UNIVERSITY OF CAPE COAST

FACTORS AFFECTING ADOPTION LEVELS OF COCOA TECHNOLOGIES IN THE ASHANTI REGION OF GHANA

BY

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THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION, SCHOOL OF AGRICULTURE, UNIVERSITY OF CAPE COAST, CAPE COAST IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN AGRICULTURAL EXTENSION

JUNE, 2001

UNIVERSITY OF CAPE COAST

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2001

CANDIDATE'S DECLARATION

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

Candidate: ..... Date: 6th June 2001

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SUPERVISORS' DECLARATION

We hereby declare that the preparation and presentation of the thesis were Supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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DEDICATION

To my wife and children, Angela, Esther and Otis for their extreme patience, understanding, devotion and love to me during the study.

ACKNOWLEDGEMENTS

The first place of honour in the list of acknowledgements must go to Dr J.A. Kwarteng, Department of Agricultural Economics and Extension, University of Cape Coast (UCC), who was my principal supervisor, Drs N.K.T. Ghartey, my cognate supervisor and Mr F. Annor-Frempong, my minor supervisor. Their counsel, guidance, suggestions and supervision have made the write up of the dissertation possible.

I wish to extend my sincere thanks to Messrs E.O. Laryea, Assistant Lecturer, Department of Agricultural Economics and Extension, UCC, J.D. Nkrumah, Teaching Assistant and A. Obeng-Mensah, a lecturer of the same Department for their assistance in computer analyses of data.

Mr J.A. Kumi, extension doctoral student at the Department of Agricultural Economics and Extension is also recognized for his advice and encouragement.

I am grateful to Mr Emmanuel Asante at the CSD Regional Office, Kumasi for assisting me in the administration of questionnaires.

Excellent secretarial support was provided by Messres David Attah, R. Andzie-Quainoo, Mrs Matilda Ackon-Mensah, Mrs, Faustina Asare Sakyiama of the Department of Agricultural Economics and Extension, UCC, Ms. Rejoice Djirackor, Veronica Adarkwa, and James Adjei, all at the CSD Regional Office, Kumasi. The final dissertation was typed by Ms. Vida Osei Mensah of the Faculty of agriculture, University of Science and Technology (UST), Kumasi.

Acknowledgement is also made of the assistance received from the published works of others as referred to throughout this work.

Finally, I am indebted to the Cocoa Service Division (CSD) of the Ghana Cocoa Board (COCOBOD) for sponsoring my course at the University of Cape Coast, Cape Coast.

ABSTRACT

The study was conducted at Fumso, Tepa, Offinso and Nkawie districts in the Ashanti Region of Ghana to investigate factors that affect farmers adoption of cocoa technologies.

The factors that were considered in the study were sex, age, level of education and working experience , sources of labour, farmers' access to credit facilities, farmer contact with extension and participation in planning, implementation, monitoring and evaluation of extension programmes were examined as well as relationship between farmers participation in extension programmes and adoption levels of cocoa technologies. The relationships between the demographic characteristics and adoption levels were further investigated.

The results of the study revealed that most cocoa farmers in the study localities were male. A mean age of 54 years indicates that many of the farmers are old and ageing. A majority of them did not receive formal education but they have rich farming experience. Their mean working experience in years was 23 while the mode was 15 years.

Sources of labour available to the farmers were family labour, hired labour, communal labour and caretaker labour. The farmers perceived the family labour as the most effective. Mean cost of labour per manday was approximately ¢5000.00 within a range of ¢3000.00 - ¢10,000.00.

The results further revealed a high cocoa farmers/FLS contacts, with a contact mean of 4 years. However, majority of the farmers received one visit in a month from the FLS.

Farmer participation in extension programmes was also high in respect of planning, implementation and evaluation.

The results further revealed that adoption levels of cocoa technologies by cocoa farmers was high in the districts and in the Region as a whole.

In the correlation analysis, relationship between farmer participation in planning, implementation and evaluation of extension programmes on

adoption level of cocoa technologies was positively significant at .05 (5%) alpha level. The relationships were also significant between age, level of education and working experience of cocoa farmers and adoption level of cocoa technologies.

Regressional analyses of significant variables, sex, level of education, number of monthly visits to farmer by FLS, farmer participation in planning, implementation and evaluation on adoption level revealed that the farmer participation in implementation was the best predictor of adoption level of cocoa technologies by the cocoa farmers.

The conclusion was therefore that planners and executors of extension programmes in the Ashanti Region should focus more on involving farmers in implementation of programmes.

ABBREVIATIONS AND ACRONYMS

COCOBOD	Ghana Cocoa Board
CRIG	Cocoa Research Institute of Ghana
CRP	Cocoa Rehabilitation Project
CSD	Cocoa Services Division
CSSVD	Cocoa Swollen Shoot Virus Diseases
DCO	District Cocoa Officer
DDCO	Deputy District Cocoa Officer
DED	Deputy Executive Director
DRM	Deputy Regional Manager
EA	Extension Assistant
ED	Executive Director
ERP	Economic Recovery Programme
FAO	Food and Agriculture Organization
FLS	Extension Frontline Staff
ICCO	International Cocoa Organization
MOFA	Ministry of Food and Agriculture
PBC	Produce Buying Company
Recce	Reconnaissance
RM	Regional Manager
SAP	Structural Adjustment Programme
SEA	Senior Extension Assistant
SFA	Senior Field Assistant
SOA	School of Agriculture
UCC	University of Cape Coast

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Cocoa, Theobroma cacao *Linnaeus* is one of the important cash crops cultivated in Ghana. Its cultivation is a major source of income for most farmers in the moist semi-deciduous forest zone in the country. It is also the driving force and backbone of Ghana's economy. The crop is one of the major sources of government's foreign exchange earnings. The Ghana government subsists on 27 percent value of cocoa (COCOBOD, 1998). The average yield of cocoa, estimated at 391kg/ha; in Ghana is low as compared to major cocoa producing countries, such as Cote D'Ivoire and Brazil with a yield from 600-800 kg/ha (MASDAR Consultancy Report, 1997). This is a major source of concern and hence the main reasons for extension work. The identified factors in the low cocoa yields in Ghana are declining soil fertility, scarcity of new virgin forest lands for cultivation, poor seeds, low yielding varieties, ineffective pests and diseases control, old age of cocoa trees, bushfires, poor farm maintenance and low technology adoption rates (Ministry of Finance Report, 1998 and Ampofo, 1999).

The Ghana Cocoa Board (COCOBOD) has targeted cocoa production of 500,000 metric tonnes by the year 2000/2001 and 800,000 metric tonnes for the next 15-20 years (COCOBOD, 1998). To this end,

various regions have been assigned quotas. The production quota for the Ashanti Region is estimated to increase by about 25 percent from 80,000 to 100,000 metric tonnes within the target year.

In Ashanti Region, cocoa farmers are largely small holders with farm sizes, averaging about 3.0ha. The region produced 36 percent of the 2,250,000 metric tonnes (national total production) of cocoa from 1960 to 1965 (Ghana Cocoa Sector Development Strategy, Revised Report 1998). Currently, the region produces 80,000 m.t. The Region has the potential of adding significantly to Ghana's quest to recover from decline in cocoa yields. This is because the Cocoa Research Institute of Ghana (CRIG) has recommended and introduced fertilizers to cocoa farmers in the region and FLS have intensified extension education on proper farm maintenance practices and the use of the fertilizers. More farm input stores have been set up by the Ghana Cocoa, Coffee and Sheanut Farmers Association (GCCSFA) (CSD Annual Report, Ashanti Region, 1998).

The Presidential Committee set up in 1995 to find out the causes of decline in cocoa production recommended that one of the strategies to increase cocoa production is to intensify education of cocoa farmers on effective crop management practices (Ghana Cocoa Sector Development Strategy, Revised Report, 1998).

Over the years, the Cocoa Research Institute of Ghana (CRIG) has developed and tested a package of high technology management

practices for cocoa, which has proved to be successful. The aim is to help cocoa farmers increase their productivity. Wider dissemination of such information can only occur through effective extension programmes.

For extension programmes to be effective, there is the need for highly competent and educated FLS. Moreover, there is the need to involve cocoa farmers in programme planning, delivery, monitoring and evaluation. This is because when people are involved in programmes, they see the programmes as theirs and even mobilize resources for the successes of the programmes (Boyle, 1981).

1.2 PROBLEM STATEMENT

Cocoa extension has been the responsibility of the Cocoa Services Division (CSD) since 1973. The Division has 41 districts, made up of 1465 cocoa extension units, each unit covering approximately 1200 ha (3000 acres) of cocoa.

To achieve CSD's mission of high productivity, the importance of adoption of cocoa technologies cannot be over-emphasized. The CSD has implemented an adapted form of the Training and Visit (T and V) system in a bid to make its extension delivery more effective.

Recommended practices extended to cocoa farmers are:

(i) Raising cocoa seedlings before planting

(ii) Line planting of seedlings

(iii) Regular brushing of cocoa farm

(iv) Removal of unwanted basal chupons

(v) Insecticidal spraying to control pests

(vi) Removal of mistletoes

(vii) Fungicidal spraying to control blackpod diseases

(viii) Provision of shade where necessary

(ix) Mode of shade reduction

(x) Harvesting technique and

(xi) Fermentation of cocoa beans before drying.

Planning of extension programmes has been a top-down approach. The CSD top-management plans the programmes and the plans are supposed to trickle down through the regions to districts for implementation.

The MASDAR CONSULTANCY report (1997) on performance of extension workers (EWS) revealed that, the EWS in Ashanti Region generally lack expertise of presenting technologies to their farmers. The report further alleged that the inadequate and ineffective performance of EWS in extension delivery has affected technology adoption in the Region. Cocoa yield levels are low, estimated at 256kg/ha which is far below the national average of 391kg/ha.

This is evident from the fact that out of 11 innovations recommended, only 2 have been assessed to have attained 60% level of adoption (Monitoring and Evaluation report of CSD, 1997). The 2

practices are removal of mistletoes and removal of unwanted basal chupons.

It is difficult to implement cocoa extension programmes in Ashanti Region because cocoa farmers allege that they are seldom involved in planning (Annual Review Report of Ashanti Region, CSD, 1995). The farmers therefore see programmes as EWS' programmes and do not fully participate. The low-level rates of technology adoption reflects in the low cocoa yields in the region, which average 256 kg/ha (The Annual Review Report of CSD, 1995).

1.3 RESEARCH OBJECTIVES

1.3.1 Overall Objective

The overall objective of the study is to examine factors that affect farmer adoption of cocoa technologies in the Ashanti Region of Ghana.

1.3.2 Specific Objectives

Specifically, the study was:

1. To find out the demographic characteristics of cocoa farmers and extension frontline staff (FLS) in the Ashanti Region in respect of:
   i. Sex
   ii. Age
   iii. Level of Educational and
   iv. Working experience

2. To determine mode of land acquisition and the sizes of cocoa farms in the Ashanti Region.
3. To assess cocoa farmers' access to financial credit.
4. To assess sources and availability of labour and labour effectiveness to cocoa farmers.
5. To find out cocoa varieties cultivated.
6. To determine cocoa farmers' contact with extension/FLS.
7. To identify cocoa technologies being extended to cocoa farmers.
8. To assess cocoa farmers' preferences of extension education methods.
9. To determine the extent to which cocoa farmers participate in extension programme planning, implementation, monitoring and evaluation.
10. To identify cocoa farmers and FLS' perceptions of problems associated with cocoa farming.
11. To determine farmers' levels of adoption of cocoa technologies in the Ashanti Region.
12. To determine overall adoption levels of the technologies by district.
13. To compare the adoption levels of the cocoa technologies among the districts.

14. To determine relationships between cocoa farmers' perceived levels of adoption of cocoa technologies and the farmers' level of participation in:

    i. Extension programme planning

    ii. Extension programme implementation and

    iii. Extension programme evaluation

15. To examine relationships among the selected demographic characteristics of cocoa farmers and adoption levels of cocoa technologies.

1.4 RESEARCH QUESTIONS

1. What are the demographic characteristics of cocoa farmers and FLS in respect of (i) Sex (ii) Age (iii) Level of Educational and (iv) Working Experience in the Ashanti Region?
2. What were the mode of land acquisition and the sizes of cocoa farms in Ashanti Region?
3. Do cocoa farmers have access to financial credit in Ashanti Region?
4. What are the sources and availability of labour and how effective is labour use?
5. What types of cocoa do cocoa farmers cultivate in Ashanti Region?
6. Do cocoa farmers have contacts with Extension/FLS?

7. What technologies are being extended to cocoa farmers in Ashanti Region?
8. What are cocoa farmers' preferences for extension methods being used by FLS?
9. To what extent do cocoa farmers in Ashanti Region participate in cocoa extension programme planning, implementation, monitoring and evaluation?
10. What do cocoa farmers and FLS' perceive as problems associated with cocoa farming?
11. What are farmers' levels of adoption of cocoa technologies in the Ashanti Region?
12. What are farmers' level of adoption of cocoa technologies in the districts?
13. Are there significant differences among the levels of adoption of the cocoa technologies among the districts?
14. What is the relationship between farmers' perceived levels of adoption of cocoa technologies and the farmers' level of participation in extension programme planning, implementation and evaluation?
15. Are there any relationships among the selected demographic characteristics of cocoa farmers and adoption levels of cocoa technologies in Ashanti Region?

