs to provide farmers with sufficient storage space is a major cause of port congestion, and the same problem arises at the port itself (Gyamera, 2007). The inability to dependably transport cocoa to the port presents a risk to LBCs.

As of April 7, 2020, cocoa prices had fallen by 6% since the beginning of 2020, while economic growth in key cocoa-importing regions (European Union, United Kingdom, United States) had slowed by 19% (UNECA, 2020).

Financial Challenges

The lack of accessible loans for cocoa growers is another major issue in the sector. It is extremely difficult for small-scale cocoa producers to get agricultural supplies. When farmers approach buying clerks for loans, the latter might leave them feeling deceived if they attempt to impose unwelcome terms and conditions. As a consequence, growers are discouraged from investing in larger cocoa plantations and end up making less money overall (Laven, 2010). Borrowing money in Ghana is a costly endeavour. In Ghana, the Bank of Ghana's interest rate is now 23.00% (BoG 2021). This, along with the lengthy waiting period in having monies held in cocoa inventory remitted to COCOBOD, makes it difficult to operate as an LBC in Ghana.

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The Stichting Nederlandse Vrijwilligers (SNV)

In 1965, the Dutch Ministry of Foreign Affairs formed SNV as the Stichting Nederlandse Vrijwilligers (literally "Foundation of Netherlands Volunteers"). Since 1992, SNV has maintained an office in Ghana. SNV is a nonprofit international development agency that uses practical expertise to alleviate poverty worldwide. SNV uses its deep and sustained roots in the nation to bring our world-class knowledge of agriculture, energy, and laundry to bear on problems specific to the region. SNV employs about 1,250 people throughout 25 countries in Africa, Asia, and Latin America, with an annual revenue of €130 million (SNV, n.d.).

SNV's initial mission was to send young Dutch volunteers to the Global South; however, due to the shifting priorities of partner groups and nations, SNV ceased its volunteer activities in 1988. SNV has become one of the most influential Dutch aid groups recently (SNV, n.d.).

Separation from the Dutch Ministry of Foreign Affairs occurred in 2002, and the organization's name was changed to SNV Netherlands Development Organisation in 1993. The SNV began aiding COCOBOD and similar NGOs in their attempts to revive and advance the cocoa business at the start of 2016, so, in January 2016, SNV began funding the SCAFS project.

The Sun-Shaded Agro-Forestry (SCAFS) Project

SNV has been present in Ghana since 1992 and has implemented close to 100 projects that contribute to economic, institutional, social, and environmental development and poverty reduction. Ghana ranks 133 out of 191 on the Human Development Index. SNV's programming in Ghana focuses on clean cooking, access to sanitation and hygiene services, and access to food.

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With increasing inequality levels and the pressing climate crisis, SNV continues to work towards sustainable development in close liaison with the Government of Ghana and our local partners (SNV, n.d.).

The development of plantations, poor productivity, food poverty, and an uncontrolled forestry sector all contribute to a high rate of deforestation, which may be slowed by using "Sun Shaded Agro-Forestry" in cocoa production. The SCAFS project emphasizes restoring damaged smallholder farms and forest ecosystems to prevent deforestation. Increased output and livelihood for smallholder cocoa farmers, higher revenue for cocoa farmers, and a more robust national economy are the primary goals of this initiative. The primary goal is to speed up the process by rehabilitating the older cocoa trees so that they can generate higher yields in a shorter amount of time.

Deforestation, brought on by the spread of plantations, has resulted in food insecurity, an uncontrolled forestry industry, and negative climatic consequences; this is why the initiative prioritizes using degraded smallholder farms. This endeavour is not destroying business supply networks. To help local governments strike a better balance between cocoa plantation growth and forest protection, they implement strategic planning initiatives and create a land use planning system. The initiative is also focusing on methods to restore smallholder-centric agroforestry systems (with native tree species) around the world in a way that protects the environment and benefits local communities. The Ghana Forestry Commission and the Cocoa Research Institute of Ghana (CRIG) are assisting with the project's implementation.

This project is being implemented in partnership with the Ghana Cocoa Board, the Forestry Commission Cocoa Research Institute of Ghana, and the

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Bia West District Assembly, and is funded by the German Federal Ministry of Environment, Nature Conservation, Building and Nuclear Safety (BMUB) over three years (2016 – 2018). SNV is addressing these challenges in several complementary ways:

i. Increasing farmer access to extension support services to promote crop intensification,

ii. Introducing improved cocoa agroforestry systems through the phased rehabilitation of old and unproductive cocoa trees and the incorporation of shade trees,

iii. Piloting a multi-stakeholder integrated land use planning system to facilitate the siting of sustainable cocoa expansion,

iv. Introducing a deforestation traceability system at the farm level,

v. To better monitor and promote deforestation-free cocoa supply chains in the High Forest Zone Implementing SNV's deforestation-free supply chains toolkit across the forest cocoa landscape to monitor and promote sustainable cocoa production.

The Project’s Key Outcomes and Achievement

i. SNV’s key achievements are around procurement, supply chain, and social responsibility towards Ghana’s school feeding program.

ii. Promoting fisheries development priorities and policies by increasing access to sustainable energy supply chains for fish processing and improving incomes for women in the sector.

iii. Offering financing and capacity-building services to Ghanaian climate-smart and innovative entrepreneurs through incubation and

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acceleration support and provision of business advisory services and access to finance.

iv. Business-to-businesses and matchmaking support for smallholder farmers and entrepreneurs in the cocoa sector.

v. Working with over 50 local-level partners, SNV has increased access to clean cookstoves in communities in the Central, Western, and Northern regions of Ghana. In Ghana's remote Nandom district, close to the border with Burkina Faso, the project advocated for water, sanitation, and hygiene services delivery, which resulted in the district being declared Open-Defecation Free (ODF) in 2019.

vi. Improved cocoa agroforestry model introduced through rehabilitation of overaged farms targeting 2000 smallholders and covering an area of 4000 hectares in 15 communities.

vii. Functional multi-stakeholder land use planning system established and operational in project communities and a Traceability system established to trace cocoa beans to farm level and also monitor no deforestation in supply chains among three private cocoa companies and smallholder cocoa farmers were key outcomes.

viii. The initiative provided comprehensive education to 1800 cocoa farmer-beneficiaries through radio programs and on-the-ground training throughout all cocoa districts. 778 male and female cocoa farmers benefitted from the rehabilitation exercise, with a total farm size of 639.5 Ha. 710,507 plantain suckers were originally projected to be sent to the designated beneficiaries; however, only 516,369 were ultimately distributed.

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ix. The total farm area of 639.5ha required 710,507 cocoa seedlings; however, only 571,381 were delivered (representing 80.4% of the required quantity). To help with the shading of immature cocoa plants, farmers were given a total of 19479 shade trees.

x. Every year, SNV gives out an extra 50,430 cocoa seedlings to deserving cocoa farmers so that they may restock their restored fields. A total of 842 cassava sticks were given to a subset of the recipient farms' farmers so that they may plant them strategically in the restored areas.

xi. Since the project aims to produce short-term results, the 264 liters of foliar fertilizer and 24 liters of insecticide donated by the Ghana Cocoa Health and Extension Division (CHED) were well-targeted and coordinated before being distributed to 180 cocoa farmers chosen at random.

xii. SNV has partnered with Solidaridad West Africa (SWA) to build and expand the number of village savings and loans societies in the Juabeso-Bia landscape to improve smallholder cocoa farmers' access to financing. Fifty farmers have joined each of the 20 cooperatives formed by the cocoa farmers. These cooperatives are connected to licensed purchasing companies (LBCs) and have received instruction in group dynamics, financial literacy, and VSLA ideas.

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Cocoa Rehabilitation

Definition of cocoa technology by Laryea (1981): the sum of all knowledge, both modern and traditional, required for growing, processing, and selling cocoa. Other writers who study the economics and financing of tree crops draw a line between "renovation" and "rehabilitation" when discussing methods to boost farm output. The terms "rehabilitation" and "renovation" are used interchangeably in this context, with "rehabilitation" referring to practices that remove and replant cocoa trees and "renovation" referring to practices that concentrate on the management of existing trees such as pruning, coppicing, and grafting (Dalberg 2015; Kroeger et al., 2017). This difference isn't made in the agricultural practice guidelines, but it may help estimate cost and payback time. It may take three to five years for newly planted cocoa seedlings to begin producing pods, although grafting can speed up the process. "Cocoa Rehabilitation" refers to reviving dormant, ailing, or unprofitable cocoa plantations.

Types of Cocoa Rehabilitation Techniques

In the case of cocoa swollen shoot viral disease (CSSVD), which can only be treated by removing and killing affected trees and keeping the area fallow for at least 1 year before replanting, the decision must be based on the age of the cocoa trees and the presence of the illness. Coppicing, phase replanting, putting seedlings beneath old trees, total replanting, and selective planting are all used to rehabilitate cocoa plants and restore their former productivity (Ruf, 2015).

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Coppicing Technique

Coppicing is a method used in cocoa fields to avoid termite damage by completely removing the main stem of cocoa using a chain saw or cutlasses 30cm above the ground level at a little oblique angle and then painting the cut surface with red paint (Cocoa Research Institute of Ghana, 2021)

Phase-replanting Techniques

If just a portion of a cocoa field produces a poor yield, or if farmers simply cannot afford to replant their whole plantation all at once, phase replanting is a suggested strategy. It would be possible to split the cocoa plantation into thirds so that the replanting process could be stretched out over three years. When the farmer replicates the latter third of his property, the cocoa trees he planted in the first section should have begun yielding. Therefore, the farmer will not suffer a complete loss of yield during the time it takes to replant in stages.

Planting Seedlings under old trees

On a cocoa farm with poor yielding types or if cocoa trees are too old, planting new cocoa seedlings beneath old trees is advisable. This method paves the way for planting new, enhanced cocoa seedlings among existing cocoa plants. Both old and new trees are given space to flourish, but routine trimming of the older ones helps prevent the spread of black pod disease and ensures that the younger cocoa trees get enough sunshine. With a chainsaw or a sharp cutlass, the old trees are felled just before the young ones begin producing fruit.

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Complete replanting

If swollen shoot disease is present on a cocoa farm, particularly in an area of mass infection, or if the trees have reached the end of their productive life, it is advised that the whole plot be replanted. The old and sick trees need to be felled using a chainsaw or cutlasses. When cocoa trees are uprooted with a bulldozer, the organic matter in the soil may be lost, which can lead to nutrient leakage and damage to the soil's surface layers. Once the old trees have been cut down, new seedlings of better types may be planted.

Selective planting

In cocoa fields, selective planting, also known as gapping up, is the practice of removing unsuccessful cocoa trees and replacing them with newer, more lucrative types. If the population acreage drops below 80%, or if the majority of the cocoa trees have been discovered to be unproductive for more than six years, it is advisable to gap up or plant selectively.

Challenges of the Cocoa Rehabilitation

Financial

The greatest economic challenge the cocoa restoration project presents is the potential loss of crop yields after a plantation is replanted. Smallholder farmers have no obvious way to overcome these monetary hurdles on their own. Although loans and input financing are available to smallholder farmers in Ghana, many are wary of taking on debt for fear of being unable to pay it back (Bymolt et al., 2018; Persha et al., 2020). Small, short-term loans generally carry high interest rates, making them unsuitable for R&R (Kroeger et al., 2017). Although cash crops have been recognized as a potential source of replacement income, R&R still experiences negative cash flow times (Dalberg,

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2015; Kroeger et al., 2017). To add to the difficulty, it may take cocoa plants up to five years to develop and begin producing pods, and many cocoa farmers lack access to enough funding, inputs, labour, or knowledge on proper agricultural practices for climate-smart cocoa.

Technical and Social Challenges

Perceptions about the industry's potential and the availability of resources, including planting supplies, labour, inputs, and rehabilitation methods. It takes a lot of work to clean up an old or unhealthy cocoa plantation. The farm's current cocoa trees must be felled and removed. No of the age or size of a cocoa farmer's family, it might be difficult to find enough labour to finish this. Many of the problems farmers have with agricultural inputs also serve as obstacles to rehabilitation (Monastyrnaya et al., 2016; Kroeger et al., 2017; Bymolt et al., 2018; Maguire-Rajpaul et al., 2020). Additional difficulties in rehabilitation are posed by the high death rate of COCOBOD seedlings (Kroeger et al., 2017).

Land and Trees Barriers

To restore an ancient farm, "Abunu" farmers often need permission from the landowner, who has the customary right to the property. The country's restrictive land tenure legislation has hampered expanding cocoa crops in Ghana. In a traditional society, immigrant and sharecropper farmers tend to work the land instead of the local leaders. Most land ownership and usage regulations are unjust to the average farmer who puts in a lot of work for little reward. A farmer's morale is lowered by policies like the "Abunu," "Abusa," and "Abunan" systems, in which the landowner and the farmer (or farmers) split the harvest in proportion to their respective investments in the venture (roughly

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1:2, 1:3, and 1:4, respectively). Share-cropping is common among the targeted farmers. The 50-year lease that many families had on the property they now own as a result of agricultural inheritances has ended. Following customary Ghanaian tenure rules, the landowner may reclaim the property or renegotiate the lease after the trees are cut down. Many cocoa growers in Ghana's Western North cocoa region are not of the same ethnicity as the region's landowners or traditional leaders. Due to these concerns, farmers hesitate to take down and transplant their aging cocoa plants.

Socio-demographic/Farm Related Characteristics of Farmers

Economic, social, and political considerations all have a role in whether or not farmers embrace new technologies to increase output.

Age of Cocoa Farmers

One of the most important demographic factors in cocoa production is the age of the farmers. Farmers' attitudes towards their labour on the farm and how efficiently they utilize resources change as they age, making age a major factor in cocoa output.

The age of the farmers is a crucial factor to consider when analyzing adoption studies since it may have many different effects on the adoption process. According to Ajagun et al. (2021), COCOBOD revealed the estimated average age of cocoa farmers in Ghana to be 55 years old. However, this may not always be the case and may be insignificant in some research. Despite this, COCOBOD has been doing all it can to keep the cocoa business in Ghana going by encouraging young people to become involved in cocoa production. Younger farmers are more inclined to accept new technologies than their more seasoned

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counterparts, according to research from the International Maize and Wheat Improvement Centre (1993).

According to empirical investigations, numerous livelihood outcomes are significantly correlated with the age of cocoa producers. For example, Amin et al.'s 2019 research in Ghana discovered that senior cocoa growers typically earn less than their younger peers. This is frequently attributed to things like diminished physical capacity and restricted access to innovative farming methods that could increase output. Furthermore, Asare et al. (2020) study conducted in Côte d'Ivoire found that older cocoa farmers have worse overall well-being, including lower life satisfaction and a higher likelihood of age-related health issues.

Furthermore, because of their limited alternative income sources and decreased agricultural production, elderly farmers are more susceptible to food insecurity, according to research by De Pinto et al. (2018). The complex relationship between age and the outcomes of livelihoods for cocoa farmers is shown by these empirical findings, which highlight the necessity for focused interventions to help older farmers in cocoa-producing regions retain sustainable livelihoods.

Educational Level of Cocoa Farmers

Education helps people acquire the skills necessary to transmit, receive, decode, and comprehend information and apply that understanding in various contexts (Byrness and Byrness, 1978). Researchers have shown a direct correlation between farmers' levels of education and their likelihood to embrace contemporary agricultural practices (Lin & Jeffries, 1998; Abdelmagid & Hassan, 1996). Farmers with a higher level of education may be better equipped

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to use extension services and embrace new technologies (IFPRI, 1995; Boateng, 2003). Thus, it is hypothesized that farmers' levels of education have a significant and beneficial effect on their willingness to acquire and employ cutting-edge technology. According to Rogers (2003), persons who embrace new technology first tend to have higher levels of education. Also, those who are educated are more willing to embrace new technology. The degree of formal education that cocoa farmers achieve is thus hypothesized to have a favorable relationship with technological adoption and intention (Tey & Brindal, 2012). According to Bosompem (2019), the level of education among cocoa farmers is a major deterrent to their use of agricultural technology for cocoa farming.