1.5 THE VARIABLES OF THE STUDY

1.5.1 The Dependent Variable

The dependent variable of the study was "farmer adoption of cocoa technologies".

1.5.2 Independent Variables

1. Selected demographic characteristics of cocoa farmers and FLS:
    i. Sex
    ii. Age
    iii. Level of education
    iv. Working experience
2. Acquisition of land
3. Access to financial credit
4. Access to labour and labour effectiveness.
5. Types of cocoa varieties cultivated
6. Extension contact.
7. Cocoa technologies extended
8. Extension education methods used.
9. Participation of cocoa farmers in:
    i. Extension programme planning
    ii. Extension programme implementation and
    iii. Extension programme evaluation

1.6 HYPOTHESES

1. H_o there is no significant relationship between sex of cocoa farmers and adoption level of cocoa technologies.

   H_1 There is significant relationship between gender of cocoa farmers and adoption level of cocoa technologies.

2. H_o There is no significant relationship between age of cocoa farmers and their adoption levels of cocoa technologies.

   H_1 There is significant relationships between age of cocoa farmers and their adoption levels of cocoa technologies.

3. H_o There is no significant difference between level of education of cocoa farmers and adoption level of cocoa technologies.

   H_1 There is significant difference between the level of education of cocoa farmers and adoption level of cocoa technologies.

4. H_o There is no significant relationship between working experience of cocoa farmers and adoption level of cocoa technologies.

   H_1 There is significant relationship between working experience of cocoa farmers and adoption level of cocoa technologies.

5. Ho There is no significant relationship between the sources and sizes of cocoa farms and adoption levels of cocoa technologies.

H_1 There is significant relationship between the sources and sizes of cocoa farms and adoption levels of cocoa technologies.

6. H_o There is no significant relationship between cocoa farmers' access to financial assistance (credit) and adoption levels of cocoa technologies.

H_1 There is significant relationship between cocoa farmers' access to financial assistance (credit) and adoption levels of cocoa technologies.

7. H_o There is no significant relationship between cocoa farmers' access to labour and adoption levels of cocoa technologies.

H_1 There is significant relationship between cocoa farmers' access to labour and adoption levels of cocoa technologies.

8. H_o There is no significant relationship between cocoa varieties cultivated by cocoa farmers and adoption levels of cocoa technologies.

H_1 There is significant relationship between cocoa varieties cultivated and adoption levels of technologies.

9. H_o There is no significant relationship between cocoa farmers' contact with extension FLS and adoption levels of cocoa technologies.

H_1 There is significant relationship between cocoa farmers' contact with extension FLS and adoption levels of cocoa technologies.

10. H_o There is no significant relationship between the type of cocoa technologies being extended to cocoa farmers and their adoption levels.

H_1 There is significant relationship between the type of cocoa technologies being extended to cocoa farmers and their adoption levels.

11. H_o There is no significant relationship between the extension education methods being used by FLS and adoption levels of cocoa technologies.

H_1 There is significant relationship between the extension education methods being used by FLS and adoption levels of cocoa technologies.

12. H_o There is no significant relationship between cocoa farmer participation in extension programme planning, implementation and evaluation and adoption levels of cocoa technologies.

H_1 There is significant relationship between cocoa farmer participation in extension programme planning, implementation and evaluation and adoption levels of cocoa technologies.

1.7 ASSUMPTIONS

The first assumption is that the goals and objectives of cocoa extension programme planning and implementation (delivery) are to provide positive change or changes in the knowledge, skills and attitudes of the cocoa farmers. It is also assumed that the sampled cocoa farmers and extension workers gave sincere responses to questions that were asked.

1.8 JUSTIFICATION FOR THE STUDY

Cocoa production continues to play an important role in the economic development in Ghana. The crop has been the driving force, the backbone and a kingpin of Ghana's economy. It is one of the major sources of government's foreign exchange earnings. The cocoa industry is the fulcrum on which the wheel of the country's economy revolves.

The total national cocoa production peaked to 568,000 metric tonnes in 1964/65 cocoa season. Thereafter, production began to fall and by 1983/84 season, only 158,000 metric tonnes was recorded in Ghana (Ghana Cocoa Sector Development Strategy, Revised Report of Ministry of Finance, 1998). Ghana, for 68 years, the leading producer and exporter of cocoa on the world market and commanding about 35% of the market share at her peak, lost her leadership to Cote d'Ivoire in 1978 (Ampofo, 1999).

Cocoa yields in Ghana are very low compared to other major producers; for example; 30% below the yields in Cote d'Ivoire and Malaysia (COCOBOD Report 1997/98). Ghana's average national yields have been sustained at 391kg/ha (ICCO, 1990).

The problem of the low yields of cocoa has been attributed to low application of recommended cocoa production technologies (Ampofo, 1999). The inability of cocoa farmers to adopt the cocoa production technologies and apply good farm maintenance practices to achieve higher outputs have in turn been blamed on their low income levels, lack of credit, ageing and lack of labour, among others.

One of the ways forward and logical directions for increase in cocoa production will therefore be through intensive and effective extension programmes to step up cocoa technology adoption rates by cocoa farmers. The COCOBOD, CSD and MOFA which are responsible to push up cocoa production are, therefore, 'committed' to ensuring successes of programmes (Ministry of Finance Report, 1998).

Current available research information indicates that the country has sufficient cocoa technology to raise the current average yield levels of 391kg/ha to a minimum of 700kg/ha and up to 1500 kg/ha or more with appropriate agronomic practices and pests and diseases control (Ampofo, 1999).

Already, the Cocoa Research Institute of Ghana (CRIG) at Tafo has developed and tested a technical package of high technology management practices for cocoa which, when adopted, would increase cocoa productivity. The technologies are:

a. raising of cocoa seedlings in poly bags or on seed beds before planting.
b. line planting at 3m x 3m
c. brushing of the undergrowth in cocoa farms, four times in a season.
d. removal of unwanted basal chupons.
e. removal of mistletoes
f. insecticidal spraying in August, September, October and December to control capsid pests.
g. cultural and three-weekly fungicidal spraying to control blackpod diseases.
h. On-farm shade provision or reduction where necessary
i. regular harvesting and
j. proper fermentation, before drying of cocoa beans.

The Ghana Cocoa, Coffee and Sheanut Farmers' Association (GCCSFA) has also intimated that the Association has located 13 cocoa farm inputs stores in Ashanti Region to assist cocoa farmers have ready and easy access to farm inputs. However, the region continues to record poor cocoa yields.

The farmers allege that they are occasionally involved in planning, implementation, monitoring and evaluation of cocoa extension programmes in the region. The programmes are planned in Accra and they trickle down to the districts, through the Regional Office, for their implementation. The FLS, therefore, act as 'messengers' and not real advisers.

The findings of the study will be important to Cocoa Research Institute of Ghana (CRIG), managements of the Ghana Cocoa Board (COCOBOD), Cocoa Services Division (CSD) and the Ministry of Food and Agriculture (MOFA) and cocoa farmers.

To CRIG, the findings will help researchers of the Institute to know more about the extent of adoption and factors which affect adoption rates of cocoa technologies. This knowledge of the factors will guide the researchers to make their research more adaptive.

Management and policy makers of extension organizations will also benefit from the findings. They will gain more knowledge of demographic characteristics of cocoa farmers, farmers' access to credit, labour, farm inputs and farmers' participation in extension programmes in the Region.

This knowledge will guide the management and the policy makers to effectively take decisions on extension programmes in the Region.

The findings of the study will reveal cocoa farmers' constraints to adoption of cocoa technologies which will be fed to the research institute for solutions.

1.9 LIMITATION OF STUDY

The study covered five (5) out of eight (8) CSD districts in Ashanti Region due to limited resources including time, logistics and funds.

1.10 DEFINITION OF TERMS

This section indicates meanings of terms as used in the study.

a) Contact Farmer: A cocoa farmer who has been selected by the Frontline Staff (FLS), the Senior Extension Assistant (SEA), the District Cocoa Officer (DCO) with the assistance of other cocoa farmers,

   To lead and demonstrate cocoa farming practices to farmers.

b) Extension Workers: They are defined in the study to mean the same as FLS.

c) Frontline staff (FLS): They are employees of COCOBOD who are in direct contact with cocoa farmers in the field and responsible for providing knowledge and skills in cocoa to farmers.

d) Senior Extension Assistant (SEA): An employee of COCOBOD who supervises the FLS and co-ordinates their activities with the (DCO).

e) District Cocoa Officer (DCO): An employee of COCOBOD who is in-charge of a CSD district in the Ashanti Region.

f) Extension Technology: Improved and recommended practices on cocoa cultivation developed by the Cocoa Research Institute of Ghana (CRIG) which is extended to cocoa farmers by CSD's FLS.

They include:

i. use of hybrid cocoa beans.

ii. seed nursery practices using hybrid cocoa beans and raising seedlings before planting.

iii. lining and pegging of field before transplanting at 3m x 3m (10 x 10ft)

iv. transplanting

v. brushing of cocoa farms;

vi. removal of unwanted basal chupons;

vii. spraying insecticides to control capsid pests;

viii. cultural method and three-weekly fungicidal spraying to control blackpod diseases of cocoa;

ix. mistletoes control.

x. provision of shade when necessary in the field

xi. shade reduction during dry season.

xii. regular harvesting

xiii. proper fermentation of cocoa beans before drying

g) Farm Input: Any material resources used by cocoa farmers to improve yield of cocoa.

h) Participation: The process of direct involvement of cocoa farmers, the SEAs and the FLS in a range of extension activities under programme planning, implementation (delivery) and evaluation.

i) Perceptions: Personal indications to disregard some things, emphasize others and put meanings in one's own way. Perception, opinions and attitudes have the same meaning in this study.

J) Adoption: Defined in this present context as acceptance and use of cocoa technology for one season or more.

k) Adoption level: number of technologies being used, out of the total being disseminated.

l) Adoption rate: The number of farmers using technologies divided by the total number interviewed multiplied by 100 in a given year.

1.11 ORGANIZATION OF THE STUDY

From the introduction, the study was organized as the following:

1.11.1 **Literature review**: Chapter 2 deals with a review of earlier works of researchers on the topic of study.

The areas reviewed included:

i. Work done on cultivation of cocoa, historical setting of the cocoa industry in Ghana and the role of the cocoa sector in Ghana's economy.

ii. Development of Agricultural Extension in Ghana.

iii. Development of Cocoa extension in Ghana.

iv. Selected demographic characteristics of cocoa farmers and extension workers.

v. Extension programme planning, implementation, monitoring and evaluation.

vi. Adoption of agricultural innovations.

1.11.2 **Methodology**: Target population of the study, sample size and sampling method are presented in chapter 3. Also presented I the chapter are the development of instrument, data collection and data analysis methods. With regard to the analysis, the SPSS Software was employed.

1.11.3 **Results and Discussions**: The results and discussions of the study are presented in chapter 4. In the chapter, tables are made from the results of the analysis in addition to discussions on them.

1.11.4 **Summary, Conclusions and Recommendations**: Chapter 5 summarizes the findings and the conclusions drawn from them. Some recommendations for policy development are made and areas for further research suggested.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

Ever since man domesticated crops on his emergence as a cultivator from nomadic practices, there have been considerable movements of corps from place to place within and between continents.

The importance of cocoa since its introduction as an essential cash crop into Ghana and other countries has made Universities, Research Institutions and Agricultural Stations and other Researchers to conduct research on some aspects of the crop, its role in the economies of producing countries, extension programmes planning, delivery, evaluation, adoption levels and factors that affect farmer adoption of cocoa technologies. Quite a number of books, bulletins, articles and other written accounts have been published on cocoa.

In this chapter, an attempt is made to review relevant aspects of the work done by earlier researchers, as a prelude to the present study.

1.2 CLIMATIC CONDITION FOR CULTIVATION OF COCOA

All the species of *Theoborma* are found in Western Hemisphere from 18°N to 15°N of the Equator. They thrive well in the lower storey of the evergreen rain forest.

In this habitat, rainfall is heavy, with relatively uniform temperature throughout the year. There is humidity and dense overhead shade.

2.2 VARIETY OF COCOA CULTIVATED

2.2.1 Species Cultivated

Cautrecasus (1964) divided the genus, *Theobroma,* into 6 varieties containing 22 species. It is the *Theobroma cacao* which is widely cultivated species. *Theobroma cacao*, (Linnaeus) appears in a great variety of forms. It can be divided into three large groups, the Criollo, Amazonion foastero and the Trinitario varieties. All these varieties of cocoa plant are inter-fertile and by crossing, give fertile hybrids which today represent most of the cultivars used in cocoa farms (Mossu, 1992).

2.2.2 Description of Cocoa Groups

The Criollo group of cocoa have been domesticated for a long time by the Maya Indians. The cocoa trees are cultivated in Mexico, Nicaragua, Guatemala, Colombia, Venezuela, Madagascar, Comoro Islands, Sri Lanka, Indonesia and Samora Islands (Mossu, 1992).

The cocoa trees are vigorous, are slow growing and have small leaves. They are also used in the chocolate industry for luxury products.

The Forastero group is found in an indigenous or semi-indigenous state in Peru, Ecuador, Colombia, Brazil and along the Orinoco river in Venezuela.

The Forasteros constitute almost all the production currently coming from Brazil, West Africa and East Asia. The West Africa 'Amelonado' cocoa belongs to this group, as do the 'Maranhao', 'Comum'

and para varieties from Brazil. Their general characteristics are that they have purple pigmented staminodes, green pods before ripening, varying shapes and with very woody mesocarp, more or less flat seeds and dark purpled cotyledons. The beans are relatively bitter and often of acid taste.

The Trinitaro group consists of very different and heterogeneous varieties resulting from a Forastero and Criollo cross. They are grown in Mexico, Central America, Trinidad, Colombia and Venezuela as well as in many African and South Asian countries.

The cocoa trees have intermediate features of the Criollo and Forastero groups. They produce cocoa pods of intermediate quality. The Trinitario varieties were originally selected from Trinidad.

2.2.3 Cocoa Varieties in Ghana

The varieties of cocoa cultivated in Ghana are the Amelonado (the oldest), the Amazon and hybrids. The Amazon variety is the most widely cultivated with about 47% of area cultivated, followed by the hybrid (13%) and Amelonado, (12%). The remaining 28% cocoa area consists of mixed stands of varieties (Ministry of Finance Report, 1998).

2.3 ROLE OF COCOA SECTOR IN GHANA'S ECONOMY

Cocoa, *Theobroma cacao*, (Linnaeus), is one of the most important crops grown in Ghana. The cocoa sector plays a key role in Ghana's economy and has always been a leading source of foreign exchange

earnings and nationally generated funding for the expansion of economic and social infrastructure including schools, hospitals, roads among others (COCOBOD Annual Report, 1997/98).

The industry is estimated to account for about 25% of employment, and 800,000 farming families are linked to it. The Ghana government subsists on 27% value of cocoa (COCOBOD Seminar on the Future of Cocoa Industry, 1998).

2.4 HISTORICAL SETTING OF THE COCOA INDUSTRY IN GHANA

Cocoa growing in the Gold Coast, now Ghana is over 120 years old. Missionaries made unsuccessful efforts to grow cocoa in Ghana during the nineteenth century, but the real introduction was effected by Tetteh Quarshie in 1876. The seeds were planted at Akwapim Mampong in Eastern region of Ghana from where it spread throughout the country. The crop soon supplanted natural rubber and palm oil, the two major export commodities and assumed the role of the leading export crop and foreign exchange earner for the country.

History also has it that, starting with a pioneering export quantity of 55kg (121lb) in 1885, and rising steadily to 100,000 tons by 1920, production reached a record output of 568000 tons in 1965, which was about 30% of the total world production (Ghana Cocoa Sector Development Strategy Report, 1998).

Thereafter, production started to decline till it hit a record low of 159000 tons in 1983/84 season (COCOBOD Annual Report, 1997/98). Ghana then lost her position as the World's leading producer of cocoa to the Ivory Coast (Cote d'Ivoire) and Brazil.

The decline in the yield was attributed to declining soil fertility, poor seeds and low-yielding varieties, ineffective pests and disease control, old age of cocoa trees; poor farm maintenance and bush fires (Ghana Cocoa Sector Development Report, Revised Report of Ministry of Finance, 1998).

In view of the important role of the cocoa industry in Ghana's economy, the Government of Ghana embarked on an industry rehabilitation programme with World Bank assistance in 1985 as part of its Economic Recovery Programme (ERP). The cocoa industry again picked up and by 1996, 404000 metric tonnes were produced in Ghana. Currently, the annual cocoa production is around 400,000 metric tonnes and Ghana is the second largest producer and exporter of cocoa to the world market and commands a market share of about 12% (Ampofo, 1999).

2.5 ESTABLISHMENT OF COCOA FARMS IN GHANA

Cocoa is grown in the forest areas of Ashanti, Brong Ahafo, Central, Eastern, Western and Volta regions of Ghana, where rainfall is 101-150cm (40-60inches) per annum.

The rainfall period covers March-October with a short break in August. Major rains occur from mid-March to mid-July and minor rains in September and October. Extremely wet and swampy lands are as unsuitable as dry areas of the country.

Cocoa soils are permeable and at least 1.2m (4ft) deep. Good, humus and deep soils allow cocoa roots to penetrate well. Hybrid seedlings are raised from October to April.

Land is cleared by under-brushing in November/December and trees felled between mid-December and January. Desirable trees are left to give shade to cocoa trees. Undesirable trees are felled; for example Ceiba pentandra and watapuo, Cola gigantea.

Lining and pegging of land is undertaken and young hybrid cocoa seedlings planted. Plantain and cocoyam are planted between March and April before the planting to provide low and intermediate shade. The young seedlings are maintained to maturity by brushing undergrowth, careful manipulation of shade, pests and diseases control, mistletoes removal and filled filling of vacancies. On maturity, ripe pods are harvested, broken and fermented and dried. The properly dried beans are frequently sold to avoid deterioration.

2.6 AGRICULTURAL EXTENSION

Different people view agricultural extension differently and have defined and interpreted extension differently. However, in all these interpretations, there are common features.

Savile (1965), regarded agricultural extension as an evolution of the agricultural advisory service which is regarded as a form of community development effort with an agricultural bias and an educational approach to the problem of rural community. The agricultural advisory service is designed to advise the farmers of improved farming techniques which would be of help to them and also to assist them to implement a benevolent government's plans for the development of the country's economy.

In 1973, Maunder also defined extension as a service or system which assists farm people through educational procedures in improving farm methods and techniques, increasing production efficiency and income, bettering their levels of living and lifting the social and educational standards of rural life.

The Food and Agriculture Organization (FAO) (1975) defined agricultural extension as an informal out-of-school educational service for training and influencing farmers (and their families) to adopt improved practices in crop and livestock production, management, conservation and marketing. Extension is also viewed as a teaching process by which information about improved methods of farming is passed on to farmers

who have no knowledge about such methods or are not using methods (Agricultural Extension Handbook, 1977). Thus according to Swanson (1984), extension is an on going process of getting useful information to people and then assisting those people to acquire the necessary knowledge, skills and attitudes to utilize effectively the information or technology. Van den Ban (1986) on his part has defined extension as 'purposeful assistance to decision making and opinion formation'.

2.6.1 Role of Agricultural Extension

Sustained high levels of agricultural production and incomes are not possible without an effective agricultural extension services supported by Agricultural research that is relevant to farmers' needs (Benor and Baxter, 1984). Although there can be agricultural development with weak agricultural extension and research services, continued and widespread improvement requires professional, effective extension and research.

In many developing countries, rural farm households and their agricultural land collectively represent the most important national resources; yet in too many countries these human and natural resources remain stagnant and largely untapped. Adequate and sustained instrument in agricultural research and extension is the most effective means of transferring these under-used resources into sustained agricultural development for national economic growth.

It may not always be possible precisely to quantify the contribution of extension to agricultural development but there is little doubt that an effective extension contributes significantly and immensely to agricultural development. Effective investment in agricultural extension contributes directly to national wealth through increased agricultural production and enhanced national food security.

In addition, increasing the technical and managerial skills of farm households, not only accelerates the adoption and use of improved technology but also increases the ability of farm households members to successfully compete for jobs off the farm when agricultural development occurs and few people are needed in direct agricultural production.

Extension can contribute to agricultural development, through both technology transfer and human resources development, particularly among large members of small-scale men and women farmers of developing countries. These roles are not mutually exclusive. Agricultural extension aims at the following:

i. It teaches farmers in rural communities how to identify and assess their needs and problems.

ii. It helps farmers acquire knowledge and skills required in coping with their needs.

iii. It inspires farmers to actions that improve the quality of their life.

iv. At its best, extension focuses on helping people to convince themselves of the benefits of scientific information, new technologies, practices and alternative approaches to solving problems or managing their own affairs.

v. Extension links farmers to research based and tested technology, practices and inputs that are expected to benefit them. Savile (1965), was of the view that without the help of extension, the research findings would remain hidden in reports.

vi. According to Swanson (1984), since agricultural development implies a shift from traditional method of production to new resource based methods of production that include new technological components, (such as new crop varieties, cultural practices etc) agricultural extension should take it as a role to teach farmers, management and decision making skills as new technology is developed and also to help rural people develop leadership and organizational skills. They can then better organize, operate and participate in co-operatives, credit associations and other support organizations and also to participate fully in the development of their local communities.

2.6.2 Development of Agricultural Extension in Ghana

Agricultural Extension started in Ghana at Aburi Botanical Gardens where few school leavers were trained and sent out as travelling instructors to teach farmers in Akwapim Hills on improved production technology of some important crops, with emphasis on cocoa (MOFA, 1991). La-Anyane (1985) stated that about this training was done for about 20 years before the Basel Missionaries started with their extension services in Ghana. A number of re-organizations have occurred within extension services in the past, which has led to the creation of parallel extension departments.

The farmer is therefore confronted with different extension agents who talk to him on different technical contents, and approaches. Following the launching of the Economic Recovery Programme (ERP) in 1983 there has been major reorganization of the extension service.

Currently, the unification of Ghana Cocoa Board Extension (being undertaken by Cocoa Services Division) and that of the Ministry of Food and Agriculture is in progress.

2.7 COCOA EXTENSION IN GHANA

The Cocoa Services Division (CSD) of the Ghana Cocoa Board (COCOBOD) is responsible for cocoa extension. The division has a chequered history which is linked with the discovery of the cocoa swollen

shoot virus disease (CSSVD). The disease is capable of reducing yields by about 80% in three (3) years (Wood and Lass, 1985).

The Division was set up in the 1930s as a special unit of the Department of Agriculture (now Ministry of Food and Agriculture) to handle diseases and pests of cocoa. The CSSVD had been identified in 1939 by one Yaw Sabeng, a cocoa farmer at Nankese in the Eastern region of Ghana. The CSD was assigned the responsibility of estimating the extent of the CSSVD in the country.

In 1946, the Division was charged as a policy to cut out diseased trees in Eastern and Ashanti regions of Ghana without compensation. The CSD was abolished in 1962 on the ground that farmers could deal with CSSVD and capsids themselves. It was, however, re-established in 1965 to re-commence the disease control and also carry out distribution and sale of cocoa farm inputs and supply of improved planting materials (hybrid cocoa seedpods) to farmers.

In 1973, the CSD was transferred to form the extension wing of the Ghana Cocoa Board (COCOBOD). This separation from the Department of Agriculture [now Ministry of Food and Agriculture (MOFA)] was to encourage MOFA to concentrate on other crops to make agricultural diversity a reality.

Hitherto, the affairs of MOFA were dominated by cocoa with very little attention to other crops. It was also to foster a better co-ordination and planning in the cocoa industry. In 1976, the CSD was again removed

from COCOBOD and placed under the Ministry of Cocoa Affairs as a Department. Currently, the Extension wing of CSD is being unified with MOFA (Ministry of Finance Report, 1998).

2.7.1 Model of Cocoa Extension in Ghana

The CSD has adapted the Training and Visit (T & V) model in the bid to make its extension delivery more effective. As recommended by Benor (1984), it is an effective management model that enables efficient implementation of known extension principles.

The model is perceived basically as being top-down including the transfer of technology' philosophy from research-extension-farmer. Top managers plan extension programmes and regions and districts implement them.

2.7.2 The Main Features of T & V System

Benor and Baxter (1984) suggest that the T&V system must be adapted to fit local conditions. They further advise that certain features of the system can not be changed significantly without adversely affecting its operation. They include (i) professionalism, (ii) a single line of command, (iii) concentration of effort, (iv) time-bound work, (v) field and farmer orientation (vi) regular and continuous training, and (vii) close linkages with research.

i. Professionalism: Appropriate advice and support of farmers to enable them increase their incomes can only come from extension service that is professional at all levels. Extension staff must keep in close touch with relevant scientific developments and research in order to formulate specific recommendations that will be useful to the farmers in all kinds of resource situations.

Extension workers must have the ability to identify production constraints in the field and to develop appropriate measures to counter them. This can be achieved only if each extension worker is fully and continuously trained to handle his particular responsibilities in a professional manner.

ii. Single line of command: The extension service must be under a single line of technical and administrative command. All extension workers should be responsible administratively and technically to a unit within only one department.

iii. Concentration of effort: Effective training and visit extension is based on a concentration of effort.