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Member of Farmers Based Organisation (FBO)

Farmers who are part of cooperatives have the edge over those who aren't learning about innovations and gaining access to credit (Boateng, 2003). Credit is often available to members of cooperative organizations, particularly for constructive reasons, which may help ease their financial burdens. Consequently, participants have access to the resources necessary to implement the invention, increasing the likelihood of its widespread uptake. Membership in a cooperative organization was shown to be substantially and positively associated with the adoption of novel bean varieties by both female and male farmers in Kenya (Saito, Mekonnen, & Spurling, 1994).

Years of Farmers Farming Experience

The years a farmer has spent cultivating cocoa is a measure of their farming experience. There was no clear correlation between years of farming experience and acceptance of cocoa rehabilitation. Because of their ability to gain information and understanding via practice, farmers may improve their field and operational efficiency as they gain experience. A farmer's level of expertise may be approximated by counting the years they have spent cultivating cocoa. Experience is crucial in determining technology adoption, farm output level, and agricultural productivity, say Oseni and Adams (as mentioned in Ajayi and Adeoti (2019). According to Tey and Brindal (2012), practical experience with cocoa rehabilitation over several years has been mostly irrelevant. Conversely, Insgin et al. (2008) suggested that the acceptance of cocoa rehabilitation might be hindered because more seasoned farmers could not see the value in the project's supplemental materials. Using variable rate

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applicators has been proven to correlate favorably with practitioner tenure (Khanna, 2001).

They contended that farmers with greater experience are more likely to learn new problem-solving methods; hence, they are less likely to adopt new technology of which they are unaware (Yeboah, 2021).

Level of Farmers' Income

The farmer’s buying power and options are heavily influenced by the money they earn from selling crops. Million (2001) argues that a farmer’s capacity to adopt new technology is directly related to the amount of money they make from farming. Increased farm profits will allow the farmer to invest in the equipment and training required to implement the technology, increasing the likelihood of using it. For instance, when profits are strong, growers can fertilize their whole cocoa estate (Simply Trini Cooking, 2011).

Farmers’ Household size

Household size refers to the number of people who rely on the same primary residence for their daily needs. Typically, this includes the parents and their offspring; however, many rural families also include extended family members. The number of their dependents measures the number of people in a household. Most farm families consist of the breadwinner and their offspring, but it’s not uncommon for other relatives to live there. The average size of a rural Ghanaian home was 6.9 people, according to data compiled by Aryeetey (2004).

Agyei-Manu, Nimoh, Owusu-Peprah, & Kyeremateng (2020) surveyed cocoa farmers in Ghana’s Upper Denkyira West District and found that the average household size was seven people, with one being the smallest and

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eighteen the largest. As family labour is the most common source of cocoa farming in West Africa, household size might indicate the availability of workers in the industry. Around 87% of the permanent labour utilized in cocoa cultivation originates from within the family (IITA, 2002). So, less work around the home may be expected from families who use labour-saving devices. This demonstrates that the level of human involvement required would depend on the specifics of the technology in question. The less work it is for humans to do, the less likely that domestic labour will be needed

Farm size/Lad size, number of farms, and land tenure

Farm size is a proxy for economies of scale, a crucial factor for deciding whether or not to use a new and better technique, such as cocoa rehabilitation (Tey & Brindal, 2012). Due to the high cost of cocoa rehabilitation equipment and the capital-intensive nature of cocoa rehabilitation, large-scale farms are more likely to use cocoa rehabilitation technology. However, most cocoa producers in Ghana are subsistence farmers with just a few farms. Research shows that the average farm size in the nation is between 1.2 and 2.0 hectares, accounting for around 85% of all farms (Oppong-Anane, 2006). Their assertion that there is no relationship between farm size and tech adoption has been debunked by subsequent research showing that bigger farms are more likely to embrace new technologies (Ferguson & Olfert, 2015).

Due to the labor-intensive nature of cocoa rehabilitation, small-scale farmers are likelier to embrace the Project's practices than their larger-scale counterparts. However, most cocoa producers in Ghana are subsistence farmers with small, scattered operations. According to a survey of 123 cocoa farmers in the Ashanti and Western areas of Ghana (Edwin & Masters, 2003), the average

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size of their farmland was 3.50 hectares (8.8 acres). According to research by Danso-Abbeam et al. (2014) on cocoa growers in Ghana's Sefwi-Wiawso Municipality, the average farm size is 7.98 acres (3.23 hectares).

Duncan and Brants (2004) argue that farmers' ability to get access to land impacts their financial stability and food security. Amfo and Ali (2020) in their study on cocoa farms, found a statistically significant correlation between farm size and revenue diversification. It was implied that bigger cocoa farms were more likely to have many sources of revenue than smaller cocoa farms. Their research on cocoa farms in Ghana discovered that the typical plantation covered eight hectares. There are likely to be obstacles to cocoa rehabilitation for farmers due to the large number of plantations in dispersed locations.

Age of cocoa trees and yield and income

Appiah (2004) reports that in Ghana, farmers typically harvest between 350 and 400 kilograms per hectare (or around 140 to 230 pounds per acre) of cocoa beans annually. Respondent cocoa growers in the Amenfi area of Ghana's Western North region saw increased output and revenue of between 1.93% and 15.34% after using artificial pollination technology.

According to a survey by Aikpokpodion and Adeogun (2011), cocoa producers in the Nigerian states of Ondo and Cross River cited aging cocoa trees as the greatest challenge. Due to the typical destruction of soil nutrients in such farms, Amfo and Ali (2020) showed that older cocoa trees are severely impacted by climate change and become less productive. The greater the threat posed by climate change, the more likely it is that cocoa producers want to diversify their agricultural income to weather the storm. Again, they discovered that the

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average age of cocoa fields in the Bekwai area of Ghana's Ashanti region was 14 years.

Outcome Factors

The characteristics of the results achieved via the use of technology by cocoa growers are referred to as outcome factors or variables. When a cocoa farmer plants his cocoa farmers in rolls, for instance, he saves time and effort by not having to individually tend to each plant. It is crucial that spraying and other excellent agronomic techniques be simple to implement. This might be measured in terms of harvest success, lower insect and disease incidence, fewer weeds, and fewer seedlings needing to be replaced. Much research examines the effects of superior strains.

The geographical heterogeneity in resource endowment, such as agroecology characteristics, population density, and closeness to the input and output market, is a major factor influencing the long-term aggregation of adoption patterns, according to several recent studies in Africa (Pender et al., 2001). According to a study conducted in Ghana and published by Masters (2003), yields increase by 21% when fertilizer is used. A relative increase in production due to the use of fertilizer may, therefore, greatly help improve or enhance cocoa producers' lifestyles. This may encourage cocoa growers to start using cocoa rehabilitation.

Distance from the Input area

A farmer's propensity to adopt cutting-edge farming techniques is largely determined by how far he or she must go to get necessary supplies. Using a new technology will be stymied by the high prices associated with sourcing components from far-flung input warehouses (Adesina, 1996). Prudentia (1983)

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and Matlon (1994) found in their research on West Africans that the more away they were from a source of inputs, the less likely they were to follow the practice.

Availability of credit to the Farmer

Credit restrictions are a major factor in the varying adoption rates seen in different places of the globe. Because access to capital is restricted, smallholder farmers may be slower to embrace new techniques than their larger-scale counterparts (Boateng, 2003). This causes people to be hesitant to invest in expensive technologies. According to Schnitkey, Paulson, Swanson, and Baltz (2022), using fertilizer necessitates the expenditure of money.

Availability of Extension Services

Farm-level extension access may increase production via adoption (Trudy et al., 2001). Agricultural extension, as described by Evenson (1998), is a channel through which farmers may learn about cutting-edge farming techniques, best practices, and management strategies.

Price of inputs

The high cost of inputs has been shown to reduce uptake in several research efforts. This is because, according to the economic theory of demand, as the price of an item (in this example, an input) rises, its demand lowers since more and more farmers simply cannot afford to buy it. A technology's predicted rate of adoption decreases as its input costs rise. COCOBOD's new program in Ghana, which provides cocoa farmers with free cocoa seedlings and fertilizers to boost output, is a positive step in the right direction.

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Increase in Productivity

Research on the Impact of Input Credit Programs on Technological Change, Productivity, and Poverty Alleviation. Many empirical studies have examined the impact of input credit schemes on farmers' technology adoption, resulting in greater agricultural production and higher incomes. Using panel data collected over two years from 420 rural Ethiopian families, Masumoto and Yamano (2010) analyzed the effects of fertilizer credit on crop selection, production, and income. Researchers observed that farmers used more inputs due to the fertilizer credit.

Good Agronomic Practices (GAP)

There are 1,111 cocoa trees per hectare in Ghana, or 435 cocoa trees per acre, although most farms are not planted in roles using the suggested planting distance of 3m × 3m (10ft x 10ft) (CRIG, 2010). As a result, determining the extent of plant contamination in the wild may be challenging. Their utilization would be challenging even if the necessary gear and equipment were available, such as a plough, tractor, power tiller, or cocoa tools like VRA, yield monitors, or planters.

Alternate Sources of home

Several members of farm households often have secondary jobs to supplement their farming income, as Amaza et al. (2009) reported in sub-Saharan Africa. Igwe (2013) and Reardon (2006) both asserted that farmers increasingly engage in non-agricultural activities to supplement their income. Plantain cultivation, which provides shade for the developing cocoa plant, was identified as the primary alternative source of income for the farmers who benefitted from this operation.

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Theoretical and Conceptual Framework

The Sustainable Livelihood Framework served as the study's major theoretical foundation.

Sustainable Livelihood Framework (SLF)

To better comprehend the elements that affect the standard of living of the poor and the middle class in emerging nations, the idea of sustainable livelihoods has received widespread recognition. Access, endowment, and usage of capital assets may be evaluated from the perspective of local people using the Sustainable Livelihood Framework (SLF) (Neely et al., 2004; Solesbury, 2003). Despite the framework's emphasis on understanding the context in which rural lives take place and the assets available to them, it is a complex approach to understanding how the poor and non-poor live, in particular, how different resource endowments are used, different livelihood strategies are selected, and the intended or expected outcomes of those choices.

A sustainable way of life can withstand and recover from stress and shock, as well as preserve or improve its current and future capacities and assets without depleting the underlying natural resource base (DFID, 2000). A farmer's feeling of social acceptability and personal agency are two intangible outcomes that livelihood may influence (Braun, Thiele, & Femandez, 2000).

According to Woodhouse et al. (2000a), this framework is meant to give a basic, rapid, and understood evaluation of the state of access, endowment, and/or use of the various capitals based on local knowledge and views of stakeholders in the system. Because of this, it is crucial. Modern scientific knowledge and Indigenous knowledge systems are both recognized as valuable parts of rural inquiry, as noted by Smith & Johnson (2021). Moreover, modern

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scientific and indigenous knowledge do not have to be at odds with one another; rather, they may complement one another (Kapondamgaga & Ragubendra, 2003). Thus, it is important to include all relevant parties in creating frameworks for assessing economic well-being.

Elements of the Sustainable Rural Livelihood (SRL) Framework

The term "livelihood approach" refers to a mode of thinking that focuses on the goals, priorities, and scope of growth (DFID, 2000). In the late 1990s, the Department of International Development (DFID) developed a set of guiding principles known as the Sustainable Livelihood Approach (SLA) (DFID, 2000). Several groups, like Oxfam and the Institute for Development Studies (IDS), have adapted the SLA idea to fit their missions and goals (DFID, 2000). The framework is based on the five capitals of the sustainable lifestyles framework and defines the low and high status in access, usage, and/or endowment of the five capitals as defined by and according to local understanding and perception.

Natural Capital

Land, water, and biological resources, including trees, grassland, and animals, are the components of natural capital. Human management may either decrease or increase the efficiency of these resources.

- Access to land, water
- Ownership of herds of cattle, sheep, goats, and trees,
- Productivity (per unit of land, per unit of water, per unit of inputs).
- Soil, water, rangeland quality.
- Biodiversity.

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Physical Capital

The economic creation of goods and services constitutes physical capital. This category includes roads, irrigation systems, power plants, water treatment plants, and factory equipment. Some of the signs are:

- Access to roads, electricity piped water.
- • Possession or access to machinery capable of producing useful goods (oxen, tractor, irrigation pump, etc. and
- Housing quality

Financial Capital

Money and other liquid savings are the building blocks of financial capital. In this sense, the term "asset" encompasses monetary assets like pension rights and movable goods like animals. Which, in a broader sense, may be called a natural resource. These are some of the signs:

- • The distribution of income in society and its change throughout time.
- Financial savings.
- Access to credit
- Debt levels

Social Capital

Resources like membership rights and group claims are examples of social capital. The capacity to rely on one's family and friends, the backing of one's profession or trade group (such as a group of farmers), and political leverage over local or national leaders are all examples. Some of these signs include

- Membership of organizations.
- Assistance from close relatives

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- Legislators and appointees need to be held responsible for their actions.

Finally, this study's conceptual framework, known as the "livelihood framework," outlines five primary asset classes around which livelihoods are constructed.

Perception

According to Van den Ban and Hawkins (1996), perception is "the mental transformation of external stimuli and information into conscious experience." According to Gamble and Gamble (2002), perception is the mental activity by which a person chooses, organizes, and subjectively interprets sensory facts to make sense of the environment.

Principles of Perception

An individual's senses are used in the perceptual process to make sense of the "world" or surrounding environment. That is to say, one person's perception of events may vary greatly from another's. In theory, perception is regulated by subjectivity, bias, orientation, and way of thinking.

Selectivity

As many environmental stimuli constantly bombard a person's senses, it follows that, as stated by Van den Ban and Hawkins (1996), perception is selective. Since the nervous system can only become sensitized to a limited number of stimuli, a person can only react to a subset of environmental cues. Individuals tend to disregard or downplay the relevance of experiences that are inconsistent with or discordant with their preexisting attitudes, beliefs, and values, according to research by Gamble and Gamble (2002). Our ability to perceive selectively is honed by experience and education. Training may shape perceptions, which provides a curated and systematic collection of experiences.

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Organization

Perception may be thought of as organized in the way that an individual can make sense of his or her sensory experience, within a second at most. Our brains process visual and auditory information into distinct shapes and forms. A designer may use a figure to draw attention to a certain area of a message. Moreover, ‘closure’ (the perceiver’s tendency to close or finish what he or she sees as an open or incomplete figure) is a feature of perceptual organization.

Direction

What a person “sets” to perceive is what that person experiences. The mental set of an individual affects what that person chooses, organizes, or interprets. Set is a crucial perceptual notion utilized primarily by communication designers to restrict the range of possible responses to stimuli. According to Van den Ban and Hawkins (1996), an audience’s “perceptual set” might be a barrier for communicators who want their audience to adopt a new perspective. One’s perceptions are shaped by various factors, including but not limited to age, motivation, experience, and degree of education (Gamble & Gamble, 2002). However, the authors advanced the idea that since experience varies even among persons of the same age, this must mean that experience influences how people interpret information. The ramifications are that people acquire knowledge and interpretations of the world in various ways.

Cognitive Style

People’s perspectives are vastly different since they all have different cognitive styles (Van den Ban & Hawkins, 1996). Personality traits, including openness to new ideas, degree of authoritarianism, and tolerance for ambiguity, profoundly influence how their minds operate. It is unrealistic to provide a

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variety of messages that cater to each possible permutation of audience members' mental processes. Thus, using a method where the same topic is delivered in multiple ways to appeal to various cognitive types is suggested. This is what the authors Van den Ban and Hawkins (1996) call redundant messages.