Only by concentrating on the tasks at hand can the impact of extension become visible and can progress be sustained. Concentration of effort is a feature of all aspects

of the system. All extension staff work only on agricultural extension.

The staff are not responsible for the supply of inputs, data collection, distribution of subsidies, processing of loans, or any other activity not directly related to extension (Benor and Baxter, 1989).

Non-extension activities dilute concentration of effort and undermines the professionalism of the service and its credibility among farmers, hinder single line of command, interrupt work and training schedules, and weaken the required two-way linkage with research.

iv. Time-bound work: Messages must be taught to farmers in a regular, timely fashion, so that they will make best use of the resources at their command.

The village extension agent must visit his farmers regularly on a fixed day. All other extension staff must make timely and regular visits to the field, as required, to fulfill their job responsibilities.

v. Field and Farmer Orientation: An extension service must be in contact with farmers to serve them effectively. The farmers served by the village extension worker are to be divided into groups, each group visited on a fixed day once in two-weeks by the village extension worker (VEW).

Trainers and District Extension Officers and other senior staff, must visit the field often and regularly to understand the problems faced by farmers and extension workers.

To enable extension workers to spend time in the field, their administrative and report-writing responsibilities should be minimal.

vi. Regular and Continuous Training: Regular and continuous training is required both to teach, and discuss with extension staff, the specific production recommendations required by farmers and to upgrade and update their professional skills (Benor and Baxter, 1989).

The basic fortnightly training and monthly workshops are a key means of bringing actual farmers' problems to the attention of research, of identifying research findings of immediate relevance to farmers, and of developing production recommendations that would fit specific local conditions.

The training should impart necessary extension knowledge to trainees and assist in the exchange of information among staff and help them learn from each other's experiences.

vii. Close linkages with Research: Rogers (1989) defines a link as a communication relationship between two units in a system. Benor and Baxter, 1989, argue that agricultural extension and research are mutually dependent. They depend on one another for their successful operation.

Extension requires the findings of research to teach to farmers, as well as the support of research in solving farmers' problems. Without research involvement, it is unlikely that extension will be able to teach significantly improved practices (including new varieties, crops, and cropping patterns) that lead to the market increase in productivity required for rapid, sustained agricultural growth.

Similarly, research requires extension's guidance on problems that farmers face and on new issues that become apparent from field exposure and on which research attention should be focused.

2.7.3 Strengths of T & V extension system

Benor and Baxter (1989) identify the following strengths of the T & V extension system/model:

i. the T & V model has been widely adopted and has proven results and adaptability to a wide range of agricultural and administrative environments in developing countries.

It has been taken up either explicitly or implicitly at national or local levels by about forty (40) countries in Eastern and Western Africa, South and Southeast Asia, the Middle East, Europe and Central and South America.

One reason for the rapid spread of the system, developed only in the mid-1970s, has been the impressive increases in agricultural production that have been associated with its introduction (Benor and Baxter, 1989).

ii. The T & V system appeals to policy-makers because it proposes a method whereby large and moribund extension organizations could be mobilized at a small incremental recurrent cost.

iii. The T & V system upgrades the calibre of extension agents by means of continual on-the-job training and increases contact between extension agents and farmers.

It is often able to ensure that available research data are actually used; this can reorient research to focus properly on problems of importance to farmers.

iv. The T & V systems change the attitudes of extension staff because of rigid training and control of extension agents.

v. The T & V system effectively mobilizes the relevant results derived locally from participatory farming systems because it has the ability to organize public servants for the broad dissemination of information (Roberts, 1989).

2.7.4 Critique and Weaknesses of T & V extension system

i. The T & V system is basically top-down in its orientation and that it responds more to the desired modus operandi of the bureaucrat than to the needs of a community and its farmers.

ii. Sometimes, the upward flow of information does not take place or takes place sporadically because the extension system is set up to permit information to flow downward from those who know to those who, supposedly, do not know.

iii. The T & V extension depends on the use of contact farmers. These contact farmers are usually selected by the extension service and are supposed to represent the range of socio-economic groups found in a particular locality.

Howell (1984) argues that in practice, local pressures and staff performances often tend to bias selection in favour of the richer or more powerful farmers.

iv. For the T & V system to have an impact, research must support it strongly, co-ordinate with extension, and tackle farmers' immediate problems; production recommendations taught to farmers must be relevant to their needs and resource conditions, be economically viable; and regular and special training of extension staff must be timely and specific to their needs.

v. The T & V development has involved either a major build up of personnel in the extension service or the injection of critical funds to

cover operating costs, which extension has been denied; a relatively costless re-organization of an existing programme is not enough.

The concentration of effort associated with successful T & V system therefore tends to be expensive, and under today's constrained budgetary scenarios, it is not generally something that governments (of developing countries) can afford without a good deal of external assistance.

vi. The economic benefits from T & V system may indeed be considerable but they may not be captured as government revenue, let alone reflected in greater budgetary allocations to extension (Roberts, 1988).

vii. It is argued that by adopting the T & V system, governments run an implicit risk that the resultant cost burden may not be easily sustainable without continued external assistance. The cost of actual recovery, is one that has so far elicited little real interest from T & V system designers.

2.7.5 Cocoa Technologies Extended to Farmers

In Ghana, research on cocoa is the responsibility of the Cocoa Research Institute of Ghana (CRIG) at Tafo in the Eastern Region. The Institute was first established in 1944, and originally made responsible for cocoa

research throughout West Africa, including sub-stations in Nigeria, Sierra Leone and Liberia. (MASDAR Consulting Report, 1997).

Research on cocoa is organised along problem solving lines and realised in the form of problem-solving inter-disciplinary groups. The main research groups are capsid, black pod, cocoa swollen shoot disease (CSSVD), establishment, management, cocoa improvement and new products development. It is aimed at yield improvement, pest and disease control and by-products research.

Cocoa technologies extended to farmers based on research recommendations from CRIG include:- raising of cocoa seedlings, lining and pegging, weeding cocoa farms 3 times a year, removal of unwanted basal chupons, spraying insecticides to control capsids, spraying fungicides to control black pod disease, removal of climbers and mistletoes, control of shade, harvesting cocoa promptly, fermentation and drying of beans.

2.7.6. Constraints associated with cocoa production

The following technical, and socio-economic constraints have been identified as the key determinants which plague the cocoa industry, resulting in low yields of cocoa in Ghana (MASDAR Consultancy Report, 1997).

i. Unavailability and price of cocoa farm inputs.

Supply of inputs to farmers continues to be a problem in that the recommended inputs are not available on time, are expensive and need to be purchased whilst cocoa provides little revenue.

ii. Scarcity and price of labour.

The availability and price of labour are frequently mentioned as major constraints to increased production. Labour requirement of cocoa has been estimated at 25.7-96 mandays per hectare depending on the intensity of the cultivation system (Andreae, 1980).

Labour became a scarce input after the Aliens Compliance Order of 1969/70 when supply of permanent migrant labour to the cocoa sector was essentially withdrawn.

Labour from family sources is also scarce because of the out-migration of children and other dependants. There are seasonal bottlenecks of labour supply; for example during periods of profuse weed growth (May/June). Competition from foodcrops on the same farm is also a limiting factor.

Availability of more rewarding opportunities for labourers, for example, mining, has also reduced supply of labour. For example, in 1996/97, while labour rates for weeding were generally around ¢3500 per day, rates of ¢4500 per day were paid in mining areas or areas with timber operations (Ghana Cocoa Sector Development Strategy Report, 1998).

iii. Lack of credit facilities and high interest rates.

The most critical factor in Ghanaian rural farming situation is credit (Owusu-Acheampong, 1986). Farmers can acquire farm inputs such as fertilizers, improved seeds, insecticides, pesticides and weedicides when they obtain credit. Credit can play a very important role of a catalyst in cocoa production. However, information from literature sources indicates that it is difficult to secure credit from credit institutions because of farmers inability to offer collateral security. Farmers' capacity to pay back credits/loans is very low because many farmers have low incomes. Farmers are therefore unable to secure farm inputs and hire labour to maintain their farms (Owusu-Acheampong, 1986).

iv. Acquisition of land and the tenure system.

Through inheritance farmers become owners of land. Others may purchase land while some become land owners through leasehold. Some farmers also cultivate cocoa on share-cropping basis.

The nature of constracts for land acquisition and usufruct rights neither provide sufficient security of tenure nor incentives to migrant farmers who are better capitalized to invest.

Access to institution credit is always hampered when land is not self-owned to serve as collateral for loans. This situation would indirectly affect adoption especially where financing constitutes a major problem.

v. Poor farm management practices.

The traditional method of planting cocoa is to plant seed at stake with 3-6 seeds per planting site. This can result in a plant density of 6000 trees per hectare compared to the recommended 1600 trees. The close planting results in tall, thin trees which bear few pods and can cause harvesting difficulties (MASDAR Consultancy Report, 1997).

The CSD Regional annual review report (1996) from the cocoa growing regions indicate that 35% of cocoa owned by registered farmers is over 35 years old and 43% between the ages of 15-30 years. The report indicates that cocoa is in decline because the area of young cocoa is 25% less than cocoa over 30 years old.

Poor maintenance levels also give rise to losses due to pests and diseases especially when regular weeding and control of shade are not carried out.

vi. Ineffective and Inefficient extension services

Ineffective and inefficient extension services have been cited as a reason in the past for poor adoption rates by farmers of the improved technical recommendations that have been developed by research. Educational level of the FLS and the cocoa farmers have been cited as reasons for poor performance and adoption of cocoa technologies.

vii. Marketing Problems

A number of problems are also associated with marketing of cocoa produce. Low producer price and the licensing of many buying

companies have been cited as reasons for low cocoa production. The producer price has progressively been increased since the start of CRP. However, the farmers perceive the increases as inadequate to meet their production costs (MASDAR Consultancy Report, 1997).

The multiple buying system also gives room for pilfering and poor quality of produce. It is alleged that some of the Licence Buying Companies buy cocoa even if they are not properly dried.

Poor feeder roads which become impassable, especially during the rainy season has been cited as a marketing problem. Farmers find it difficult to send their produce to buying centres/societies during the rainy season.

Activities of timber firms and bush fires cause destruction of cocoa farmers. It was alleged that some timber firms refused to pay compensation to the farmers whose farms were destroyed.

2.8 FARMERS AND EXTENSION WORKERS' SELECTED DEMOGRAPHIC CHARACTERISTICS

Some characteristics of farmers and extension workers are believed to have influence on their performance. This had been revealed by research findings of earlier researchers including Adewuni, 1976 Beilin, 1995, Budke and Paddie, 1994, Byrnes and Byrnes, 1978, Celis 1971, Cernea, 1981 and Nelson, 1981.

2.8.1 Age of Farmers

La-Anyane (1985) reports that the average age of the farming community in Ghana lies between 50 and 60 years and this affects productivity. In many cases, health and declining age have a positive relationship between age and work a farmer can do.

MASDAR Consultancy (1997) undertook training needs assessment survey for trainers, extension workers and cocoa farmers in the cocoa industry of Ghana. The MASDAR Consultancy Report (1997) grouped age of cocoa farmers in Ghana into old and young. The older cocoa farmers are 50 and above.

The consultants reported that age is one of the major constraints to increased production of cocoa. The older farmers are less able to perform heavy tasks such as spraying which also involves transporting large quantities of water as well as manipulating heavy spraying machines.

2.8.2 Sex

Rural men and women may have different needs and desires. Nelson (1981) supports this theory when she writes that it is wrong to assume that an effective development programme for males will automatically translate into an effective programme for women, as well.

Roberts (1989) refers to women as 'mother earth' and implies that it is the responsibility of women to nurture a land and that the long standing emphasis on women's domestic labour, principally child rearing has

always masked their visible participation in the area of production. Whatmore (1988) argues effectively that an analysis of women's work in family farming offers a counterpart to simplistic attempts to divide their input into domestic or wage labour.

Beilin (1995) gives an account of her experience in village agriculture in 1980s at Oro Province in Papua New Guinea. She observed in Oro Province that technology transfer was the key element in the agricultural extension service, and as most of the extension agents were men, the technology was transferred to men even though women were the key subsistence farmers and the field labourers in plantation crops.
Beilin concluded that the extension agents tended to meet with key individual farmers, who were really likely to be important village men and least likely to work in the fields.

2.8.3 Age of Extension Workers

Sabihi (1978) reports that young agents and specialists perceive a greater need for training in extension philosophy, organization and administration than older agents and specialists.

In a study of the relationship between supervisory techniques of extension supervisors and organizational outcomes in Uganda, Budke and Paddie (1994) found out that older extension agents tend to exert less extra effort and are less satisfied with their supervisors and rate them low on organizational effectiveness.

2.8.4 Educational level of farmers

Byrnes and Byrnes (1978) suggest that education enhances one's ability to receive, decode, and understand information and that information processing and interpretation is important for performing many jobs. They state further that a farmer's level of education to some extent determines the type of tasks he can undertake in any programme, and therefore the type and level of participation.

Education may make a farmer more receptive to advice from an extension agency or more, be able to deal with technical recommendations that require a certain level of literacy and indirectly the farmer's managerial ability. It again affects the farmer's ability to decode information about new technology and prices of inputs and how to relate this to farming operations. In countries where educational levels are high in the rural area, farmers can read about new technologies on printed bulletins and try them while others will observe and follow (Gordon, 1976).

Cernea (1981) explains that the ability to process information is particularly important in farming which entails what he calls a diversified set of activities for which allocative decisions are made continuously as part of the normal routine. Therefore a farmer with a higher level of education is expected to be able to participate in more extension activities than one with a lower level of education. Sukaryo (1983) stresses the importance of education to farmer participation in agricultural extension programmes and adoption. He explains that, participation in

agricultural programmes and adoption usually involves farmers acquiring and decoding information about modern inputs and in learning how to use these inputs efficiently. Therefore, farmers who have low level of schooling may require longer time lags to select, assimilate, and allocate new farming skill and inputs. Farmers' level of participation is thus influenced by their level of education. The researcher will also be interested in finding out if any relationship exists between farmers educational level and level of adoption.

2.8.5 Educational level of Extension Workers

In Adewuni's (1976) study, the general trend of rating was that Bachelor of Science (BSc) degree holders rated themselves lower than Master of Science (MSc) degree holders whilst according to Sabihi (1978) extension agents with lower educational levels perceive a greater need for training in extension philosophy, organization, administration and evaluation. Amon (1989) suggests that the qualification of middle level administrators and supervisors should be a university degree with special training in extension education.

2.8.6 Working Experience

Celis (1971) finds that Mexican extension agents with less than 3 years experience express a greater need for technical information, while

those with more than 3 years express a need for training in the social sciences/agricultural extension.

Sabihi (1978) also reports that specialists who have more experience perceive a lesser need for training in extension philosophy, organization and administration.

According to Budke and Padde (1994), supervisors who hold their positions for a long period of time tend to generate less extra effort and satisfaction from their subordinates.

2.9 LAND ACQUISITION AND TENURE SYSTEM

In Ghana cocoa land is believed to be held mainly on freehold by land owners consisting of individual families and clans through inheritance from clan or family and by land purchase. It is also believed that in the Ashanti Region migrant farmers are entitled to usufruct rights only (Ministry of Finance Report, 1998).

Fragmentation of cocoa farms through inheritance has reduced previously large cocoa farms to small holdings, with some as small as 0.4 ha and less. Recently, it has become more difficult to obtain land through outright purchase in the more populous areas in Ashanti Region (Ghana Cocoa Sector Development Strategy Report, 1998).

The nature of contracts for land acquisition neither provides sufficient security of tenure nor incentives to migrant farmers who are

believed to be better capitalized to invest. This may hinder the diffusion of innovative practices into the industry.

The non-uniformity of land acquisition contracts and lack of a consistent and formalized regulatory system for cocoa farmland, may also act as a major constraint to the dissemination of new ideas by migrant farmers (Ministry of Finance Report, 1998).

Access to institutional credit is believed to be hampered when land is not self-owned to serve as collateral for loans. This situation would indirectly affect adoption especially where financing constitute a major problem.

2.10 EXTENSION PROGRAMME PLANNING

Programming in agricultural extension imposes three critical functions on programme managers or administrators, namely planning, implementation and evaluation (bin Yahya, 1996).

Extension education programmes are planned to effect desirable changes in the behaviour of farmers. Objectives of planning are derived from need assessments of farmers.

2.10.1 Needs Assessment

Assessing needs is a critical component of a programme development process since it helps to inform decision making including

planning elements such as identifying issues and problems, prioritizing needs, formulating objectives and determining implementation strategies.

There are many procedures that can be used to find the needs of farmers and extension frontline staff (FLS). Deshler and Wright (1979), outline dimensions of needs that must be considered in ascertaining learner's needs:

i. **Felt Needs** – the educator examines what the individuals within a group to be affected by the programme wish and hope for, and this is done through interviews and/or questionnaire.

ii. **Expressed Needs** – these are needs observed in the types of actual participation in services, and the needs are obtained by studying records and through interviews.

iii. **Normative Needs** – needs assessment based upon statements and opinions of experts and policy makers who hold ideas on what the learners of individuals should have to meet the norms or what a group of similar people have. It uses textbooks, research regulations, etc to measure the needs; and

iv. **Comparative Needs** – needs assessment based on observed inequalities in availabilities of services to different individuals.

Need assessment procedures with indications of how the educator and his learners could use are given by Knox (1986).

v. Obtaining opinions of experts and people in helping roles to identify needs they perceive as widespread among participants; and

vi. Using standards of achievable best practice etc.

Hagan (1992) argues that planning processes should basically require a direct input from peasant farmers, fishermen and animal rearers since they form the bulk of the beneficiaries.

2.10.2 The Planning Concept

Meier (1965) recognizes planning as the process which controls the order of a sequence of operations to be performed and called the sequencing of programmes in a plan , a STRATEGY; that of the subsidiary projects within the programme he called TACTICS, while the execution of the minor elements is referred to as ACTIONS.

Planning requires an explicit set of objectives but achieving a set of objectives does not necessarily require planning (Mellor, 1966). Sagasti (1979) defines planning in the broadest sense as anticipatory decision making.

Generally, planning is concerned with looking ahead and taking account of future development. Despite the great variety of forms, which it may take, Mosher (1986) states that all planning activities have certain attributes. These include looking ahead, forecasting, making choices, generating, identifying and evaluating alternatives and, where possible, arranging that future actions for attaining objectives follow some paths or setting limits to the consequences which may arise from such actions.

Planning in agriculture therefore consists of forging tactics or programmes to carry out strategies in order to achieve a desired or set goal over a period. Like Sagasti (1979), Hagan (1992) talks of planning as a process of methodical reasoning involving the systematic identification, collation and correlation of elements that are necessary, or can contribute to the solution of a problem or the realisation of a desired goal. In an important sense, planning, according to Hagan also derives from and rests upon cultural modalities and habits of reflection, exchange of ideas and information. This involves the identification of common objectives on the basis of a people's perception of their need and circumstance.

But having in mind that a country's resources are limited, Hagan further states that a plan may be thought of as a framework or rationale that enables needs that cannot be satisfied together to be ordered and placed in a relative time scale that reflects their urgency and casual priority on the basis of accepted values and ends.

Planning is also defined by Lucey (1995) as a managerial process of deciding in advance what is to be done and how it is to be done'. It is done on both formal and informal basis, using information from internal and external sources. Lucey (1995) then summarizes planning as decisions by management about:

i. what is to be done

ii. how to do it

iii. when to do it, and

iv. who is to do it

2.10.3 Why Plan Extension Programmes?

In managerial and administrative functions, planning:

i. gathers, translates and communicates information that will help improve the quality of current decisions which are based on future expectations.

ii. plays a central role in management and by helping organizations to succeed because all things being equal, organizations that plan achieve better results than those, which do not.

iii. provides direction and helps management to focus on both 'felt' and 'analyzed' needs of the plan beneficiaries.

iv. brings rationality and order into an organization and minimizes emergency situations and crisis and,

v. makes easy, control of extension programmes since control involves correcting deviations from plans.

Planning is therefore, a basic management function; failure to plan may result in random activities that are not directed to defined goals.

2.10.4 Problems of Planning

Often, however, planning results from the pressure exerted by donor countries/agencies on recipient countries, as Waterson (1968) observes. This is so because it has become fashionable and because possession of a national development plan often makes it easier to obtain foreign grants and loans. On time-span, Waterson reports of countries where comprehensive plans have been prepared in a few weeks in an office without the planners having consulted with operating ministries and agencies. Because of unexpected and unpredictable events, especially agriculture, it is impossible to plan in such a way as to avoid periodic revisions of medium-term plans (Barter, 1966; FAO, 1970).

Mellor (1966) and Barter (1966) point out that wide geographic dispersion and extremely large number of persons are also problems in agricultural planning. That is agricultural development plans are executed through decision-making units which include a high proportion of the total population of a nation. The geographic area over which farmers are scattered varies greatly with regard to physical, economic, cultural and institutional factors.

According to Barter (1966) and FAO (1970), agricultural planning is particularly difficult, not because the factors determining demand are largely exogenous to agriculture but also because supply is conditioned by the biological and seasonal nature of agriculture.

Millikan (1976) identifies three major reasons for poor plan performance. These are:

i. major decisions required for implementation of a plan either do not get made at all or do not get made in time for the plan's targets to be achieved. This situation is due to lack of timetable for the interrelated and sequential decisions.

ii. unavailability of critical supplies items. These may be physical items like raw materials, equipment or trained manpower or they may be financial items such as credit or foreign exchange.

iii. Delays in the carrying out of certain activities called for by the plan. Completion times of some activities will be very much more critical to plan implementation.

A plan is a means, not an end. Yet in many countries planners and other officials behave as though completion of the plan formulation is the end, and not the beginning of the planning process (Waterson, 1968).

Under the assumption that technical progress occurs at an exogenously determined rate, and that no effort need be expended to produce it, developing countries rather than carrying out their own research and development activities 'borrow' the existing technology of developed countries (Waterson, 1968)..

Consequently, as these latter countries advance, the state of their technical knowledge, the state of technology available to developing

countries changes – as a result of what are to them exogenous factors, and without the input of resources. This results in failures of plans, as Waterson (1968) observes.

Market limitations also handicap the development of African agriculture (FAO, 1991). The lack of institutions by means of which ideas which might crystallize can be put into practice does not facilitate good plan design and execution.

2.11 ACCESS TO FINANCIAL CREDIT

2.11.1 Definition of Credit

Cowie (1989) defines credit as a permission to delay payment for goods and services until after they have been received. He also sees credit as the sum of money lent by a bank.

To Owusu-Acheampong (1986), credit is a 'temporary transfer of capital resource from an individual or institution to another person or institution for a specific period of time, purpose and at agreed interest charge'.

2.11.2 Role of Credit

The most critical factor in Ghanaian rural farming situation is credit (Owusu-Acheampong, 1986). Credit can play a very important role in rural development.

With credit unproductive traditional farming can be transformed by modern techniques of farming, utilizing more sophisticated equipment and other essential inputs recommended by the extension FLS.

Farmers can acquire farm machinery and equipment that can help them to increase their hectarage (acreage). With credit, farmers can buy and use essential inputs such as fertilizers, improved seeds, insecticides, weedicides and pesticides.

The crucial point is that with credit, the farmer can increase his productivity which in turn would ensure greater farm output and increased income. With the proper utilization of the increased income, the farmer can bring out considerable improvement in his welfare and living conditions. Thus, the individual farmers collectively can bring about considerable improvement in the community in which they live. Credit can play a very important role of a catalyst in the development process. But for it to be a strong catalyst, it has to be made an integral part of the programme covering input supply, marketing, processing, storage and advisory services.

2.11.3 Features of Rural Areas

Ghana has about 69% of its population living in rural areas and about 31% in urban areas (Owusu-Acheampong, 1986). Rural communities in Ghana are therefore of great significance and importance not only because they need to be developed but also they form the

bedrock upon which any meaningful economic programme should be based. Socially, the rural communities are depressed with poor surroundings, lack of amenities and infrastructural facilities. Economically, the communities are predominantly agricultural. Most farm operations are traditionally carried out, using simple farm tools and traditional varieties of crops without the application of improved inputs and credit.

Another feature is that the communities are, to a large extent, non-monetized. A very small portion of the total outlay on farm operations and home consumption is in the form of cash; the percentage of families which borrow is small, and the average amount borrowed per family is also very small (Owusu-Acheampong, 1986). Credit can play a very important role in agricultural development in rural communities. An economic planner must always ensure that provision of credit is made an integral part of the programme covering input supply, marketing, processing, storage and advisory services.

2.11.4 Sources of Credit

In Ghana, credit sources in rural and urban communities are non-institutional and institutional credit agencies.

The non-institutional credit sources include:

i. relatives and friends

ii. private money-lenders

iii. traders

iv. distributors of farm inputs and

v. processing of agricultural products.

Owusu-Acheampong (1986) further states that of all these agencies, the private money-lender is the most prominent and well-known. The relatives and friends constituting themselves into unorganized credit givers are perhaps the oldest of the non-institutionized sources of credit.

A Government Committee on Agricultural Indebtedness (1968) reports that socially the money-lender is an asset to the village farming community and he is held in high esteem. The lender is approachable and he is ready to lend at a short notice.

However, Harvers (1960) reports on the rates of interest and terms of repayment of money-lenders and describes them as exorbitant and harsh. Their interest rates are very high and range between 50% and 100%.

No meaningful rural development programme in Ghana can be implemented on the limited resources of credit available from the non-institutionalized agencies. Permanent and formal source of credit are pre-requisite to a smooth development process.