Evaluation in Agricultural Programs

Evaluation is the process of assessing the value of a project or activity's value by measuring its usefulness, efficiency, effectiveness, and impact. Evaluation, in its simplest form, is a method used to determine what a program does and how effectively it does it (Patton, 1990). For an assessment to be considered "excellent," the method used must be appropriate to the circumstances under which it was conducted (Christie, Ross & Klein, 2004; Worthen, Sanders & James, 1997). The two major goals of most evaluations are to inform future program development and execution better and to illustrate the results of previous efforts.

Formative and summative assessments represent two of the most common forms of evaluation and two distinct philosophical orientations. In contrast to summative evaluation, which is used after a cycle to offer an overall assessment of program efficacy, formative evaluation is an ongoing process that enables input to be adopted throughout a program's lifecycle. Decisions on the future of the program and the services it will provide cannot be made amid the program cycle, but with this tool, stakeholders may do so (Scriven, 1967).

Although both formative and summative techniques for assessment are necessary, current research on program evaluation favours the former. This evaluation focuses on a program's development or improvement (Scriven,

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1967). However, the necessity for impact data to address responsibility and progress has led many extension educators, according to Voichick (1991), to lay greater weight on the summative assessment. According to Chambers (1994), using evaluation data differentiates formative from summative assessments, not the timing of the assessments themselves.

As defined by Pefile (2007), an impact assessment is conducted to ascertain the degree to which the target audience has benefited. Due to the urgency involved in conducting an impact assessment, investigations must be repeated regularly during the project being evaluated (Pefile, 2007).

Principles of Basic Impact Evaluation Designs

Assessing the immediate results of the study, the indirect effects, and the personal consequences are the three key components of an impact evaluation (Anandajayasekeram, Martella, & Rukuni, 1996; Anandajayasekeram & Martella, 1999). People-level impact, on the other hand, is the effect of the technology on the ultimate users or target group for which it was developed, and it can be economic, whereas intermediate impact is concerned with the organizational strategies and methods used by researchers and other actors in conducting more effective technology development and transfer. A study's or a project's potential financial, cultural, and/or ecological consequences.

Hence, formal assessment is the process of carefully highlighting issues and themes of concern, gathering relevant information, and then analyzing and interpreting that information for its intended and planned purposes. In practice, researchers conducting evaluations of agricultural programs need to be familiar with both the program and the questions that need to be addressed (Lewis, Ritchie, Nicholls & Ormston, 2013).

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Bennett's Hierarchy in Extension Programme Evaluation

Bennett (1979) created a model that has since been known as "Bennetts's hierarchy" to illustrate the chain of events from inputs to outcomes, allowing evaluators of extension programs to more accurately track progress over time. In this way, interested parties may keep tabs on the progress made by supported life extension programs.

There were found to be seven stages: Activities (such as newspapers or newsletters, articles, discussion groups, and seminars); Inputs (such as staff time, expenditures, and resources utilized); Involvement (how many individuals were contacted, what kind of people they were, how often and how intensely they were contacted), Responses (how enthusiastic they were about participating), and Perceptions (how they felt about the initiatives) What individuals know, feel, can do, and want are all components of KASA (Knowledge, Attitudes, Skills, and Aspirations). Putting what you know, believe, or want to achieve into action; Final Results (the program's social, economic, environmental, and individual consequences).

The Rockwell and Bennett Model of Extension Program Evaluation

Based on Bennett's hierarchy, which was first published in 1975 and revised by Rockwell and Bennett in 2004, the TOP framework for planning and evaluating programs was established. It was said that the model's primary purpose was to get planners of extension programs to think about those objectives at every stage of making those plans. Whereas other development models, like the Logic Model, focus on one aspect of a project at a time, the TOP model emphasizes how planning and executing a program mirror each other. Resources, activities, participation, reactions, KASA (knowledge,

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attitude, skills, and aspirations), practices, and social-economic-environmental factors are the seven tiers of the TOP model. Program development, on one side, and program planning, on the other, are separated by a feedback loop (Wynn & Eckert, 2017).

As part of its methodology, the TOP model employs process and result assessment to assess the efficacy of a given program (Rockwell & Bennett, 2004). While evaluating a process, researchers track how much money was spent, how many people took part, and how they felt about the whole thing. The simplest portion of a program's assessment is the first four stages (inputs, activities, people's engagement, and responses), which assess implementation. Implementers of a program might use the information gleaned from a process assessment to fine-tune the program's operational details. Changes in participants' KASAs (knowledge, attitudes, skills, and aspirations), participants' actions, and the resulting social, economic, and environmental impacts are all evaluated as part of the outcome assessment process. In the last three stages (KASA, practice, and results), evaluations of the program's success are made, particularly emphasizing it is short-, medium-, and long-term effects on participants and their communities.

When evaluating the success of a program, the TOP model cannot prove that the program itself caused the desired results. But it does indicate a strong correlation between the program and its results (Rockwell & Bennett, 2004).

Context, Input, Process, and Product Evaluation Model

Stufflebeam and Shinkfield (2007) state that there are about 26 common methods used to assess projects. These 26 may be broken down into the following five categories: pseudo-evaluations, quasi-evaluations, evaluations

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focused on improvement and accountability, evaluations with a social agenda or advocacy focus, and evaluations with a more general focus.

According to Stuffflebeam and Shinkfield (2007), the Context, Input, Process, and Product (CIPP) assessment model has emerged as the best evaluation technique when compared to professional standards for project evaluation and also rated by usefulness, feasibility, propriety, and correctness. The CIPP assessment model is well-known as one of the most popular evaluation approaches, and it falls under “improvement and accountability” (Stuflebeam & Shinkfield, 2007).

Stufflebeam’s sophisticated CIPP evaluation technique is used for formative and summative assessments. It is a guide for evaluating programs, projects, people, stuff, places, and things (Stufflebeam, 2003). There are two primary premises upon which the CIPP assessment methodology rests:

1. Change may be started and achieved with the help of evaluation.
2. Regular evaluation is an essential part of every agricultural program.

Evaluators have acknowledged that product assessment is crucial to the accountability report (Stufflebeam and Shikfield, 2007). Whether or whether a current program should be maintained, replicated, or expanded to other areas of the community may be determined using this analysis (Stufflebeam, 2003). Measuring, interpreting, and rating accomplishments are the main goals of the product assessment process. It also points the way for lowering costs by making programs more responsive to the needs of their intended recipients.

Conceptual Framework

The research considered the impacts of inputs, both material (seedlings, fertilizers, plantain suckers, economic shade trees, cutlasses) and training on the

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lives of beneficiary cocoa farmers to assess the perceived effectiveness of the SCAF Cocoa Rehabilitation Project.

The conceptual framework of the cocoa farmers' perception of the impact of the perceived impact of the SNV Full to Sun Shaded Agro-forestry (SCAFS) on their livelihood systems (Figure 1) consists of five parameters. These are, the perceived effectiveness of the SCAFS components; the impact of the SCAFS project on beneficiary farmers' livelihood; farmers' suggested problems and strengths of the project and how the problems may be solved, and socio-economic characteristics of farmers influencing perception of livelihood impact of the SCAFS project.

The conceptual framework illustrates how various components interact to achieve the desired livelihood impact for farmers by increasing their productivity. At the core of this framework is the "Farmers' Perception of Components' Effectiveness," which mediates the interactions among key variables such as Farmer Groups, SCAFS provision component, and Extension Service Delivery. Farmer Groups enable members to access essential resources, extension technologies, and market information while fostering empowerment among members. This collective approach ensures farmers can leverage these resources more effectively, leading to better farming practices and increased productivity.

SCAFS plays a crucial role by providing improved planting materials, training, and input support, ensuring farmers have the necessary tools and knowledge to enhance their yields. This support is further complemented by Extension Service Delivery, which includes public extensions, agro-input dealers, and

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monitoring and evaluation teams. These services provide guidance, supply essential inputs, and continuously assess and optimize the effectiveness of the interventions. The demographic and farm-related characteristics of the farmers, such as age, education, farm size, and crop type, also influence how effectively they can utilize these resources and services.

When farmers perceive these components as effective, they are more likely to adopt the provided practices and resources, leading to increased productivity. This positive perception acts as a catalyst, enhancing the overall impact of the interventions. The synergistic interaction among the Farmer Groups, SCAFS, and Extension Services, mediated by farmers' perceptions and influenced by demographic factors, ultimately results in increased productivity and improved livelihoods for the farmers. Thus, the framework effectively demonstrates how these interconnected variables contribute to achieving the desired livelihood impact.

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An extensive literature review revealed that farmers' demographic and farm-related characteristics have a significant relationship with agricultural productivity. Studies by Teryomenko, 2008; and Yasmeen, Abbasian, and Hussain, 2011 showed that age, educational level, farming

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experience, and farm size significantly affect agricultural productivity. Obasi, Henri-Ukoha, Ukewuihe, and Chidiebere-Mark (2013) among arable crop farmers in Imo State, Nigeria confirmed the assertion.

The primary objective of SCAFS intervention is to rehabilitate old, diseased, and moribund farms, and that is evident in the main components (provision of improved planting materials, training, and input support). Successful extension delivery in terms of technologies and processes is channeled through effective decision-making and behavioral change processes of the target clients (Rogers, 1995). These are expected to bring about optimal-level performance that should have a positive influence on productivity (Wu, 2005). The farmer groups play very useful complimentary roles in augmenting the technology delivery concerning access to resources, improved technologies, market information, and empowerment of farmer groups (Bosc, Eycheme, Hussen, Losch, Mercoiret, Rondot, & Walker. (2002). The expected outcome is to rehabilitate old farms to improve productivity. The ability of the main components of the interventions to effectively increase productivity is determined from the viewpoint of the beneficiary farmers.

The overall expected results are the achievement of the desired positive impact points of the program's interventions on the livelihood systems of cocoa farmers. These include improved production of quality planting materials, ownership of mobile phones, decrease in debts owed to service providers, ability to pay wards' school fees, and improved access to extension services (DFID, 2000; Norton, 2004). There is a significant and positive relationship between real impact and productivity.

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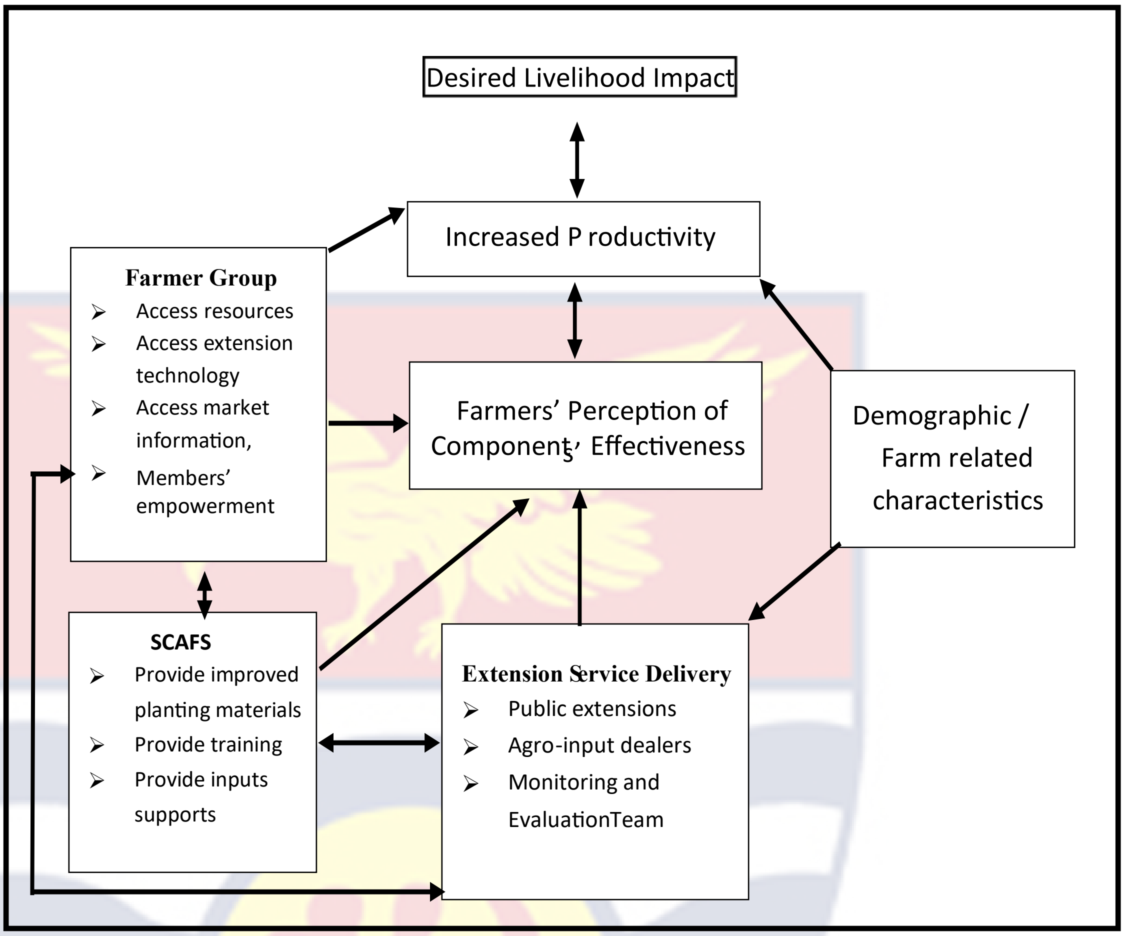

Figure 1: Conceptual Framework of Cocoa Farmers' Perceived Impact of SCAFS Project on Their Livelihood Systems

Source: Adopted from: (Bampoe, 2015).

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter of the research elaborated on the methods used to undertake the study. This included the research design, study population, sample size, sampling procedures, research instrument, data collection procedure, validity and reliability, and data analysis.

Research Design

The research used a descriptive survey layout, a structured approach to gather detailed information about a specific subject or population, aiming to

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describe characteristics, behaviors, attitudes, or opinions without manipulating variables (Fraenkel, Wallen, & Hyun, 2019). Several individuals are asked the same questions regarding the status of a program or project in a survey design. Researchers who use a survey design collect data on various factors, put out several hypotheses, and extrapolate causal relationships to the past. Surveys also collect information from many participants simultaneously (Best & Kahn. 1998). Bennett (1979) noted that surveys used in program evaluation or impact studies often assess the program's success in meeting its goals at a single moment, or they may examine the program's influence on different groups of people.

Since the study aimed to establish a connection between dependent and independent factors and identify the strongest predictor(s) of the dependent variable among the independent variables, the researcher opted for a correlational study design.

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Study Area

The research was conducted in Ghana's Western North Region, specifically in the important cocoa-producing areas of Bia West and Bia East, which include the districts of Essam and a portion of Adabokrom cocoa districts (COCOBOD, 2016). Seventy-five percent of the Western North Cocoa Region's flora is found in the high forest zone of Ghana, where temperatures average between 22 and 34 degrees Celsius. Fourteen cocoa districts make up the area. Many locals make their living in some way along the chocolate value chain, whether officially or not. The Ghana Cocoa Board (COCOBOD) divides the country into cocoa regions and districts according to their responsibilities. The primary goal of this categorization is to let COCOBOD more precisely target the distribution of policies and inputs. The Western North Cocoa Region consists of the districts of Sefwi Bekwai, Akontombra, Boako, Bodi, Juaboso, Adjuafoah, Asempaneye, Essam, Bibiani, Dadieso, Adabokrom, Sefwi Wiawso, Enchi, and Boinso.