In Ghana, the financial institutions are biased against agriculture and rural credit; they prefer to lend to urban-based sectors such as trade and industry (Owusu-Acheampong, 1986). He further states that the usual reason given for this bias is the inability of the rural man to offer adequate security for loans and the enormous risks associated with

agricultural production. The large number of small loans, coupled with geographical dispersion make rural credit considerably more expensive to administer. The internal liberalization of cocoa marketing had made loan recovery difficult.

2.12 ACCESS TO LABOUR

The agricultural labour force is defined to cover those engaged in agriculture, in livestock production and in agricultural services but does not include those engaged in Forestry, in logging, in hunting and in fishing (Rourke 1986).

To ensure abundant food supplies for the urban worker and the urban elite and provide exports and raw materials for local industries, policy-makers in Ghana in the past decade have been eager to increase agricultural production. Much concern also has been expressed about the persistent migration of labour from rural to urban areas, particularly of the educated youth and the alleged increasing age of farmers and others engaged in agriculture.

As little capital equipment is used in agricultural production in Ghana, the supply and mode of organization of the agricultural labour force is a key determinant of the volume of agricultural production (Rourke 1986).

For many years large numbers of labourers have been employed in the cocoa belt by cocoa farmers. Most of those labourers have come from

Burkina Faso, Mali, Togo and Northern Ghana and have had little or no schooling. For this reason, the youth in Southern Ghana with some schooling, and even those without schooling, considered such work as unsuitable for them. (Rourke, 1986).

The cultivation of cocoa tends to be labour intensive in comparison with coffee, rubber and oil palm as a monocrop (Andreae, 1980). Labour expenditure is often the largest component in the cost of cocoa production. (Andreae, 1980). Requirement of labour for cocoa farming has been estimated at 25.7-96.0 per hectare per year compared to 44 mandays for oil palm and 94 mandays for coffee (Andreae, 1980). Labour became a scarce input after the Aliens Compliance Order of 1969/70 when the supply of migrant labour to cocoa sector was essentially withdrawn. Although some migrant labour from northern Ghana, Togo and Benin is available, the supply tends to be seasonal. Labour from family sources is also now scarce because of out-migration of children and other dependants. There are seasonal bottlenecks of labour supply during periods of profuse weed growth (May/June). Competition from food crops in the same farm is also a limiting factor.

Availability of more rewarding opportunities for labourers, eg. in mining, has also reduced supply of labour. This affects the price of hired labour for cocoa farmers. For example, while the price of labour was generally ¢3500 per day for weeding, rates of ¢4500 per day were paid in

mining areas or areas with timber operations (Ghana Cocoa Sector Development Strategy Report, 1998).

Access to labour can be facilitated through measures at improve cash-flows to farmers such as seasonal credit to enable them hire and pay for labour. Addo (1972) finds that at the time of his survey, 65% of the vacancies on cocoa farms caused by the implementation of the Aliens Compliance Order had been filled by Ghanaians. He concludes that in Brong Ahafo and Ashanti most vacancies were filled by labourers in northern Ghana.

2.13 IMPLEMENTATION OF EXTENSION PROGRAMMES

This section reviews literature on farmer participation in extension programme planning, implementation, monitoring and evaluation.

Waterson (1968) states that plan formulation should not be divorced from plan implementation. This had been the practice for some time, which led to the failure of some plans. It is also realized that for efficient link, there should be well spelt out Institutions for carrying out what aspects of the plan and its organizational measure. He concludes that nothing is more conducive to bad planning than the separation of a plan formulation from provision for follow up in its implementation.

The way plans are implemented has been identified as one of the major causes of plan failure (Meier, 1970). Meier further states that the

record of development planning reveals that problems of implementation need more attention than problems of formulation.

2.13.1 Theories of Development Participation

The general belief also persists that, local participation, and the means of enhancing and nurturing it, are necessary elements in successful development efforts (such as in agricultural development) around the world.

According to Meads (1955) social changes aimed at improving the well being of a target beneficiary should be introduced with the consent and participation of those whose daily lives will be affected by the change. This emphasis on participation in decision-making with regard to a development programme is a departure from the traditional notion of planning with the people (Deshler and Sock, 1985). In this regard some authors describe participation in terms of the 'extent of control of power' by target beneficiary (in this case, the farmer). One of such theories, which address beneficiary participation in social programming, is The Concept of Power.

The Concept of Power

This concept describes a ladder of citizen participation that begins with manipulation at the bottom and moves up to citizen control at the top (Arnstein, 1971).

According to her, participation is the redistribution of power that enables the have-not citizens, presently excluded from the political and economic process of social programming to be deliberately included in the future.

The concept of power by Arnstein (1971) is based on the assumption that change in decision making results from confronting existing power sources with a new power centre based on the size and dedication of its group members rather than on the control of wealth or institutions.

Ahmed (1978) observes that in many cases, the political commitment to development is simply not there. Development means a change and change means a disturbance in the status quo. The ruling class is not prepared to tolerate a drastic disturbance of the status quo. It is prepared to go along with development in so far as it does not impinge upon its power, well being, influence, status control and pre-eminence.

The underlying theme of this theory therefore is that of conflict, that is the have-nots against the affluent or power holders. The conflicts are expected to push the existing powers to negotiate.

Deshier and Sock (1985) classify the concept of power in development under conceptual frameworks into participation Co-operation and Empowerment.

i. The context of co-operation

Deshier (1984), notes that co-operation is a characteristic of a dialogical action which occurs only among subjects who may, however, have diverse levels of functions and thus of responsibility. He further states that this can however be achieved through communication. Co-operation between programme planners and the target beneficiary is therefore a crucial factor in determining the success of the programme in any rural development programme.

The underlying assumption of participation in the context of co-operation is that, beneficiaries of any development programme are required to co-operate with planners, administrators and power elite to enable a satisfactory response to beneficiaries' needs and priorities, to provide access to decision-making, and to share the costs and benefits of development equitably (Deshler and Sock, 1985).

Authorities in Citizen Participation Theories agree that this approach is a form of genuine participation since it requires at least a minimum of dialogue for programme objectives to be achieved.

ii. The context of Empowerment

Lele (1975) finds people participation to be very important for the success of any programme. She reports that local participation may mean involvement in planning, including assessment of local needs. She further states that even if local people do not participate in planning, at the very

minimum, they should be informed of the plans designed for their areas if they are expected to consent and to cooperate in programme implementation. Lele concludes by saying that participation in planning and implementation of programmes can develop the self-reliance necessary among rural people for accelerated development.

Lance and Mckeana (1995) also find people participation in programme planning to be essential for programme success. They report that out of fifty development programmes implemented in Northern Nigeria, after evaluation, twenty-nine out of the total was found to be partial or total failure; however most of the successful ones had a participation element.

Thus Kindervatter (1979) describes empowerment in terms of people gaining an understanding of and control over social, economic and/or political forces in order to improve their standing in society. An empowering process to him is a means to bring about such understanding and control.

Under this framework, beneficiaries of a social programme are seen as demanding a degree of power or control that guarantees that they can govern a programme or an institution, be in full charge of policy and managerial aspects, and be able to negotiate that conditions under which outsiders "may change them".

Aguaga (1989) describes participation according to the power or control concept as sensitizing people and thus increasing the respectivity

and ability of rural people to respond to development programmes as well as encouraging local initiatives. Aguaga goes on to say that many Third World leaders decentralized the administration of development programmes in the region as a first step to people's participation, and that the World Bank encouraged decentralization as a pre-condition to its loan disbursement.

2.13.2 Farmers Participation in Agriculture Extension Programmes

Rural farmers are usually the target beneficiaries of any agricultural development programme. Although the farmer occupies a fulcrum of any agricultural development, his input in social programming is almost non-existent. This situation has lead to failure of a number of agricultural development programmes.

Deshler and Sock, (1985) also state that programmes that are designed for farmers without their involvement in the planning stages often lead to such failures. The reason for the failures is that farmers feel less obliged to implement decisions, which have been made on their behalf by external change agents.

2.13.3 Supervision

Supervision, as defined by Collings (1972), is a process by which workers are helped to do their jobs with increasing satisfaction to themselves, to the people with whom they work, and to the agency.

Extension supervision is concerned with the improvement or growth of extension personnel as individuals and as educational leaders.

In contributing to individual growth, the goal of supervision is the maximum development of the potential capacities of the extension agent as a person. In contributing to the effectiveness of the worker as an educational leader, its goal is to provide the best possible extension programme for the people of the country. Through activity and habitual practice, supervisors live out the process, which we call supervision and demonstrate the extent to which they meet criteria.

By a review of the literature, the underlisted criteria have been identified with supervision (Collins, 1972). A good supervisor:

- is guided by clear purposes
- guides agents to get job done, to carry out the purposes of the agency
- concentrates his/her supervisory programmes on helping to meet needs
- makes a careful analysis of the needs of each individual agent
- makes supervision a co-operative activity. He or she draws on the ideas and experience of all staff members.
- assumes responsibility to develop staff competence. He or she motivates professional improvements.
- studies the extension job

- uses evaluation to improve every major phase of extension programmes
- evaluates his or her own effectiveness
- demonstrates a desire to be of assistance to the agents.

Also, according to Benor and Baxter (1984), supervision should determine whether the extension system is operating effectively in both organizational and technical areas, and identify key constraints to its effectiveness. Common constraints may be the result of the fact that the Village Extension Worker (VEW) and other staff are not interested in their work or do not undertake the required appropriate messages to teach farmers that, training is inadequate, or that leadership and guidance for extension staff is poor.

Benor and Baxter (1984) specified that supervision of extension activities should not be paper-based or report-oriented as staff is not evaluated on the basis of paper work or written reports they produce.

Very few reports are required of any extension staff. Village Extension Workers (VEWs) are only required to keep a daily diary to record their activities and the main problems they encounter in the field, especially with respect to farmers' reactions to production recommendations.

The purpose of extension supervision is not merely to check that staff do their work in a correct and timely manner but, more important is the objective of assisting and guiding staff to do their assigned duties

effectively. The schedule of visits of the supervisors should normally be known to all staff.

Unscheduled visits are made to check on staff who may not be performing adequately, or in response to particular field or training problems.

Benor and Baxter add that since supervision cannot be conducted through a review of written reports, it must be done at the location where the activity to be supervised normally takes place; field activities are supervised in the field, training is supervised in training sessions.

Furthermore Benor and Baxter (1984), supervisory visits to the field focus on organizational (methodological) and technical matters. The importance given to either depends on the level of responsibility of staff making the visit. Most important, however, is to check the end result. Do farmers benefit from extension? Supervisors at all levels should do this check.

A supervisor who looks upon newcomers as potentially outstanding performers will treat them accordingly thereby motivating them to do their best and the supervisor's expectation will tend to be confirmed. Conversely, a supervisor who expects newcomers to perform poorly will communicate these expectations directly or indirectly, thereby triggering the indifferent performance that fulfills the negative expectations (Stoner and Freeman, 1992).

2.14 ADOPTION

Adoption of technological innovations in agriculture has for many years attracted considerable attention among development economists because the majority of the population of less developed countries derive their livelihood from agricultural production and income substantially (Feder, 1985).

With the overriding objective of increasing aggregate output in these countries, a primary goal of agricultural development has been to improve the welfare of rural families through enhancing productivity of small farms (Merril Sands, 1986).

He further states that small farmers frequently reject or only partially adopt 'improved' technology. This occurs despite the technology's demonstrated higher levels of productivity in experimental plots, its calculated economic profitability for the farmers, and its beneficial contribution to the larger society.

Merril-Sands (1986) describes this problem of limited adoption of introduced technology as the 'technology applications gap'.

2.14.1 Definition of Adoption

The process by which a farmer is supposed to consider and reject or accept to practise a particular innovation is referred to as adoption of an innovation (Moshler, 1986). To Adams (1990), adoption is a process,

which involves the decision to make full use of an innovation as the best course of action available.

Rogers (1983) also looked at adoption as a process and proposed its sequence as knowledge, persuasion, decision, implementation and confirmation. Thus, the individual must first learn of the existence of the innovation and understand its function. Persuasion, which is the formation of favourable or unfavourable attitude towards an innovation by the decision-maker, must occur in the process of adoption. This is followed by a period when the individual engages in activities that lead to decision on whether to partially or totally adopt. Implementation occurs when the individual, having developed a favourable attitude towards the innovation, puts it to use.

2.14.2 Adoption Characteristics

It has been observed that adoption behaviour tends to be specific to particular innovations, individuals, and environment but also has some general characteristics (Leagans, 1979).

The first is that adoption is unique to each individual and environmental influences. The second is that farmers must know what the idea is, why and how they should incorporate it in their farming. The third being that socio-demographic characteristics such as age, income, education and family size influence adoption indirectly. The last characteristics are socio-psychological factors.

On the basis of the above, Leagans (1979) came out with the following:

i. adoption of simple innovations is made at much higher rates before complex practices.

ii. Dissemination of technical information is an easier task if it is compared with achieving final act required to terminate the adoption act.

iii. Adoption behaviour requires a favourable mental state and a successful physical act.

iv. Optimum adoption of innovations is achieved only when a farmer perceives the recommended practices physically possible and socially acceptable.

v. Adoption behaviour at optimum levels depends on technical, physical, economical, social, educational and political act that establishes and maintains a macro and micro environment which is favourable to farmers to translate their behavioural influences into action.

Leagans (1979) concludes that adoption behaviour is attained through a series of mental workouts involving reasons favourable to non-action or maintaining the status quo.

2.14.3 Categories of adoption

Rogers (1983) categorizes adopters with respect to time they take to adopt innovations. These are innovators, who usually take risk and are the first to adopt new ideas. This group forms about 2.5%.

After this group, the next to adopt is the early adopters who are also about 13.5%; followed by the early majority, 34.0%, late majority (34.0%) and lastly, the laggards who are often reluctant to adopt. This last group is usually conservative and always wants to play it safe. They form 16.0%.

Age and gender may determine farmer's command over labour, land, credit or information about the technology and many other factors which in turn influence adoption; thus an innovation may be adopted more by men than by women or vice versa (CIMMYT, 1993).

2.14.4 Technological Characteristics

Bryerlee (1982), relates adoption technological components to the characteristics of the technology itself, and demonstrated that farmers followed a stepwise approach to adoption of a package that reflects the characteristics of each component and the interaction between them. These characteristics are: profitability, riskiness, divisibility, complexity, and availability of necessary inputs. Byerlee and Hesse de Polaco (1982) also report that most adoption studies had a 'pro-innovation' bias that

assumes that the innovation is 'right'. Therefore they analyzed patterns of adoption in terms of different socio-economic characteristics of farmers.

Rogers (1983) also lists five similar characteristics from the farmer's point of view which affect their adoption as follows:

i. relative advantage

ii. compatibility

iii. complexity

iv. trialability

v. observability

Relative advantage:

This is the degree to which an innovation is regarded as better than the idea or object it is intended to replace. The acceptance of an innovation is thus in relation to economic gains, social prestige factors, satisfaction and convenience associated with it. Adams (1990) puts it that sometimes the relative advantage of an innovation is enhanced by reducing its cost and also by subsidies.

Farmers are astute economists and will not readily adopt technology which appears to have some pecuniary risks. The more tangible the benefits of an innovation, the more farmers may be willing to adopt it. For example, farmers may take up a new variety of cocoa offering them higher yields more rapidly than one which they perceive as low yielding.

Compatibility

It is the degree of consistency of the package with the farmer's value, management objectives, the level of technology and the stage of farm development (Adams, 1990).

In a guide for survey design, prepared by CIMMYT (1993), questions of compatibility with ethnic, religious and community factors are usually asked to find out compatibility of programmes. Farm size, availability of equipment and machinery are some factors that determine the compatibility of an innovation.

Complexity

This is the degree to which an innovation is understood and can be used by farmers (Rogers, 1983). According to Rogers, some innovations are readily understood by most members of a social system, others are more complicated and will be adopted more slowly.

Education may make a farmer more able to deal with technical recommendations that require some level of literacy. Thus if a technology is found to be more accepted by the educated folk, then the result can be used as a case for more investment in the extension services to the uneducated fold to simplify the technology (CIMMYT, 1993). It therefore follows that, the more complex an innovation is, the more difficult it is for farmers to adopt (all other things being equal).

Trialability

A farmer will be more inclined to adopt an innovation which he has tried first on a small scale on his own farm and which proved to work better than an innovation he had to adopt immediately on a large scale which involves great risk.

Observability

It is the degree to which the results of an innovation are visible to farmers (Adams, 1990). Farmers are more inclined to adopt an innovation after seeing its results than when results are not easily seen.

2.14.5 Adoption-diffusion process

In Western Nigeria, Basu (1969) assesses the relationships between farmers' attitudes and their adoption behaviours. He finds that farmers' farm size, extension contacts, participation in organization (training), land tenure, status and occupation have relationship with adoption whilst age, education, use of mass media, farming experience and socio-economic status were not.

Ogunfiditimia (1981) uses partial correlation coefficient to study the relationship between selected socio-economic variables and adoption of improved maize and cocoa varieties in Oyo and Ondo States of Nigeria.

Out of all the ten socio-economic variables tested (education, age, economic status, farm size, leadership role, perceived risk and uncertainty

of adoption of new practices, contemporary influence, conformity of the new practice with community norms, family decision in relation to the new practice and credibility of extension agent in relation to the new practice) only age did not significantly influence farmers' adoption of improved maize and cocoa varieties.

Wake (1982) states that rural people seek information from each other, and recommends the use of communication methods which capitalize on it. He cautions about assuming a high credibility of extension sources of information. Wake further recommends that because of extension's low credibility, there is need to increase dialogue with farmers and build on the tendency of rural people to seek information from each other. This dialogue is necessary to develop a change in attitude and to provide information to assist decision-making and translate knowledge into action.

Diffusion research empirically demonstrated that new ideas, once introduced into a social system, spread in that social system from one decision-making unit (individuals, households, collectives) to the next over time. Diffusion is shown to be a process which can take place in social systems quite autonomously, irrespective of any intervention (Rogers, 1983). He finds out that time is an important element in diffusion and adoption of an innovation and that adoption is a mental process on the part of an individual over a period of time.

Hailu's (1990) study on household characteristics and input supply factors affecting the adoption and use level of improved farm practices in small holder agriculture in the Northern Ghana, shows that education, farm size, family labour and extension contracts determine the adoption and use of new innovations in agriculture.

2.15 MONITORING AND EVALUATION

Monitoring and Evaluation are closely related and can overlap. In practice, the terms are often used loosely; even interchangeably. However, they are two distinct functions.

2.15.1 Definitions of Monitoring and Evaluation

Appiah and Kannae (1988) define Monitoring as an internal programme or project activity and calls for diagnostic studies as part of its function of aiding management decision-making. It is a continuous assessment of implementation of a programme to ensure that input deliveries; work schedules, target outputs, and cost estimates are being met and whether initial/estimated effects are being felt by the beneficiaries or target groups(s). Monitoring may imply watching, observing, tracking, and documenting programme implementation in order to ensure compliance to programme plan.

Appiah and Kannae (1998) state, however, that evaluation makes judgements on efficiency, effectiveness, relevance and impact of

programmes outputs in contributing to solving the development problem for which it was formulated.

2.15.2 The Relationship Between Monitoring and Evaluation

The basic objective of monitoring is to provide timely feedback on programme performance or progress to appropriate level programme management, (that is implementers) for corrective measures to be undertaken to ensure efficient and effective implementation (Appiah and Kannae, 1998). It consists of operational and administrative activities that track resource acquisition, and allocation, production or delivery of services, and cost record. Thus, programme monitoring involves periodic documentation, analysis, reporting, and storage of key programme success indicators. It provides information on progress of individual programme activities as well as overall programme performance towards the achievement of the stated goals and objectives.

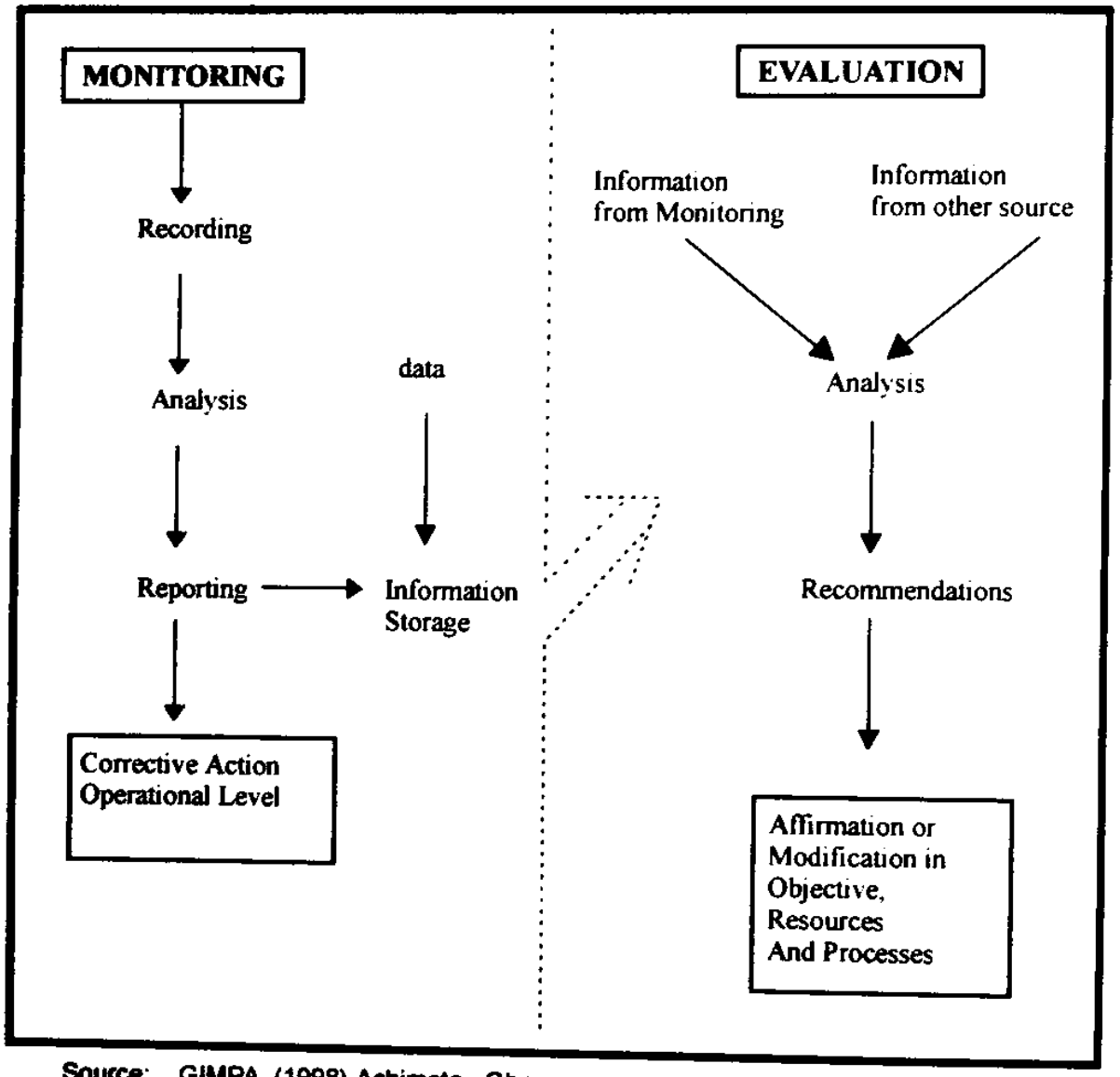
The monitoring processes are integrated into the day-to-day management for keeping an activity moving ahead as planned. Programme monitoring forms the basis for programme evaluation. Evaluation essentially attempts to provide an answer to the key question, 'Has the programme made any positive observable difference'?

For positive observable difference to be made, the plan and implementation of the programme should be nearly perfect. Evaluation

therefore involves an analysis and assessment of the programme plan, implementation and outcomes.

The important outcome of a programme evaluation is a set of recommendations to address issues relating to the programme plan (e.g. objectives), and implementation (e.g. Human and financial resources. The relationships are illustrated in Figure 1 that follows.

Fig. 1.
RELATIONSHIP BETWEEN MONITORING AND EVALUATION



Source: GIMPA, (1998) Achimota, Ghana.

2.15.3 Purpose and Use of Evaluation

Appiah and Kannae (1998) list some uses of effective evaluation. These are:

i. evaluation can help improve management of programmes and related activities, and point to better usage of funds and other resources.

ii. can help people to learn from experience so as to improve the relevance, methods, and results of programmes, for current and future work.

iii. can improve public accountability by demonstrating that resources have been used effectively.

iv. can provide information to enhance communications within programmes and organizations; and between different stakeholders, and also for advocacy work.

v. help in decision making, focusing on where action should be taken, where training or specialist help is needed or where further research would be helpful.

vi. improves planning by providing information about past performance and influence about past performance and influence policy-making.

vii. provides information for fund raising and advocacy.

viii. will indicate the effectiveness of extension programme planning, implementation and adoption levels.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents methods that were used to collect data to investigate factors that affect farmers adoption of cocoa technologies in the Ashanti Region.

3.1 RESEARCH DESIGN

This study is in the form of descriptive-correlational design using Questionnaires to describe the nature, strength and direction of relationships among variables of the research.

3.2 POPULATION

The target populations for the study were cocoa farmers and extension frontline staff (FLS) in Ashanti Region of Ghana. The main population for the study was cocoa farmers. However views were sought from extension staff in respect of some variables of the study.

3.3 SAMPLING AND SAMPLE SIZE

Four out of 8 CSD districts, namely, Fumso, Tepa, Offinso and Nkawie, were randomly selected for the main study, using lottery method. With this method, the names of all the 8 districts were written on pieces of paper and folded individually. All the folded papers were put in a small box and placed on a table. Five people were asked to pick the folded

papers. The names of the first 4 districts picked were selected for the main study. They were Fumso, Tepa, Offinso and Nkawie districts. The fifth person's pick was Obuasi district which was later used for pre-testing the questionnaires.