According to Agyemang (2020), there are fourteen cocoa districts in the Western North Region, two of which are situated in Essam and Adabokrom between the coordinates of 60°60′N and 70′00′N and 20°400′W and 30′150′W. The study area is about fifty kilometers separating the capital city of Sefwi Wiawso from the Bia West/Bia East area. The semi-equatorial climate zone, of which the Essam and Adabokrom cocoa district is a part, provides an abundance of both human and natural resources, including a large labour pool, fertile soil, a mild year-round temperature range, a lush tropical forest teeming with a wide variety of timber species, productive cash crops, and healthy livestock. Plantain, banana, yam, cocoyam, rice, and maize may also be grown in parts of the

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districts, although cocoa growing is the mainstay. The research region also has active fish farming and domestic animal-raising industries (Agyemang, 2020).

The average yearly humidity in the cocoa districts is between 70% and 90%. The forest ochrosol soil found across much of the region is ideal for growing various crops. These include tree crops like cocoa, palm tree, cola, cashew, coffee, citrus, and coffee and food crops like plantain, cocoyam, yam, and maize (GSS 2010). Average yearly temperatures vary from around 25°C to 26°C, and annual rainfall averages between 1,250 mm and 2000 mm. The research region has a dry season of about 70% to 80% relative humidity and a rainy season of around 75% to 90%. Ochrosols are common in these areas since they are located in the woodland zone (Agyemang, 2020).

Nonetheless, cocoa is the most important cash crop and provides substantial income for many families. The ideal annual precipitation for cocoa cultivation is between 1,100 and 3,000 millimeters. Nevertheless, regions with an annual rainfall of 1500–2000 mm attain optimal productivity (CRIG, 2013). Rainfall patterns in Ghana's cocoa-growing areas average between 1200 and 1600 mm annually. Growing cocoa requires an average yearly temperature of around 25 degrees Celsius. The ideal conditions for growing cocoa are 25 degrees Celsius, 70 to 80 percent humidity, and Rhodic Ferralsols soil. The Adabokrom and Essam cocoa districts were taken into account for this study. Both the Adabokrom and the Essam cocoa districts were included in the research. It's true that other places like the Adjuofuah and Bonsu Nkwanta cocoa districts exist and might have been examined instead, but these are the ones that were picked instead for the following reasons:

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First, a bigger portion (area) of land in these two cocoa districts was included in the SCAFS project. The SCAFS's effect on the livelihood of recipient farmers is expected to be quantified once the project was finished in 2021.

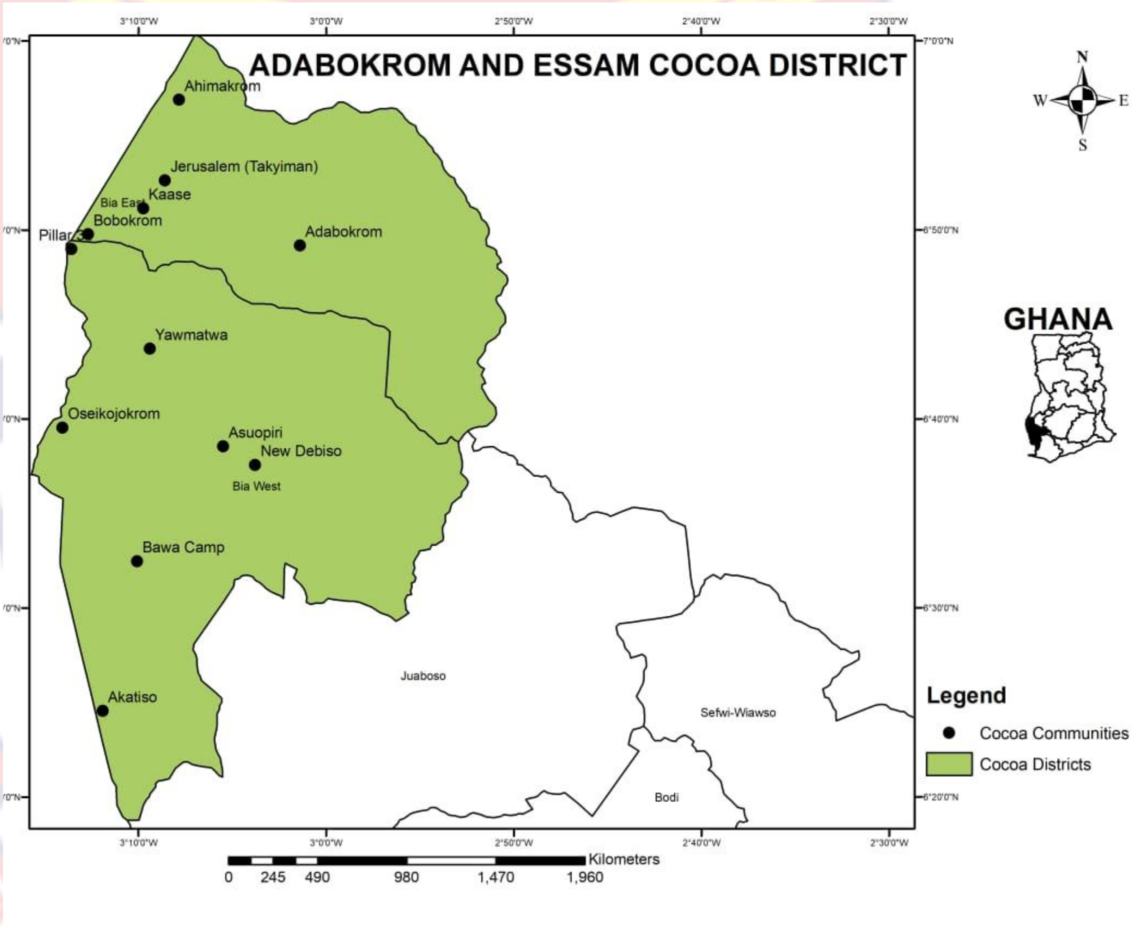

Figure 2: Map of Adabokrom and Essam cocoa districts

Source: Author's Construct (2021)

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Population

It is only possible to conclude the characteristics of the research population by extrapolating from the sample to the designated population (Banerjee & Chaudhury, 2010).

The people, events, and things about whom the researcher hopes to conclude the research are known as the "target population" (Mugenda & Mugenda, 2003). All cocoa growers who benefitted from the SCAFS program were included as participants in this research.

The population for the study was all cocoa farmers' whose farm(s) had been rehabilitated by SNV in 2016 in the Adabokrom and Essam Cocoa District in the Western North Region of Ghana. Most of these farmers in the cocoa district rely on agriculture productions such as crop farming especially cash crops such as cocoa and oil palm, for a living.

Sampling and Sample Procedures

Sampling is the process of picking a subset of a population to represent the whole (Sharma, 2017). The study's intended respondents were chosen using a multi-stage sampling process. Cresswell (2016) explains that a multi-stage sampling method combines random and non-random sample methods.

First, out of the four primary cocoa districts where the initiative was executed, two were chosen randomly (Adabokrom and Essam) using a purposive sample approach (Neuman, 2014). This happened because of the large number of repaired cocoa fields in those two areas. Beneficiary communities in the districts where the project was carried out were chosen using a similar method of purposive sampling. This allowed the researcher to reach

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out to farmers whose cocoa fields will be significantly impacted by the SCAFS program.

Ultimately, 200 beneficiary cocoa growers from the research area (communities) were chosen using a simple random selection procedure.

Bujang and Baharum (2017) state that the sample size should be based on the population's characteristics, the data gathered, the kind of analysis to be conducted, and the amount of funding available for the study's implementation. Nonetheless, it is widely acknowledged that the more representative the population is, the greater the sample size, and the better. 454 cocoa growers profited from the project, according to SNV reports on the SCAFS project from the two chosen cocoa districts.

A sample size of 200 respondents from the general public was chosen using the sample size calculation technique developed by Krejcie and Morgan (1970). The following formula was established:

s = X2 NP (1-P) +d2 (N-1) +X2 P (1-P)

Where;

s = required sample size

X2 = the table value for chi-square for 1 degree of freedom at a desired confidence level of 3.841

N = population size

P = the population proportion

d = the degree of accuracy expressed as a proportion of (0.5).

Confidence Interval Calculation for Proportions was also used to determine, the true proportions of the population of cocoa farmers with a 95% confidence level obtained by the study. The "exact" confidence intervals

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computed by Clopper and Pearson's (1934) method were utilized in calculating the confidence interval. Therefore, achieved a representative sample for the interview schedule that matched as closely as possible to the population of the respondents. The table shows the sample size and population used for this research.

Table 1: Population and Sample Size Determination for the Study

Town/Community	District	Population	Sample Size
Essam/Debiso	Essam	107	47
Nsowakrom	Adabokrom	191	84
Adabokrom	Adabokrom	156	69
Total		**454**	**200**

Source: Field data, 2021

Data Collection Instruments

Based on the study's particular and primary objectives, a data-collecting technique was created from the examination of the literature. To achieve the particular goals of this research, primary data on respondents' personal information and perceptions of the effect of the SCAFS project on the livelihood of the recipient farmers have to be collected. This was accomplished via the gathering and examination of original data. Primary data is information gathered directly from participants through interview schedules.

The major tool for gathering data for this research was an established structured interview schedule. It was used to gather information on the perceived effects of the SCAFS project, the efficacy of the SCAFS project's key components, and the socio-demographic characteristics of respondents.

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Pilot Study

The study conducted pretesting to identify any problems with the data-collecting instrument, such as language barriers, missing information, or improper phrase design. One of the remaining cocoa districts (Adjoafuah) in which the initiative was used to serve as the site for a pilot study. Thirty (30) cocoa farmers from the Adjoafuah community who benefitted from the SCAFS initiative from the outset (in 2016) were chosen and interviewed. The features of the cocoa farmers selected for the pilot research were similar to those of those selected as respondents for the study. The pilot research was a reliability test of the measuring tool. Helped along by SPSS 25.0 (Social Science Statistical System; now part of Statistical Product and Service Solutions).

A Likert scale's internal consistency may be maximized if the distribution's Cronbach Alpha reliability coefficient is high, as stated by Pallant (2001). If the Cronbach Alpha coefficient is more than 0.7, then the dependability of the data is better. The study's data-gathering device was trustworthy since the resulting value was more than 0.7.

Reliability and Validity of the Instruments

The tool was tested for both content and face validity. Supervisors and lecturers in the Agricultural Economics and Extension department and the SCARF project coordinator evaluated the content and established its validity. "Content validity" refers to how well the instrument's actual contents measure the constructs it's designed to assess. Researchers evaluated the instrument's face validity by reviewing

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the created questions and concluding that respondents' responses would provide the desired results.

During data collection, interview schedules were given to participants in their homes to ensure they could devote their full attention to the process. Again, a pilot study was conducted in the Adjofuah cocoa area to pre-test the instruments before they were distributed to the cocoa growers. For this purpose, the Cronbach Alpha coefficient was calculated. If the result is more than 0.7, the instrument may be trusted to demonstrate its consistency.

To aid in the data gathering for the SCAFS project, ten (10) district residents were chosen as Technical Assistants. To collect reliable information from the cocoa farmers surveyed, they received training on the meaning and interpretation of each question on the interview schedule.

Each respondent's comments were recorded correctly after being translated into their native tongue from the approved and pre-tested structured interview schedule.

Data Collection Procedures

To answer a research question, Kabir (2016) defined data collection as measuring and collecting information on variables of interest to the researcher. Although data gathering is an idea shared by all fields of study, how that idea is implemented varies considerably. The need for truthfulness and precision in data collecting is universal throughout fields of study.

After the data collection instrument was accepted and approved by the supervisor and the management of the "Institutional Review Board" of the

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university, which is in charge of ethical clearance, training was organized for four enumerators and two agricultural extension agents on how to administer the instruments to the farmers. This was to prepare them with the necessary skills to improve the quality of their behavior in decreasing biases and errors during the data collection exercise. This training was the first step in the data collection procedure. The training also aided the interviewers in becoming familiar with the fundamentals of research to guarantee precision, clarity, and consistency in the process of gathering data. The researcher interviewed the interviewers during the training to provide as an example of the interview process. The interviewers also practiced by interviewing themselves to enable the researcher to make the corrections that may arise.

The data collection exercise commenced in the 2nd week of February 2023 and ended in the last week of February 2023. The time for the data collection was subject to the farmer's schedules since the data collection time fell within the farming season. All protocols including that of COVID -19 were observed accordingly. The research team introduced themselves and stated their goal to allay any questions or suspicions that the farmer may have had as they entered the homes of each of the selected farmers. The farmers were assured of their right to anonymity and confidentiality to facilitate honest responses. The criteria used for selecting each of them for the exercise were explained as well.

The respondents were made to understand that their participation was voluntary, and for that matter, they were free to withdraw in the course of the interview without any punishment. However, they were encouraged to complete the questionnaire to achieve a high response rate. An estimated time of 30min - 45min was assigned to engage each farmer for the interview and it was disclosed

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to each farmer to assess whether there was enough time to participate or will arrange for another time. During the interviews, the researcher was more often than not available to clarify and resolve issues that arose. The researcher crosschecked all filled questionnaires to ensure that all the questions were answered appropriately. This exercise continued till all the respondents were contacted and the required information solicited.

Data Processing and Analysis

Data was processed with the help of IBM Statistical Package for Social Sciences (SPSS) version 25.0, where means, standard deviations, weighted means, frequencies, and percentages were used to describe the perceived effectiveness, perceived impact, the farmer's suggested challenges/solutions of the SCAFS project, as well as the demographic and farm-related characteristics of respondents in the Adabokrom and Essam cocoa district in the eastern region of Ghana.

Calculated using SPSS 25.0 (Statistical Product and Service Solutions) to calculate central tendencies, dispersions, and other descriptive statistics. The data was analyzed using a variety of statistical methods. Each goal was analyzed using one or more of the following methods:

Frequencies, percentages, means, standard deviations, pie charts, and bar charts were used to describe cocoa farmers' demographic/farm-related characteristics as set out in objective one (1).

Objective two (2) was to find out the perceptions of farmers on the effectiveness of the main components of the SCAFS. Frequencies, percentages, means of effectiveness, weighted means, and standard deviations were

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computed from respondents' responses to describe their perceived effectiveness of the project.

To analyze objective three (3), which aimed to determine how much of an effect the SCAFS project was seen to have on the respondents’ lives, the study used descriptive statistics such as frequencies, percentages, means of impact on livelihood, weighted means, and standard deviations.

Also, frequencies and percentages were used to describe the perception of farmers on the problems or weaknesses and strengths of the program and how the program may be improved as purported in objective four (4).

Finally, for objective (5), to determine the socio-demographic/farm-related characteristics of the farmers influencing their perception of the livelihood impact of the SCAFS, a multiple regression model of $Y = a + \beta i\ xi + \varepsilon$ was used. Where Y = perceived relevance of the SCAFS, a = constant or the intercept, which describes the mean response value when all predictor variables are set at zero. βi = parameters of the independent variables (xi), and ε = error term. These variables are presented in Table 2.

Table 2: Variables and Scale Measurement of the Socio-Demographic/ Farm related Characteristics of Farmers Influencing their Perception of Livelihood

Variables	Measurement
Sex of respondent	Nominal
Age of respondent	Ratio
The highest educational level of respondent	Ordinal
Household size of the respondent	Ratio
Size of the cocoa farm for the project	Ratio
Other sources of income from project farm	Dummy (1= Plantain only or cassava only, 2 = both plantain and cassava)

Source: Field Data, 2021

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All hypotheses, significant differences, and relationships were tested using a 0.05 alpha level.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The main purpose of this study was to evaluate the perceived impact of the SCAFS project on the livelihoods of cocoa farmers in the Western North region of Ghana. Specifically, the study focused on describing the socio-demographic\farm related characteristics of cocoa farmers who are beneficiaries, ascertaining the perception of beneficiary farmers on the effectiveness of the project in terms of its components, and examining the level of impact of the SCAFS on farmers' livelihood concerning natural, physical, financial, human and social capitals. The study further evaluated the socio-demographic/farm-related determinants of beneficiary farmers' livelihood impact of the SCAFS project.

Background Characteristics of the Respondents

Respondents' socio-demographic and farming-related characteristics were characterized by sex, age, marital status, household size, education, years of farming experience, farm size, farm status, and cocoa yields.

Distribution of farmers by sex

The gender breakdown of responders is seen in Figure 3. The findings indicated that men comprised the vast majority (87.5%) and women made up 12.5% of the total. This closely mirrors most findings in the cocoa industry, reflecting a broader trend of male dominance in agricultural sectors. According to the International Cocoa Organization (ICCO), men often own the majority of cocoa farms and are more involved in primary production activities, with men making up around 70-80% of the cocoa farming population in countries like

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Ghana and Côte d'Ivoire (Barrientos, 2014). While women constitute a smaller percentage of primary cocoa farmers, ranging from 20-30% depending on the region and specific roles, they play crucial roles in post-harvest processing and farm management (World Cocoa Foundation, 2019). Both sectors face significant challenges related to gender disparities in access to resources, training, and economic opportunities, further perpetuating the gender gap and limiting the productivity and economic empowerment of women (Hirons, 2018). Recognizing these disparities, various initiatives and programs aim to promote gender equality in the cocoa sector, providing training, resources, and support specifically targeted at women cocoa farmers. Addressing these challenges is crucial for the sustainable development of both industries.

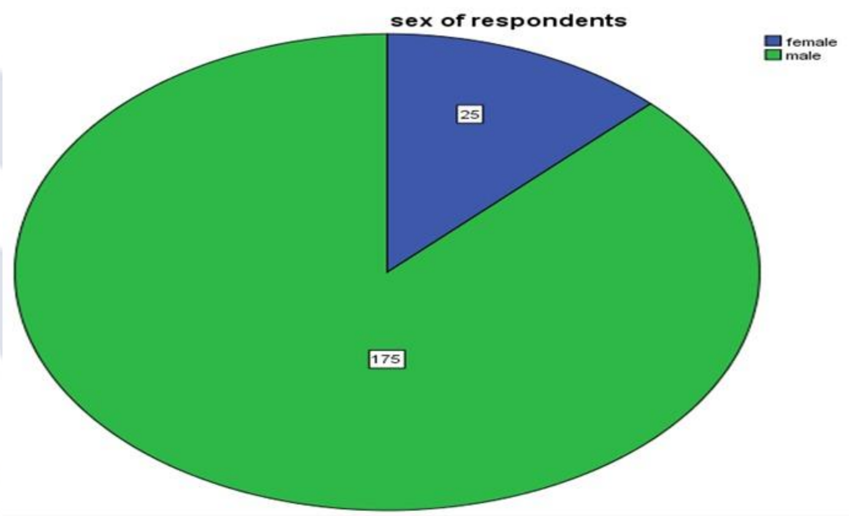

Figure 3: Sex Distribution of Respondent

Source: Field data, 2021

More than half of the survey's respondents were male (87.5%), whereas just a minority (12.5%) were female cocoa growers. A recent study in Ghana found that men were more likely to work in the cocoa industry. According to a CRIG survey done in the Ashanti and Eastern Regions of Ghana in 1995, most cocoa growers in those areas are men. U.S. Agency for International

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Development et al. (2017) found that men made up almost three-quarters (74.8%) of the respondents to their survey on land ownership and cocoa output in Ghana. Ansah's (2019) results that the majority of the cocoa farmers utilized in the 'Assessing pesticides application and effects among smallholder cocoa farmers in Western Region of Ghana' was the current research corroborates males.

In many cultures, women are expected to do everything from gathering firewood and water to raising children and maintaining the household. Production, initial processing, product development, and marketing are where women predominate in the value chains of important food and certain cash crops (Asamoah & Owusu-Ansah, 2017). According to the findings, most of the work associated with cocoa rehabilitation is labour demanding, and as men are often stronger than women, they can get the job done on their farms with little to no assistance from SNV.

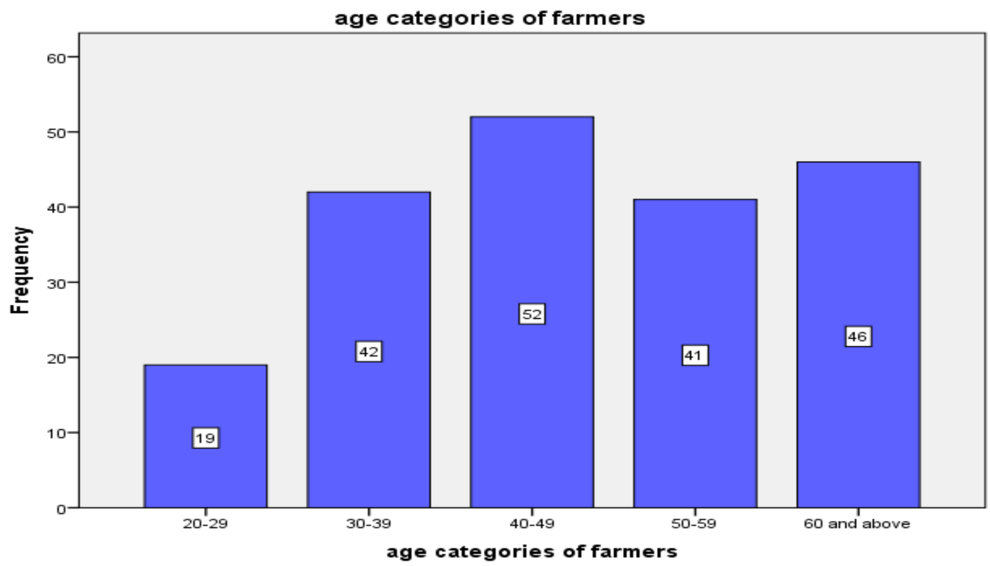

Figure 4: Age Categories of Respondents

Source: Field data, 2021

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The average age of the cocoa farmers who participated in the research was 48, ranging from 21 to 92 years old as shown in figure 4. Among the total sample, 52 farmers representing (26%) were in the age group 40–49, while 46 farmers representing (23%) were 60+. Twenty-one percent of the respondents were between the ages of 30 and 39, while twenty-one percent were between the ages of 50 and 59, and nine percent (19) were under 30. Respondents between the ages of 56 and 65 (10.2%) and those 66 and above (7.4%) made up the fewest total numbers (33 and 24), respectively.

Researchers found that the average age of Ghanaian cocoa growers was 55 (Ajagun et. al, 2021). Despite this, COCOBOD has been doing all it can to keep the cocoa business in Ghana going by encouraging young people to become involved in cocoa production. The average age of the cocoa growers surveyed by Codjoe et al. (2013) was 52 years. According to Bosompem (2019), the average age of a cocoa farmer in Ghana is X=52 (SD=14), and only 20% of farmers are younger than 40 years.

The data also indicated that around 46.5% of the respondents fell into the middle-aged category (40-59 years old), with just under a third of the respondents falling into the young-adult category (21-39 years old), and roughly 23% falling into the elderly category (i.e., more than 60 years old). Middle-aged people (40–59) seem to have predominated in the research region, with young individuals a distant second. Even though older farmers have more advantageous circumstances, such as greater farm sizes, better overall income, and more secure land rights, they are less inclined to actively participate in altering practices (Schulte et al., 2020).

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Table 3: Marital Status of Farmers

Marital status	Frequency	Percent
Single	30	15
Married	120	60
Separated	6	3
Divorced	20	10
Widowed	24	12
Total	**200**	**100**

Source: Field data, 2021

The marital status of the respondents was also examined, and out of the total of 200, 120 (or 60%) were married, while 30 (or 15%) were single as shown in Table 3. Of the remaining 63 responses, those who were widowed (24) made up 12%, divorced (20%), and separated (6) made up 3%. The data show that many of the respondents were in committed relationships. This concurs with Bosomed (2019) who revealed that 84% of the cocoa growers who participated in the survey were married. This implies that cocoa farmers happen to be responsible family-oriented farmers.

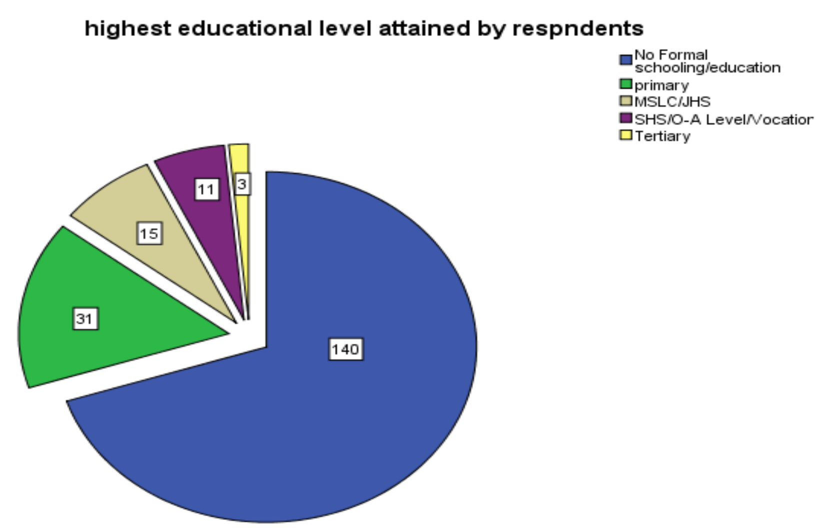

Figure 5: Highest Educational Level of Farmers

Source: Field data, 2021

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According to the data in Figure 5, of the total sample size of (200), (140) (or 70%) did not complete secondary school, whereas (31) (or 15.5%) completed elementary school. In addition, (15) respondents, or 7.5%, have finished JHS/MSLC, (11) respondents, or 5.5%, have completed SHS/O-A Level/Vocational, and (3) respondents, or 1.5%, have reached university education. Most of the 35 respondents in the research titled "Impact of Non-Price Incentives on the Choice of Cocoa Licensed Purchasing Businesses by Farmers in the Western North of Ghana" had completed some formal education (Bannor et.al, 2019). The vast majority of Ghana's cocoa farmers (about 92%) have either never attended school (22.5%) or have only completed elementary and intermediate school (69.5%), according to a 2017 study by USAID, CRIG, and WCF, just like we thought! Farmers' experiences in the research region differ from those reported in the works mentioned above. As a result, most residents in the research region are uneducated farmers or with little levels of education. Because of this, it's safe to assume that most responders are stuck in low-paying, entry-level employment because they lack the education and experience necessary to move up the corporate ladder.

As predicted, most cocoa farmers in Ghana (70%) are either completely uneducated or have barely completed elementary and intermediate school (30%) (Hirons, 2018). A mere 1.5% had completed post-secondary education beyond the bachelor's degree.

Table 4: Years of Farming Experience

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Years of experience in Farming	Frequency	Percent
10 and below	28	14
11-20	51	25.5
21-30	63	31.5
31-40	35	17.5
41-50	18	9
50 and above	5	2.5
Total	**200**	**100**

Source: Field data, 2021

A farmer's level of expertise may be approximated by counting the number of years he or she has spent cultivating cocoa. Experience is a crucial component in determining technology adoption, output level in farming, and agricultural productivity, say Oseni and Adams as mentioned in Ajayi and Adeoti (2019). Most responders (172) have been farmers for over 10 years (Table 4). About nine in ten farmers with more than ten years of experience are among the responders. The level and rate of output in farming are strongly influenced by the farmer's degree of experience (Amaza et al., 2009). The common belief is that someone's level of expertise in a field increases proportionally with the years they have spent working in it. Farmers who stand to gain from the research might be recruited for their wealth of knowledge on agricultural technology transfer and adoption.

Table 5: Household Size of Farmers

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Household size	Frequency	Percent
1-3	54	27
4-6	71	35.5
7-9	55	27.5
10-12	10	5
13-15	5	2.5
16-18	5	2.5
Total	**200**	**100**

Source: Field data, 2021

Table 5 shows that 35.5% of respondents lived in a family with four to six individuals, whereas only 27% lived in a household with one to three persons. Just 2.5% of respondents lived in a home with 13-15 people, and 2.5% lived in a home with 16-18 people. The fact that much of their farming is done by hand explains why so many families consist of more than three people at a time.

The average number of people living in a home in the Upper Denkyira West District of Ghana was seven, according to a study by Agyei-Manu et.al, (2020). The smallest and largest households had one and eighteen members, respectively. According to research by Akrofi-Atitianti et al. (2018) in the Ghanaian districts of Juabeso and Atwima Mponua, the average number of people living in a home is eight.\

The average household size in the research region was higher than the national average in Ghana, with 6.12 people living there. In Ghana, 3.6 people live in each home on average (GSS, 2021). A larger average family size may provide farmers with a ready source of agricultural labor. According to Amaze

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et al. (2009) FAO/WFP (2006), the importance of household size in agriculture is founded on the fact that it determines factors such as the availability of labor for farm production, the total area cultivated to different crop enterprises, the amount of farm produce kept for domestic consumption, and the marketable surplus.

Table 6: Total Farm Size for Cocoa Production

Total farm size (Ha)	Frequency	Percent
1-2	105	52.5
3-4	79	39.5
5-6	12	6
7-8	4	2
Total	**200**	**100**

Source: Field data, 2021

Table 6 shows that among the respondents, 52.5% grow cocoa on farms with an area of less than 2 hectares. Among the respondents, 39.5% had an overall land area of 3-4 ha, whereas 6% had an overall land size of 5-6 ha. Of those who participated, just 2% possessed 7-8- hectares of land. Possible explanations for the modest quantity of farmland include the study's land acquisition techniques. Given that most farmers' means of subsistence are directly or indirectly tied to their property, the findings suggest securing land in the research region is difficult.

Most farms in Ghana, particularly cocoa fields, are tiny and spread out. According to a survey of 123 cocoa farmers in the Ashanti and Western areas of Ghana (Edwin & Masters, 2003), the average size of their farmland was 3.50 hectares (8.8 acres).

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Table 7 : Project Affected Farm Size

Project Farm Size (Ha)	Frequency	Percent
less than 0.1	50	25
0.1-0.5	65	32.5
0.6-1.0-	33	16.5
1.1-1.5	14	11.5
1.6-2.0.	14	7
2.1 and above	15	7.5
Total	**200**	**100**

Source: Field data, 2021

One-fourth of the farmers have an area of less than 0.1 Ha of their farms benefited from the SCAFS project. Just 32.5% of the 200 respondents had areas between 0.1 and 0.5 hectares of farmland, while 16.5% had beneficiary areas between 0.6 and 1.0 Ha. Just 11.5% of the respondents have a beneficiary area of between 1.1 and 1.5 Ha. An additional 7% of the respondents also have a beneficiary area of between 1.6 and 2.0. Finally, about 7.5% of the respondents have a beneficiary area of 2.1 Ha and above as indicated by Table 7. The absence of a stable land tenure structure in the region likely accounts for the tiny farm sizes observed. This research backs with previous results from the [Comprehensive Food Security and Nutrition Survey (CFSNS, 2006)] that found 42% of farmers in the study region don't have access to farmable land. As there is a strong correlation between land size and the adoption of cocoa rehabilitation technology, this may have a chilling effect on the spread of new agricultural techniques.

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Farmers' Perceived Strengths, Problems, and Solutions to Problems of the SCAFS Project

Major Strengths of the SCAFS Project as Perceived by Farmers

Table 8 shows the major strengths of the SCAFS project, perceived by the beneficiary farmers. Perceived strengths of the project depicted in Table 8 are arranged in ascending order of the number of responses. It can be deduced from the table that almost all of the farmers **(72.9%)** perceived the cutting and treatment of cocoa as the major strength. Provision of cocoa seedlings **(57.5%)**, Monitoring of project farm and extension **(50.2%),** and Provision of economic trees **(42.1%)**.

The finding that 72.9% of farmers perceive the cutting and treatment of cocoa as a major strength aligns with the emphasis placed on pest and disease management in cocoa farming. According to the World Cocoa Foundation (2019), effective pest and disease control is critical for maintaining cocoa yields and quality. Farmers often consider practices that protect their crops from pests and diseases as essential strengths of any agricultural intervention. Similarly, the finding that 57.5% of farmers value the provision of cocoa seedlings is consistent with other studies. Access to high-quality planting material is a common challenge for cocoa farmers, and the provision of seedlings is frequently cited as a crucial support measure. For instance, a study by Abenyega and Gockowski (2001) highlights that access to improved seedlings can significantly enhance farm productivity and sustainability. The finding that 50.2% of farmers appreciate the monitoring of project farms and extension services reflects the vital role of extension services in disseminating knowledge and best practices. Research by Asamoah and Owusu-Ansah (2017) indicates

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that effective extension services can lead to better farm management practices, higher yields, and improved farmer livelihoods. Additionally, the finding that 42.1% of farmers value the provision of economic trees is supported by literature on agroforestry. Agroforestry, which involves integrating economic trees with cocoa cultivation, is recognized for its benefits in improving biodiversity, and soil health, and providing additional income sources. A study by Gockowski and Sonwa (2011) discusses the advantages of agroforestry systems in enhancing the sustainability and economic viability of cocoa farming. Overall, these findings are in line with other literature on the strengths of interventions in cocoa farming, emphasizing common priorities and challenges faced by cocoa farmers.

Most farmers were particularly appreciative of the fertilizer component of the project.

Table 8: Cocoa Farmers' Perceived Strength of the SCAFS Project

Major Strength of the SCAFS Project	Frequency	Percent
Provision of economic trees	93	42.1%
Monitoring of project farm and extension	111	50.2%
Provision of cocoa seedlings	127	57.5%
Cutting and treatment of cocoa farms	161	72.9%

Source: Field data, 2021 N=200

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Major problems encountered and solutions to the problems of the SCAFS Project as perceived by cocoa farmers

Major problems encountered by cocoa farmers in applying SCAFS are presented in Table 9, and solutions to the problems suggested by farmers are also presented in Table 10. The problems in Table 9 are listed in increasing order of importance of the problem as perceived by the farmers.

The main problem encountered by farmers was that they received the inputs, especially the fertilizer later than they expected. After cultural maintenance of the farm, the next step that follows is the application of the fertilizer, if the rains at all. Due to the late arrival of fertilizer. Most farmers were unable to apply the fertilizer during the beginning of the rainy seasons or when the rains fell (Compare with Table 10).

As reported earlier in Table 10. 171 out of 200 farmers representing 85.5. % could not apply the fertilizer at the appropriate time when the rains fell due to the late arrival of inputs. This could affect the effectiveness of the fertilizer in increasing yield. Farmers, therefore suggested as shown in Table 8 that the inputs especially the fertilizer should be made available at the appropriate time before the start of rains.

Table 9: Frequency Distribution of Cocoa Farmer over Constraints /Weakness Encountered in the SCAFS Project

Major Constraints /Weakness of SCAFS	Frequency	percent
Late arrival of fertiliser	171	85.5%
High cost of weeding the farm	168	84%
Unreliable and inadequate source of Rain	162	81%
Inadequate inputs (cocoa seedlings)	150	76.5%

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High cost of inputs (spraying machine)	144	73.1%
Land tenure constraints	139	70.6%
Difficulties in transporting inputs	99	49.5%

Source: Field data, 2021 N=200

Another problem farmers encountered was the high cost of weeding due to quicker growth of weeds in the farm since weeds also make use of fertilizer which resulted in quicker growth of weeds and this was anticipated by the project. Appiah (2004) reported that improved cultural practices such as weeding, created job opportunities for rural youth thereby reducing the frequency of migration of rural youth to urban centres.

This implies that although this created jobs for the rural youth, it also increased the cost of labour for the farmers. Farmers, therefore suggested that weedicide should be included as one of the components of the SCAFS (Table 9). This would help to reduce to some extent the cost of labour (weeding). A few farmers also suggested that the weedicide could not be included as one of the components of the project. SNV should provide soft loans to beneficiary farmers so that they could use them to offset the cost incurred in weeding and other cultural maintenance practices on their farms.

Additionally, another challenge faced by cocoa growers was a lack of enough rainfall necessary for the optimal development of their crops. They also thought the inputs they got weren't sufficient given the scope of the SCAFS project's impact on them. As no funds were set aside to help farmers cope with the high cost of inputs, they were already having trouble making ends meet due to a lack of those same inputs. One of the biggest obstacles to the successful rollout of the SCAFS initiative was the existence of land tenure constraints.

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Seventy-six percent of farmers said land tenure issues were to blame for the small farm projects. Ultimately, one of the difficulties experienced during the project's execution was the late delivery of planting material. About half of the cocoa farmers (49.5% or so) believed that inconsistent and insufficient rainfall negatively impacted the survival rate of planting materials since they did not arrive at the desired time for planting.

Farmers' Suggested Solution to Problems of the SCAFS Project

Farmers, therefore suggested as shown in Table 10 that the inputs especially the fertilizer should be made available at the appropriate time before the start of rain. About 184 of the farmers representing 92% of the farmers suggested that fertiliser components should be supplied before the rains start. Additionally significant number of farmers (90.5) suggested that weedicide should be included as one of the components of the SCAFS. It is therefore very relevant weedicide component is taken into consideration to aid farmers control weeds in their respective farms.

Several farmers also said that the unpredictable and insufficient rainfall greatly reduced the survival rate of their planting material, particularly cocoa seedlings. 178 out of 200 cocoa farmers surveyed supported installing irrigation systems on their properties to bring the project's goals to fruition (Table 9). Some farmers irrigated their crops throughout the dry season, but they were limited in their ability to do so by the great distances that separated their fields from the water sources. Consider an example. Thus, farmers advocated for the installation of irrigation systems in their fields to water crops. Seventy-five percent of farmers said they weren't getting enough of what they needed, and they recommended boosting input supplies to reach all project boundaries. This

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is particularly true for the hybrid cocoa seedlings, which are hard to come by. Farmers who advocated for more inputs may have been the ones who, while having the means to do so, could not get a supply of hybrid cocoa seedlings from retailers.

As the cocoa trees provided a significant portion of the farmers' income, many of them (74.5% of the total) said that SNV should pay them for having to take them down. They went on to say that because most of their land contracts were leases, their landlords might recoup the costs of tree removal immediately. As a result, they proposed that financially compensating farmers and landlords would aid in the project's efficient rollout. Sixty percent of farmers surveyed agreed that input costs were too high and that the government or SNV should help offset those costs.

Another 57.5 percent of farmers agreed that low-interest, subsidized loans from the government or SNV are essential to keeping farms in business. Farmers will be able to use these loans to purchase the essential inputs for a successful rollout of the project. The fact that these loans will help farmers take care of their families by covering expenses like tuition and medical bills is crucial.

Several landowners want to renegotiate the terms and conditions of the repaired properties, which has led to land litigation and tenure hurdles, which have been regretted by some farmers (42%). So, to keep the SCAFS project going smoothly, SNV/government needs to have stakeholder meetings/engagements to tackle these land tenure concerns and complexities.

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Table 10: Frequency Distribution of Farmers' Perceived Solutions to Problems of the SCAFS Project

Solution to Problems of SCAFS Project	Frequency	Percent
Timely supply of fertilizer	184	92%
Supply of weedicide package component	181	90.5%
Provision of Irrigation schemes	178	89%
Adequate provision of inputs (seedlings)	150	75%
Payment of compensation to Farmers	149	74.5%
Reduction in the cost of inputs by the Government/SNV	120	60%
Provision of soft loans by the government/SNV	115	57.5%
Stakeholder engagement on land tenure barriers	84	42%

Source: Field data, 2021 N=200

The SCAFS project's components

The SCAFS project's components were reviewed regarding the farmers' perceptions of its efficacy in delivering enhanced planting materials, input assistance, training, and extension services. Supply of Enhanced Planting Materials: The SCAFS Project's Impact Table 11 summarises user feedback about the SCAFS project's impact on their satisfaction with the provided enhanced cassava planting supplies.

Table 11: Farmers' Perception of the Characteristics of Cocoa Seedlings Supplied Under the SCAFS Project

Characteristics of Cocoa seedlings	Mean	SD
Early Maturing Varieties	4.1000	1.35617
Disease Resistant Varieties	3.1350	1.34380
High Yielding Varieties	2.5850	1.50803
Weighted mean	**3.27**	**1.40**

Scale: 5= "Strongly Agree, 4= Agree, 3= Indifferent 2= Disagree 1= Strongly Disagree" N=200

Source: Field data, 2021

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Table 11 presents the characteristics of cocoa seedlings as evaluated by farmers using a scale where 5 represents "Strongly Agree," 4 denotes "Agree," 3 is "Indifferent," 2 stands for "Disagree," and 1 indicates "Strongly Disagree."

The findings revealed that early maturing varieties have the highest mean score of 4.10, which falls between "Agree" and "Strongly Agree." This suggests that farmers generally perceive early maturing varieties of coca seedlings provided by the SCAFS initiatives positively and believe they are beneficial or highly beneficial. The standard deviation (SD) of 1.356 indicates a moderate level of variability in farmers' responses, showing that while the consensus is generally positive, there is some variation in individual opinions. Also, disease-resistant varieties have a mean score of 3.14, indicating that farmers are "Indifferent" to "Agree" about their effectiveness. This score reflects a neutral to positive perception, with farmers recognizing the value of disease resistance but not as strongly as with early maturing varieties. The SD of 1.344 indicates a similar level of variability in responses, suggesting some diversity in how these varieties are viewed.

The high-yielding varieties on the other hand have the lowest mean score of 2.59, which falls between "Disagree" and "Indifferent." This implies that farmers generally perceive high-yielding varieties less favorably, viewing them as less beneficial or not meeting expectations. The standard deviation of 1.508 suggests a wide range of opinions about these varieties, reflecting greater disagreement or variability in perceptions.

The overall weighted mean score is 3.27, which is close to "Indifferent" but slightly above "Agree." This aggregated score indicates that, on average, farmers have a mixed or slightly positive view of the characteristics of cocoa

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seedlings. The overall standard deviation of 1.40 shows a significant degree of variability in perceptions across the different characteristics.

Apparently, Table 11 reveals that farmers strongly favor early maturing varieties, view disease-resistant varieties with moderate approval, and are generally less enthusiastic about high-yielding varieties. These insights help in understanding farmers' preferences and guiding improvements in cocoa seedling traits to better meet their needs.

Effectiveness of SCAFS Project on Provision of Inputs

Support Table 12 displays cocoa farmers' opinions on SCAFS's usefulness in providing inputs to help them develop better cocoa rehabilitation.

Table 12: Perceived Adequacy of the Quantity of Inputs Supplied for Planting

Planting material (Quantity)	Mean	SD
cocoa seedlings	3.9950	1.28578
plantain suckers	3.7650	1.41413
economic trees	3.9650	1.22936
Cassava sticks	2.0850	1.3701
Fertilizers	1.9850	.66859
Insecticides	1.4100	.58619

Scale: "5= Very Adequate, 4= Adequate, 3= Undecided, 2= Inadequate, 1= Very Inadequate" N=200

Source: Field data, 2021

The results demonstrate that the SCAFS project did not successfully provide farmers with access to necessary planting supplies. Most respondents (Mean= 2.41, SD= 1.09) said the SCAFS initiative did a good job of providing them with seedlings and other planting supplies. Nonetheless, they rated the

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delivery of cocoa seedlings as almost ‘adequate’ (Mean= 4.00, SD= 1.28), followed by the delivery of economic trees as “somewhat” adequate (Mean= 3.97, SD= 1.22), and finally, the delivery of plantain suckers as “somehow” adequate (Mean= 3.97, SD= 0.92). The cassava sticks that were sent out were not particularly inadequate (M= 2.09, SD= 1.37). The fertilizer and insecticide supplies were provided “somewhat” inadequate (Mean= 1.99, SD= 0.66), and the insecticide supply was delivered very inadequate (Mean= 1.41, SD= 0.58). The assumption was that not enough planting supplies were provided. Most farmers in the study region are now engaged in farm rehabilitation, placing increased demand for planting supplies on the local market.

Effectiveness of SCAFS Project components in terms of Time of Provision of Inputs.

Support Farmers’ ratings of SCAFS’s inputs demonstrate how helpful they found the project in boosting their efforts to rehabilitate their farms (Table 13).

Table 13: Farmers' Level of Satisfaction with the Timeliness of Input Provision

Inputs (Timeliness)	Mean	SD
Timely cutting/treatment of cocoa trees	4.3200	1.25518
timely provision of economic tree	3.0850	1.29466
Timely provision of cocoa seedlings	2.5200	1.34486
timely provision of plantain suckers	2.5100	1.42480
timely provision of fertilizer	2.1200	1.24230
timely provision of cassava sticks	2.0503	1.27425
timely provision of insecticide	1.7200	1.20785
Weighted mean	**1.29**	

Scale: “5= Very Satisfied, 4= Satisfied, 3= indifferent, 2= unsatisfied, 1= Very unsatisfied” N=200

Source: Field data, 2021

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The results demonstrate that farmers have access to SCAFS project input assistance for cocoa restoration of different kinds. Most of the farmers rated inputs as 'somehow' unsatisfied (Mean = 2.41, SD =1.09) as inputs were sent late. Their opinions on whether or not these inputs will be delivered on time varied widely. Timely cutting/treatment of cocoa trees was considered 'Satisfied' (Mean = 4.32, SD = 1.26), and the timely supply of economic trees was assessed as 'indifferent' (Mean = 3.09, SD= 1.29). As compared to the timely supply of plantain suckers 'somehow' indifferent (Mean = 2.51, SD= 1.42), farmers judged the timely provision of cocoa seedlings as "somewhat" indifferent (Mean = 2.52, SD= 1.34). The farmers regarded the timely delivery of fertilizer as 'unsatisfied' (Mean = 2.12, SD= 1.24) and were on par with the timely delivery of cassava sticks (Mean = 2.05, SD= 1.27). The third input assistance, pesticide, was not properly given on time (Mean = 1.72, SD = 1.21). Farmers were likely unable to make full use of the inputs since they were not sent at the optimal time. Historically, farmers have relied on natural rain for their cocoa production, but when inputs are late, the harvest often fails (Baryeh, Ntifo-Siaw & Baryeh, 2000).

Effectiveness of SCAFS Project on Provision of Training

Table 14 displays the cocoa farmers' opinions on the efficacy of SCAFS project training in facilitating their ability to join cooperatives and increase output at their repaired cocoa estates. Cocoa growers were able to participate in the project's training, as seen by the outcomes. As a whole, they thought the training themes chosen by the project team to address their requirements were only moderately 'indifferent' (Mean =3.13, SD =1.40). The majority (Mean= 4.01, SD= 1.37) agreed that the training on group dynamics had been beneficial

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and rated as 'Satisfied'. Deliveries of harvesting training were "somehow" Satisfied (M= 3.68, SD= 1.00), as were those of planting distance training (M= 3.62, SD= 1.38) and pegging and planting in rolls (M= 3.58, SD= 1.40). As with other aspects of fertilizer use, most people found training 'somehow' satisfied (Mean= 3.58, SD= 1.40).

Table 14: Farmers' Level of Satisfaction with Training Components

Training Topics	Mean	SD
Training on group dynamics	4.0100	1.37454
Training on harvesting	3.6800	.99627
Training on Planting Distance	3.6200	1.38390
Training on Pegging and planting in Rolls	3.5750	1.40865
Training on fertilizer application	3.3150	1.62758
Training on pesticide application	2.9700	1.56568
Training on pest and disease control	2.8450	1.54691
Training on Management of 'Susu' scheme	2.7150	1.46097
Training on weed control	2.5700	1.32813
Training on record keeping	1.9800	1.34112
Weighted mean	**3.13**	

Scale: "5= Very Satisfied, 4= Satisfied, 3= indifferent, 2= unsatisfied, 1= Very unsatisfied" N=200

Source: Field data, 2021

The average rating for pesticide application training was 'Satisfied' (Mean = 2.97, SD =1.57). Also "somewhat" indifferently provided were training in pest and disease control (Mean = 2.84, SD= 1.55), management of the 'Susu' scheme (2.72, SD= 1.46), and weed control (2.57, SD= 1.33). The

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least successful training was on farm record keeping (Mean = 1.98, SD = 1.34), which was deemed 'somewhat unsatisfied' overall. This likely means the farmers appreciated the instruction and applied what they learned to their cocoa operations. To reduce waste and maximize efficiency in the use of available resources, "farmer training on better techniques in agriculture is of the utmost importance" (Nweke, 2002).

Effectiveness of SCAFS Project on Extension Services Provision

Table 15 displays cocoa farmers' perceptions of the different organizations utilized in the SCAFS initiative to provide extension services. These groups primarily helped farmers by transferring technology to them and offering guidance and technical support.

Table 15: Perceived Effectiveness of Extension Type Received by Farmers

Type of Extension	Frequency	Mean	SD
project team	200	4.2600	1.11743
agro-input dealer	200	3.0100	1.34870
public extension service	200	2.0150	1.56750
Weighted mean		**3.10**	**1.34**

Scale: "5= Very Effective, 4= Effective, 3= Moderate, 2= Ineffective, 1= Very Ineffective" N=200

Source: Field data, 2021

Farmers, on average, thought the organizations that provided extension services did a good job (Mean = 3.10, SD = 1.34). The high mean and standard deviation scores for the Project team's extension service delivery show what a crucial role they play in the system of pluralistic extension. Their assessed efficiency in dealing with the suppliers of agricultural inputs was average (Mean

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= 3.01, SD = 1.34). Public extension service distribution was also deemed inefficient (= 2.02, SD = 1.57). This suggests that the project staff in the study region did their best to ensure that the beneficiary farmers benefited from the transfer of technology. According to Nweke (2002), it is a waste of resources if newly created technologies are not disseminated to their intended audiences.

Impact of SCAFS Project on the Livelihood Systems of Cocoa Farmers

The effect of SCAFS on the natural, physical, financial, social, and human capital of the beneficiary cocoa farmers' livelihood systems is addressed.

Impact of SCAFS Project on the Natural Capital of Cocoa Farmers

The term "natural capital" is used to describe the land and natural resource base. Cocoa farmers' opinions on the SCAFS initiative are summarised in Table 16, which details their expectations for improved access to fertile land, higher yields per acre, and higher-quality planting supplies.

Table 16: Perceived Impact of SCAFS Project on Natural Capital of Beneficiary Cocoa Farmers

Natural capital	Mean	SD
improved cocoa seedlings	3.6250	1.41577
increase in yield	3.4300	1.53848
increase in productivity	2.3950	1.14259
reduction in the cost of production	2.3550	1.41385
Weighted mean	**2.95**	**1.38**

Scale: "5= Very Satisfied, 4= Satisfied, 3= indifferent, 2= unsatisfied, 1= Very unsatisfied" N=200

Source: Field data, 2021

The findings suggest that farmers rated the effect of the SCAFS project on their natural capital as almost 'moderately' indifferent (Mean = 2.95, SD = 1.38), albeit their opinions varied. Farmers reported a moderately high level of

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satisfaction as 'somehow' Satisfied with the quality of the enhanced cocoa seedlings they received (Mean = 3.63, SD = 1.42), indicating that the seedlings may be utilized as planting material on the farmers' farms. These cocoa cultivars outperform the indigenous kinds regarding disease resistance, maturity, and yield stability.

They also reported a 'somewhat' indifferent improvement in yield from the enhanced cocoa cultivars they had planted (Mean = 3.43, SD = 1.43). This could as a result of that the new cocoa plant has just begun fruit and needed some time to reach its peak production stage. In addition, productivity gains were rated "unsatisfied" (Mean = 2.40, SD = 1.14) in yield per unit area. The age of the cocoa tree affects its production, and the cocoa trees used in this study are just five years old; hence the rating on growth in productivity is low. While farmers' opinions may change next year after cocoa plants reach their peak yield, this is because it takes many years for cocoa trees to reach their full potential. Reducing manufacturing costs (Mean = 2.35, SD = 1.41) was rated by farmers in terms of satisfaction. Newly rehabilitated farms demand more input and expenditure, making the output more expensive than farmers originally estimated.

Impact of SCAFS Project on the Physical Capital of Cocoa Farmers

Table 17 shows the effect the cocoa growers believe the SCAFS initiative will have on their physical capital. Farming equipment, housing, and infrastructure are all examples of physical capital. Infrastructure includes hospitals, classrooms, highways, dams, and water and sewage systems.

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Table 17: Perceived Impact of SCAFS Project on the Physical Capital of Beneficiary Cocoa Farmers

Physical capital	Mean	SD
Ownership of knapsack	3.7100	1.70010
Ownership of mobile phone	3.5500	1.86680
Ownership of livestock (sheep, goats, pigs, etc.)	3.1850	1.70449
Ownership of tricycle, motorcycle, bicycle	2.7550	1.92183
Weighted mean	**3.214**	**1.7907**

Scale: "5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low"

N=200

Source: Field data, 2021

The findings demonstrate that while the cocoa farmers generally believed that the initiative strongly affected their physical assets (Mean = 3.21, SD=1.79), they had differing opinions. Among the many elements of their physical possessions, they gave ownership of a backpack the highest rating (Mean = 3.71, SD = 1.70). In the past, they had to either employ someone or borrow money from someone else, leading to crop failure since certain pesticide treatments must be applied on time. Having a knapsack sprayer made it possible for them to buy the equipment separately.

After acquiring a knapsack sprayer mobile phone ownership was fairly modest (Mean = 3.55, SD = 1.86). Cell phone usage for agricultural communication has become very important in the twenty-first century. The respondents (Mean = 3.49, SD = 1.32) thought owning animals had a "moderate" influence on their physical capital. Access to transportation had a "high" (Mean = 3.18, SD = 1.70) impact on livelihood. The care of livestock is

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crucial to the livelihoods of smallholder farmers (Carney, 1998). Crop farmers who maintain animals as insurance against unforeseen circumstances are known as insurance-keeping. Keeping livestock may be used as security for loans and a means of social integration to elevate one's status. Most cocoa growers feed their cattle with leftovers, especially peels (cassava, plantain), for the abovementioned reasons.

Tricycle, motorbike, and bicycle ownership had the "least" amount of influence (Mean = 2.76, SD = 1.92) compared to the other factors. This suggests that the farmers' financial situations have not improved as anticipated since the majority of them cannot afford a tricycle, motorbike, or bicycle that would help them with their farming.

Impact of the SCAFS Project on the Financial Capital of Cocoa Farmers

Financial capital is essentially property and rights with a monetary value. For instance, income, money sent home by relatives employed elsewhere, sources of credit, stockpiles of seeds, and animals. Table 18 shows how the SCAFS program is perceived to have affected the recipient cocoa producers' financial capital.

Table 18: Perceived Impact of SCAFS Project on the Financial Capital of Beneficiary Cocoa Farmers

Financial capital	Mean	SD
decrease in debt	3.1600	1.40866
increase in livestock/investment	3.0350	1.61145
increase in income	2.8400	1.55127

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increase in savings	2.1150	1.42193
access to credit	1.1900	.39329
Weighted mean	**2.4680**	**1.2774**

Scale: "5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low"

N=200

Source: Field data, 2021

The findings demonstrate that the average cocoa farmers' view of how the SCAFS project will affect their financial capital was fairly low (Mean = 2.47, SD = 1.28). Most farmers thought that their cattle stock had increased while their obligations to service providers had either slightly increased (Mean = 3.04, SD = 1.61) or significantly reduced (Mean = 3.16, SD = 1.41). As a consequence of the SCAFS initiative, most cocoa farmers now have relatively low enhanced incomes (Mean = 2.84, SD = 1.55) and poor savings (Mean = 2.11, SD = 1.42). Most cocoa producers are probably not interested in loans from financial institutions because of the lengthy investment in cocoa production and high input costs. The "least" significant difference between the groups was access to credit (Mean = 1.19, SD = 0.39). Financial institutions are also hesitant to lend money to farmers since they are still cultivating new areas, whether or not they yield returns, because the majority of cocoa trees have been chopped down and are being rebuilt.

Impact of the SCAFS Project on the Social Capital of Cocoa Farmers

Social networks, organizations, and mutually beneficial interactions within and across families are all examples of social capital. It also encompasses interactions inside social networks, and within communities, and the assistance offered by non-profit, informal, and religious organizations. Table 19 displays

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the recipient cocoa farmers' opinions on how the SCAFS initiative has affected several facets of their social capital.

Table 19: Perceived Impact of SCAFS Project on Social Capital of Beneficiary Cocoa Farmers.

Social capital	Mean	SD
member of the farmer association	4.2100	1.48895
support from the farmer association	3.5750	1.32406
ability to feed a family	2.5400	1.15980
support from family	2.4700	1.57847
meet social obligations	2.2200	1.14374
pay school fees	1.9450	1.35319
support from friends	1.5950	.88026
Weighted mean	**2.6507**	**1.2754**

Scale: "5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1 = Very Low"

N=200

Source: Field data, 2021

The study showed that the beneficiary cocoa farmers' perceptions of the SCAFS project's influence on their social capital were generally fairly variable and relatively low (Mean = 2.65, SD = 1.23). The effect of being a member of a farmer organization (SNV farmer groups) was the greatest (Mean = 4.21, SD= 1.49) among the different social (livelihood) assets. This result is favourable and highly commended, as farmers are becoming more aware of the need to join an organization for its advantages. A relatively high level of support came from the farmer association (Mean = 3.58, SD = 1.32). The farmer groups created and had a common input to use and share depending on timetables may have had a role in this.

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Their capacity to provide for family members (Mean = 2.54, SD= 1.16), get assistance from family (Mean = 2.47, SD = 1.58), and fulfil societal commitments (Mean = 2.22, SD = 1.14) was not significantly impacted by the SCAFS initiative. Their capacity to pay for school expenses (Mean = 1.95, SD = 1.35) and get help from friends (Mean = 1.60, SD = 0.88) were both very little affected by the SCAFS initiative. The capacity of cocoa farmers to pay for their children's education had the least influence, whereas help from friends had the least impact.

Table 20: Perceived Impact of SCAFS Project on the Human Capital of Beneficiary Cocoa Farmers

Human capital	Mean	SD
access to unskilled labour	4.2450	1.08668
access to private Extension (Project Team)	4.2200	1.04261
Access to agro-input dealers	3.0100	1.34870
access to skilled labour	1.9800	.91860
Access to public extension services (AEAs)	1.9600	1.23939
Weighted mean	**3.083**	**1.127196**

Scale: "5 = Very High, 4 = High, 3 = Moderately High, 2 = Low, 1= Very Low"

N=200

Source: Field data, 2021

Impact of the SCAFS Project on the Human Capital of Cocoa Farmers

The knowledge, expertise, work ethic, level of education, and health of an individual and their community are all examples of human capital. The views of SCAFS project beneficiaries, a group of cocoa growers, are summarised in Table 20.

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Overall, the findings reveal that the SCAFS initiative had a relatively high perceived effect (Mean = 3.08, SD = 1.12) on the human capital of the recipient cocoa producers. Unskilled labour availability was cited as a key problem (Mean = 4.23, SD = 1.09), perhaps due to a dearth of employment opportunities caused by widespread illness and old age among the country's cocoa farmers. Thus, the remaining tenant farmers have few other options for making a living and are eager to find labour on farms in exchange for payment. According to COCOBOD (2018), which surveyed 256 thousand hectares of farms in the Western North Area, 69% had been hit by the Cocoa Swollen Shoot Virus Disease. Around 42% of cocoa crops in the western north have been hit by this disease. In contrast, unskilled labourers are hired to remove weeds, spread fertilizer, plant fresh fields, and collect grown roots. Access to private Extension (Project Team) (Mean = 4.22, SD = 1.04) and Access to agro-input dealers (Mean = 3.01, SD = 0.73) were also significant variables.

The project team was heavily engaged in delivering extension services to farmers in the field throughout the project's implementation phases. As the area under investigation is well known for its cocoa production, several well-established agro-input businesses and stores are spread across the region. Availability to public extension services (Mean = 1.98, SD = 0.91) and Access to skilled labour were also significant determinants (AEAs). Skilled workers are in high demand for removing sick or otherwise unusable trees and applying treatments on farms. Most farmers thought their tree-cutting efforts paid well, but they also thought the farm treatments failed since the illness reappeared in their younger cocoa plants. Because the cocoa rehabilitation by SNV is coupled with its technological tools, the effort is needed to educate farmers for their

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adoption, but access to public extension services (AEAs) was perceived as slightly below low and is therefore not commendable to the Extension Directorates of the districts where the SCAFS project is located. Beneficiary cocoa farmers reported an increase in their ability to contract labour for a charge due to the project's effect on their human capital.

Selected Socio-demographic/farm related Characteristics of Farmers Influencing their Perception on Livelihood Impact of the SCAFS

A multiple regression analysis was conducted to examine how farmers' demographic and farm-specific factors interact with the SCAFS. As the dependent variable, the effect of the SCAFS on people's livelihoods was entered alongside seven significant independent variables. Household size, respondent education, project farm income diversification, farmer age, total land area, and gender were the independent factors. The effect of SCAFS on people's livelihoods served as the dependent variable. The multiple regression analysis of socio-demographic and farm-related factors that influence the SCAFS's effect on the livelihoods of recipient farmers is summarised in Table 21.

Table 21: Multiple Regression of Selected Socio-demographic/ farm related Characteristics of Farmers influencing their Perception of Livelihood Impact of the SCAFS.

	Unstandardised Coefficients			
Explanatory Variables	B	**Std. Error**	**T**	**Sig.**
(Constant)	77.176	4.844	15.933	.000
sex of respondents	-4.469	2.319	-1.927	.049
age of respondents	-.031	.058	-.536	.592

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highest educational level of respondents	-.248	.884	-.281	.779
household size of respondents	.173	.230	.752	.453
size of cocoa farm for project	1.036	.956	1.083	.280
other source of income from project farm	.263	.960	.274	.784
R	**R Square**	**Adjusted R Square**	**Std. Error of Estimate**	
0.176455	0.031136	0.001016	10.659224	

Source: Field data, 2021

The regression equation (from the unstandardized Beta coefficient) Y = 72.530 + 0.067X1 – 0.140X2 + 0.140X3 + 1.061X4 + 0.361X5 – 0.585X6

If B=0 then Y= 2.846

The SCAFS's effect on people's livelihoods is calculated as follows: 72,530 + 0.140 household size -0.585 respondent education level + 0.361 other income -0.140 farming experience -1.061 farm size -0.067 respondent age.

The regression analysis reveals that among the explanatory variables, only the sex of the respondents significantly impacts the dependent variable, with females showing a decrease in the outcome (B = -4.469, p = .049). This finding aligns with literature highlighting gender disparities in agricultural outcomes, where women often face different challenges compared to men (Quisumbing & Maluccio, 2003). Other variables, such as age, highest educational level, household size, cocoa farm size, and additional income sources, do not significantly affect the dependent variable, with p-values well above conventional significance levels. This suggests that these factors do not have a meaningful impact in this context. For instance, age and education,

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typically associated with productivity and efficiency in agriculture (Bezu & Holden, 2014; Mendola, 2007), show no significant effects here. Similarly, the size of the cocoa farm and other sources of income do not contribute significantly to the outcome, which contrasts with findings from studies that emphasize the role of farm size and income diversification in enhancing agricultural productivity (Cline, 2007; Ellis, 2000). The overall model has low explanatory power, with an R^2 of 0.031 and an adjusted R^2 of 0.001, indicating that the included variables account for only a small portion of the variance in the dependent variable. This suggests that other factors not included in the model may play a more substantial role in influencing the outcome.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The overview, findings, and suggestions from the research are presented in this chapter. This chapter also suggests areas for more investigation.

Summary

The Sun Shaded Agro-Forestry Project (SCAFS) is an SNV initiative in Ghana's cocoa subsector to assist in the rehabilitation of outdated or infected

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farms and prevent deforestation. Four cocoa districts in Ghana’s Western North were chosen to participate in the project’s implementation in 2016.

The study’s objective was to assess how farmers regarded the SCAFS project’s effects on their standard of living. The study’s objectives were to define the socio-demographic and farm-related features of project beneficiaries, obtain beneficiaries’ opinions of the SCAFS project’s components’ efficacy, and assess perceived SCAFS project effects on beneficiaries’ livelihoods. In addition, the research attempted to understand how farmers saw the project’s encountered problems as well as potential solutions. Lastly, the research intended to identify farmers' socio-demographic/farm-related factors.

The study was conducted using a descriptive research approach. Participants in the research were 200 cocoa farmers who benefited from the initiative. Interview schedules with both closed- and open-ended questions were used for data collection. Using SPSS version 25.0 software was used for data analysis. Following the specified research goals, a summary of the key results is provided in the following paragraphs.

According to the study’s assessment of the farmers' socio-demographic and farming-related features, the majority (87.5%) were men between the ages of 40 and 49 who were primarily married. Farmers who benefited from the SCAFS project comprised a larger percentage of households with four or more individuals and had little to no formal education. Most of the farmers were found to be producing cassava and plantains on the same restored farm, which was their secondary source of farm income. Most interviewees had been small-scale farmers for at least 20 years, with farms that produced cocoa on less than

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5ha of land. The survey also showed that the project impacted just a tiny part of the recipient farmers' farms, measuring 1 hectare or less.

The survey again showed that the three (3) key project strengths were the provision of cocoa seedlings (57.5%), monitoring of the project farm and extension (50.2%), and cutting and treating of cocoa farms' components (72.9%).

The main issues that the SCAFS project's beneficiary cocoa farmers ran into were late arrival of fertilizer (85.5%), high cost of weeding the farm (84%), inconsistent and insufficient supply of rain (81%), inadequate inputs (76.5%), high input costs (73.1%), land tenure restrictions (70.6%), and a delay in the delivery of planting materials (49.5%).

The benefiting cocoa farmers also offered ideas for resolving or reducing the issues. They included a timely supply of fertilizer (92%), Supply of weedicide package components (90.5%), offering irrigation programs (89%), providing sufficient inputs (75%), compensating farmers (74.5%), lowering input costs by the government or SNV (60%), offering lenient loan terms by the government or SNV (57.5%), and engaging stakeholders on land tenure issues (42%).

It was found in a survey of SCAFS project beneficiaries that the majority (Mean = 3.27, SD = 1.40) thought the initiative's fundamental tenets were beneficial (Characteristics of Cocoa seedlings). Beneficiary cocoa farmers ranked Effectiveness on training items (Mean = 3.13, SD = 1.40) and Effectiveness on kind of extension (Mean = 3.10, SD = 1.34) as two of the most moderately successful components. Effectiveness on the timing of supply of inputs (Mean = 2.62, SD = 1.29) and Effectiveness on the amount of planting

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material delivered (Mean = 2.41, SD = 1.19) scored lowest among the components and was rated as highly ineffective by farmers.

Based on the data collected, it was determined that the SCAFS project had a "moderate" (Mean = 2.87, SD = 1.37) positive effect on the standard of living of the cocoa farmers who participated in the program. Physical capital (Mean = 3.21, SD = 1.79) was farmers' most affected livelihood capital after the SCAFS project's intervention. Farmers that have access to a knapsack sprayer are likely responsible for this. Their natural counterparts followed closely behind artificial capitals (Mean = 3.08, SD = 1.12) (Mean = 2.95, SD = 1.38). The increased yield and better cocoa seedlings significantly boosted natural capital. The SCAFS initiative had the smallest impact on improving social capital (Mean = 2.65, SD = 1.23) and financial capital (Mean = 2.47, SD = 1.28), two of the five capitals essential to a person's standard of living.

The research found that the SCAFS accounted for 17.0% of the variability in recipient farmers' perceptions of the project's influence on their livelihoods after controlling for the socio-demographic/farm-related factors of farmers.

Conclusions

Based on the study's results, it can be concluded that most of the SCAFS project's beneficiaries in the study region were smallholder subsistence farmers growing cocoa, plantains, and cassava on land less than 5 hectares in size. Beneficiary farmers participating in the SCAFS produced mediocre yields (cocoa).

Generally, the farmers' perceptions of the initiative on each of the five key components as being "moderately successful" in raising yields were

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remarkably consistent. The implementation of irrigation plans, proper input supply, payment of farmer compensation, and other solutions were suggested as ways to reduce or resolve the issues faced by farmers.

The farmers in the region of the research were old and becoming older. Thus, the vast majority of responders (69.5%) were 40 or older. On average, respondent ages varied widely, from 21 to 92 years old. As a result, they may have been hindered in their efforts to restore their cocoa fields. Moreover, the findings showed that among farmers, just 30% were literate, and 70% were not. Apparently, most of the population (70%) did not finish elementary school, just 15.5% completed middle school, and only 7.5% of farmers had completed high school (MSLC/JHS or SHS/O-A Level/Vocational). Just 1.5% of farmers have completed post-secondary education. Their generally low levels of education hampered cocoa producers' access to resources. Determine the meaning of encoded data and execute other SCAFS-related tasks.

Also, the findings revealed that the average working experience of the farmers in the study region was 25 years. Thus, most farmers (86%) have been doing so for at least 10 years. The farmers' cumulative experience with cocoa cultivation varied from five to seven decades. Seventy-three percent (73%) of those who responded lived in homes with 4-18 people. In the region we were looking at, household sizes varied from one to eighteen people. The average family consisted of six people (6). Farmers may find a ready source of labour among their extended family members as they restore their land.

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Recommendations

The research's findings informed the following suggestions for enhancing the SCAFS initiative and its influence on the economic well-being of cocoa producers in the study area.

1. The SCAFS project targeted only one hectare of a beneficiary farmer's cocoa farm. It is recommended that SNV should increase the size and scope of its project to cover a larger area for the optimum benefit of the cocoa farmers. SCAFS disproportionately impacts small-scale cocoa growers (1 hectare or less). SCAFS administration should consider boosting inputs to cover more than 2ha of farm to farmers.
2. That effort to increase farmer literacy via adult education programs be strengthened.
3. SNV should pay more attention to improving the physical capital of farmers' livelihood by helping to solve outstanding land tenure disputes.
4. SNV should pay greater attention to better agricultural technology delivery, supply of training requirements of the farmers, and input assistance to enhance the livelihood systems of beneficiary cocoa farmers in the research region.
5. As an alternate source of agricultural income, the SCAFS should provide farmers with plantain and cassava planting material.
6. Financial assistance is something that other stakeholders, such as LBCs, Rural banks, and Cocoa Processing Corporations, should consider. This is because the initiative helped transform a non-productive farm into a productive one, bettering the lives of the farmers who benefited from it.

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7. The fungicides and insecticides used by cocoa growers should be emphasized more by the project team chosen to instruct them. Farmers need instruction in the correct measurement of agrochemicals, the calibration of spraying equipment, and the use of necessary safety measures. Using the SCAFS-recommended pesticides, insecticides, and weedicides may devastate cocoa and other crops.

Suggestion for Further Studies

1. The study should be repeated in the study area after some time to show the trend of effectiveness as well as the impact of the program on livelihoods.
2. Different impact assessment designs such as the 'with and without' method be used to assess the impact of the SCAFS on livelihoods.
3. The study should be extended to other cocoa-growing districts where the SCAFS project covered.
4. Studies should also be conducted to compare the investment in SCAFS effort to the value of the results, measured in terms of yield, income gains, or rate of returns.

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APPENDICES

APPENDIX 'A'

DAVIS CONVENTION FOR DESCRIBING THE MAGNITUDE OF CORRELATION COEFFICIENTS

Coefficient Description	Coefficient Description
1. 1.0	Perfect
2. 0.70-0.99	Very High
3. 0.50-0.69	Substantial
4. 0.30-49	Moderate
5. 0.10-0.29	Low
6. 0.01-0.09	Negligible

Source: Davis. J.A (1971). Elementary Survey Analysis. Englewood. NJ: Prentice-Hall.

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APPENDIX B

STRUCTURED INTERVIEW SCHEDULE FOR COCOA FARMERS' PERCEIVED IMPACT OF THE SUN SHADED AGRO-FORESTRY PROJECT ON THEIR LIVELIHOODS IN THE WESTERN NORTH REGION OF GHANA

INTRODUCTION

The main purpose of this study is to assess how you perceived the effectiveness of the Sun Shaded Agro-Forestry Project (SCAFS) and how the project has impacted your livelihood systems. It is hoped that the result from the study would be useful to the directorate of the SNV, Cocoa Research Institute of Ghana and Forestry Commission of Ghana and other collaborating organizations to make decisions for the improvement of the project in the future.

CONFIDENTIALITY:

You are assured that the information you provide on this paper would be treated as confidential and would not be disclosed to any individual or institution. Therefore, be as open and sincere as possible; believing that your anonymity is assured. THANK YOU.

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PART A

DEMOGRAPHIC AND FARM RELATED CHARACTERISTICS OF COCOA FARMERS

1a) District ……………………………………………………………………

b) Name of Village/Town………………………………………………...

2. Sex: Please tick [√] a) Male [ ] b) Female [ ]

3. 4. Marital status of respondent: a. Single ( ) b. Married ( ) c. Separated ( ) d. Divorced ( ) e. Widowed ( )

4. Please indicate your age at your last birthday (in years) ……………………

5. Kindly indicate your highest educational qualification. Please tick [√]

a. No formal schooling / education [ ] b. Primary Education [ ] c. MSLC/JHS [ ] d. SHS/ GCE "O"/Technical/ Vocational [ ] e. Tertiary [ ]

6. How long have you been working as a cocoa farmer (in years?) ……………………………………………………………………………………

7. Age of the rehabilitated farm……………………………………………

8. Status of the farm before rehabilitation?

a. Diseased [ ] b. Over aged [ ] c. Both [ ]

9. Please indicate the size of your family (household size)? ……………………………………………………………………………………

10. What is the size (in acres) of your cocoa farms which the project affected? ……………………………………………………………………………………

11. What other source of farm income do you receive as result of this project?

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a. Plantain/plantain suckers [ ] b. Cassava/cassava stem [ ] c. Both [ ]

12. Please, indicate the estimated yield (kg) of your farm which the project affected. (2020/2021)…………………………………………….

PART B

PERCEIVED EFFECTINESS OF THE SCAFS PROJECT ON FARMERS LIVELIHOODS

Please indicate whether your farmer group enabled you to acquire the under listed knowledge, attitudes, skills, and aspirations (KASA) by ticking [√] YES or NO against each activity.

If your answer is YES, please rate how effectively each activity has contributed to improvement in your farming enterprise; by using the following ratings:

5 = Very Effective [VE] 4 = Effective [E] 3 = Moderately Effective [ME]

2 = Ineffective [IE] 1 = Very Ineffective [VI]

Please put a tick [√] where appropriate

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	Livelihood Asset	Activity		Rating				
		YES	NO	5 VE	4 E	3 ME	2 E	1 VI
A.	**Natural Capital** (the project has resulted in							
i.	Increase in Yield							
ii.	Increase in Productivity (yield per unit area)							
iii.	Increase Productivity (yield per unit cost of inputs)							
B	**Physical capital**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Ownership chainsaw							
ii.	Ownership of knapsack/motorized (spraying machines)							
iii.	Ownership of tricycles, motorcycles, bicycles etc.							
iv.	Access to vehicles (tractors, trucks, etc.							
v.	Ownership of mobile phones.							
vi.	Ownership of livestock (cattle, sheep, goats etc.)							

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C	**Financial capital**	YES	NO	5	4	3	2	1
i.	Increase in income levels							
ii.	Increase in savings level							
iii.	Decrease in debt levels							
iv	Access to credit facility							
v.	Increase in investment							
D	**Human Resource**	**YES**	**NO**	**5**	4	3	2	1
i.	Access to labour (skilled)							
ii.	Access to labour (unskilled)							
iii.	Access to public extension service (AEAs)							
iv.	Access to private extension service (NGOs, Agro-input dealers, etc.)							
E	**Social capital**	**YES**	**NO**	5	4	3	2	1
i.	Membership to association / farmer group							
ii.	Support from association / farmer group							
iii.	Ability to feed family member							
iv.	Support to other family members/ friends							
v.	Ability to pay school fees							

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vi.	Other social obligations (pay funeral dues, basic rate, church/mosque dues.)							

2a. What is / are the major production challenge (s) that you encounter as a cocoa farmer in the SCAFS project

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

2b. what do you think is/are the major strength (s) of the SCAFS project? ……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

2c. what do you think should be done to solve the problems of the SCAFS project you encountered as listed above?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

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PART III

PERCEIVED EFFECTIVENESS OF THE MAIN COMPONENTS OF THE SCAFS PROJECT.

Please identify from the under listed livelihood assets whether or not it has improved your livelihood as a cocoa farmer under the SCAFS project.

Please tick [√] YES or NO against each livelihood asset. If yes, indicate the extent to which the cocoa production project (SCAFS project) has impacted on the various aspect of your livelihood system by using the following ratings:

5 = Very High [VH] 4 = High [H] 3 = Moderately High [MH]

2 = Low [L] 1= Very Low [VL]

Please put a tick [√] where appropriate

	Project Components	**Activity**		**Rating**				
		YES	**NO**	**5 VH**	**4 H**	**3 MH**	**2 L**	**1 VL**
A	**Provision of improved planting materials**							
i.	Early maturing varieties							
ii.	Hybrid Disease resistant varieties							
iii.	High yielding varieties							
iv.	Provision of Economic tress							
v.	Provision of Plantain sucker							
vi.	Provision of cassava stems							

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B	Provision of inputs	YES	NO	5	4	3	2	1
i.	Timely provision of cocoa seedling							
ii.	Timely supply of inorganic fertilizers							
iii.	Timely provision of insecticides							
iv.	Timely supply of improved planting materials							
v.	Timely supply of plantain suckers							
vi.	Timely supply of economic trees							
vii.	Timely cutting of over age cocoa trees							
Viii	Timely supply of cassava stem							
C	**Training**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Weed control							
ii.	Pesticide application							
iii.	Fertilizer application							
iv.	Pests and Disease control							
Vi	Timely harvesting							
vii.	Farm record keeping							
viii.	Group dynamics							

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D	**Application of fertiliser**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Application of fertiliser							
a.	Ring method							
b.	Broadcasting method							
c.	Foliar method							
ii.	Timely fertiliser application							
ii	Applying the recommended rate of fertilizer							
E	**Application of insecticides/weedicide**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i	Timely application of weedicide/ weeding							
ii.	Timely application insecticide							
iii.	Applying the recommended rate of insecticide							
iv.	Applying the recommended rate of weedicide							
F	**Provision of extension service**	**YES**	**NO**	**5**	**4**	**3**	**2**	**1**
i.	Public extension (AEA)							
ii.	Agro input dealers							
iii.	Project team							

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