A list of cocoa farmers and another on FLS were compiled with the help of District Cocoa Officers (DCOs). A total of 160 cocoa farmers and 80 FLS were randomly selected for the main study. This includes 40 cocoa farmers and 20 FLS from each district.

3.4 INSTRUMENTATION

Two different questionnaires targeted at farmers (Appendix 2) and Frontline Staff of CSD were used to collect data for this study.

The content validity and relevance of the questionnaires was determined by supervisors of this project and lecturers.

Pre-testing of the questionnaires was conducted in Obuasi district in Ashanti Region. Twenty (20) cocoa farmers and 20 FLS were used for the pre-testing. The results were used to improve the questionnaires.

The questionnaires were in 2 parts: Part 1 was designed to collect data on the demographic characteristics of cocoa farmers and FLS. This included gender, age, levels of education and working experience.

The purpose of Part 2 was to collect data on cocoa farmers' participation in planning, implementation and evaluation of cocoa extension programmes. Among others, the questionnaires also collected

data on cocoa farmers' access to credit, farmers' access to labour and labour effectiveness, farmers' working experience with FLS and adoption.

3.5 THE RESEARCH AREA

The randomly selected area for the study engulfs Fumso, Tepa, Offinso and Nkawie districts in the Ashanti Region of Ghana. In these districts, agricultural activities are the predominant occupations of the people. A map showing the location of the districts for the study is presented as Appendix 1.

3.5.1 Fumso District

The district falls within the forest zone of Ashanti region with an annual mean rainfall of about 1580mm (The Annual Review Report of CSD, Ashanti Region, 1995). In the district, farmers grow mainly cash crops as well as food crops. The main crops cultivated are cocoa, coffee, oil palm, plantain, cassava, cocoyam, maize and yam. Tomato, egg plant and onion are the vegetables grown.

Cocoa cultivated in the Fumso district are mainly of the Amazon and hybrid varieties, with about 27% of the cocoa less than 8 years old and about 0.4% cocoa being more than 30 years old. The rest are 8-30 years old (The Annual Review Report of CSD, Ashanti Region, 1995).

Fumso district has been the leading producer of cocoa in Ashanti Region for the past 3 years. The district produced about 15.74m.t of

cocoa in 1998/99 season (Produce Buying Company of the COCOBOD, Ashanti Region, 1999).

3.5.2 Tepa District

The district is within the forest zone in the Ashanti Region. It experiences over 1600mm mean rainfall annually (The Annual Review Report of CSD, Ashanti Region, 1995). Apart from cocoa, the people of Tepa district cultivate food crops such as plantain, cassava, yam, cocoyam and maize. Until the 1980s, Tepa district produced over 40% of cocoa in the Ashanti Region and was the highest producing district in Ghana.

Amelonado and Amazon varieties are the predominant cocoa cultivated in the district. Thirteen percent (13%) of the district's cocoa farms are between 1-8 years old and about 36% cocoa are over 30 years (The Annual Review Report of Ashanti Region, CSD, 1995).

3.5.3 Offinso District

This district is within the marginal and fringe semi-deciduous forest zone of Ashanti Region. The district has a warm climate with an annual mean rainfall of about 800mm (The Annual Review Report of CSD, Ashanti region 1995). Agricultural crops grown are mainly cereals. Farmers grow maize, yam, sorghum, millet and groundnuts, among others, in the northern sector of the district.

In addition to maize, cassava, plantain and yam, farmers grow cocoa in the southern sector of the district.

The researcher's discussions with the District Officer revealed that cocoa production had declined drastically in the district during the past decade due to black pod disease caused by *Phytophthora palmivora* and P. *megakarya*.

P. megakarya infections had been identified to be more virulent and devastating in the district. The disease had seriously destroyed many cocoa farms. (Produce Buying Company of COCOBOD, Ashanti Region, 1999).

I.5.4 Nkawie District

The district is one of the densely populated districts for cocoa production in the region. It has a dense forest vegetation with annual rainfall of 1800 – 2000mm (The Annual Review Report of CSD, Ashanti Region, 1995).

Cocoa production is very important in the district. It is second to Fumso district in cocoa production in Ashanti Region for the past 3 years (Produce Buying Company of COCOBOD, Ashanti Region, 1999).

Amazon, Amelonado and hybrid cocoa varieties are dominant in the district. Fourteen percent (14%) and 33% of the districts cocoa farms are 1-8 years and over 30 years old, respectively (The Annual Review Report of CSD, Ashanti Region, 1995).

3.6 DATA COLLECTION

The written, validated and the pre-tested questionnaires were administered to cocoa farmers and FLS in January, 2000 to collect the data by the researcher and two-trained assistants. The researcher did 2 follow ups to gather data from non-respondents.

Eighty percent (80%) questionnaires were returned to the researcher by the 3rd week in January, 2000. The remaining 20% questionnaires were received at the end of January, 2000.

3.7 DATA ANALYSIS

The returned questionnaires were checked for completeness and accuracy. This was done by checking individual responses to verify whether each respondent has answered without omissions.

The data were then organized and subjected to statistical analysis, using the Statistical Package for Social Science (SPSS) computer software.

Below are techniques used to analyze the data:

1. Demographic characteristics of cocoa farmers and FLS.

Descriptive statistics involving frequencies, the measures of central tendency, and percentage distributions were computed to describe the respondents for the study.

This involved computations of frequencies and percentage distributions of sex, ages and working experiences of cocoa farmers and FLS. Percentages of cocoa farmers' who had formal and non-formal education and farmers' highest levels of education were determined. The FLS' data were treated in the same way.

In addition, the researcher calculated ranges and mean ages as well as average years of experiences of cocoa farmers and FLS.

2. Mode of land acquisition for cocoa farming: To describe the mode of land acquisition (family land, purchased land, share-cropping and leasehold), frequencies, percentage distributions were computed from responses.

3. Cocoa farmers' access to financial credit: Frequencies and percentage distributions from responses of cocoa farmers were computed. Farmers' perceptions of access to credit were also assessed by computing means and standard deviations.

4. Sources of labour to cocoa farmers: Frequency and percentage distributions of responses of cocoa farmers were calculated. Mean and standard deviation of cocoa farmers' responses of labour effectiveness were computed from responses from a five-point Likert scale (5 = Very effective, 4 = Effective, 3= Moderate, 2 = Less effective and 1 = Least effective).

5. Types of cocoa cultivated: Frequency and percentage distributions of cocoa varieties grown by the respondents were analyzed.

6. Cocoa farmers' contact with extension/FLS: Frequency and percentages of number of monthly visits to cocoa farmers by FLS were calculated. Also computed were the means of the monthly visits to the farmers by the FLS.

7. Cocoa technologies extended to cocoa farmers

Frequency and percentage distributions of respondents were analyzed.

8. Cocoa farmers' preferences of Extension Methods: The data on these were analyzed using the data on a five-point Likert scale (5 = Most preferred, 4 = Next preferred, 3 = somewhat preferred, 2 = Least preferred and 1 = Not preferred). Means and standard deviations were computed.

9. Cocoa farmers' participation in planning, implementation and evaluation of extension programmes: With responses of cocoa farmers from a five-point Likert scale (5 = Very high, 4 = High, 3 = Occasionally, 2 = Low and 1 = Very low), frequency and percentages distribution were computed to describe farmers' participation/involvement in extension programmes.

Mean and standard deviation were also computed to show that farmers' extent of involvement in extension programmes.

10. Factors which influence farmers to adopt cocoa technologies extended to them.

Frequencies and percentages were computed to determine variables which influence cocoa farmers' adoption of cocoa technologies. Also, calculated were the mean weight of factors to rank the variables (factors) which influence the adoption levels of cocoa technologies.

Correlational and stepwise regression techniques were used to determine the nature and strength of relationships between variables to identify the best predictors of adoption level on account of amount of variance in adoption explained.

11. Cocoa farmers and FLS' perceptions of problems associated with cocoa farming: Frequency and percentage distribution of response from respondents were analyzed. Mean, standard deviation, frequency and percentage distributions were computed.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

The results of the study are presented and discussed in this chapter. This is done based on the objectives of the study.

Objective 1 of the study sought to describe demographic characteristics of respondent cocoa farmers and extension frontline staff (FLS). The findings of the study showed that there are more male cocoa farmers as compared to females in the Ashanti Region. Out of 160 respondents, 84.4% were males and 15.6%, females in the Region. Similar result was obtained by the Cocoa Research Institute's survey carried out in the region in 1995. The Institute found 71% male respondents as compared to 29%, females (MASDAR Consultancy Report, 1997).

This is a healthy observation for the cocoa industry in the region since it is generally accepted that men are physically stronger than females. The male cocoa farmers will therefore provide more effective labour on their farms in addition to other sources of labour than their female counterparts.

Table 1: Sex distribution of cocoa farmers

SEX	FREQUENCY	PERCENT
Male	135	84.4.
Female	25	15.6
TOTAL	160	100.0

Source: Field data, March, 2000

The results also showed that 96.2% of FLS' respondents were males while only 3.8% were females (Table 2). From Table 2, there were more male FLS than female FLS in the system.

The region also has more male cocoa farmers (84.4%) than the females (15.6%), refer from Table 1.

This is a good observation in the region because male extension agents usually would like to work more with male farmers than with the females. Beilin (1995) made similar observation in Oro Privince in Papua New Guinea where most of the extension agents were men who transferred technology to men even though women were the key subsistence farmers and field labourers in plantation crops including cocoa. The extension agents tended to meet with key individual farmers, who were important village men. However, it is likely the female FLS will have freer and more open discussions with the female cocoa farmers than their male counterparts.

Table 2: Sex distribution of extension frontline staff (FLS)

SEX	FREQUENCY	PERCENTAGE
Male	77	96.2
Female	3	3.8
TOTAL	80	100.0

Source: Field data, March, 2000

Age distribution of the farmers is presented in Table 3. The findings showed that 45.6% of the farmers were 50 years or less with 54.4%, being 50 years. The respondents' ages range from 29 to 90 years. The mean age of all the respondents was 54 years and mode, 45 years. The result showed that a high percentage of cocoa farmers in Ashanti Region are aged and ageing.

This observation in the region was also made by the Monitoring and Evaluation Department of COCOBOD (COCOBOD, 1998). MASDAR Consultants made similar observation of the old age of cocoa farmers in the Region during their survey in 1997 (MASDAR Consultancy Report, 1997).

The situation is not surprising since cocoa is a life investment and it takes a long time to mature. The finding brings to the fore the need to lure the youth into the cocoa industry in Ashanti Region. Youth farmers will be more active than the aged and ageing farmers.

Table 3: Age distribution of cocoa farmers

Age (years)	Frequency	Percent	Cummulative %
Below 30	2	1.3	1.3
31 - 40	21	13.1	14.4
41 - 50	50	31.3	45.6
51 - 60	40	25.0	70.6
61 - 70	32	20.0	90.6
71 - 80	11	6.9	97.5
81 - 90	4	2.5	100.0
TOTAL	160	100.0	-

N = 160 Mean = 54 years, Mode : 45 years

Source : Field data, March, 2000

The findings further showed that the age of FLS ranges from 27 to 59 years. Majority of FLS (71.3%) were up to 50 years while the remaining 23 (28.7%) were between 51 and 60 years. The mean age of the FLS was however 42 years (Table 4).

The result showed that the FLS in the Ashanti Region were young, with most of them being between 34 and 47 years. When the mean ages of the cocoa farmers and FLS respondents were compared, the FLS' mean age was less (42 years) than the cocoa farmers (54 years) (Table 3 and 4). The FLS are therefore more active than the farmers. Given the necessary logistics and push by the management of COCOBOD and CSD, it is likely that the FLS will perform their duties creditably.

Table 4: Age distribution of extension frontline staff (FLS)

Age (years)	Frequency	%	Cummulative %
Below 30	3	3.8	3.8
31 - 40	35	43.7	47.5
41 - 50	19	23.8	71.3
51 - 60	23	28.7	100.0
TOTAL	80	100.0	-

Mean = 42 years Range = 27 to 59 years Mode = 34 and 47

Source : Field data, March, 2000

The educational qualifications of cocoa farmers in the region were investigated in the study. Table 5 presents the level of education of the farmers. The table showed that about 49% (48.8%) had no formal education. The rest, 51% (51.2%) possessed Middle School Leaving Certificate or higher level of education (Diploma and BSc). This is encouraging because education enhances farmer's ability to receive, decode, and understand information, process and interpret it to perform many jobs (Gordon, 1976). This will enhance adoption of cocoa practices

Table 5: Level of education of cocoa farmers

Level of Education	Frequency	%
No formal education	78	48.8
Middle Sch. Certificate	79	49.3
Diploma	2	1.3
Degree (BSc)	1	0.6

N = 160

Source : Survey data, March, 2000

Table 6 shows the results of the educational distribution of FLS. It shows that 79 (98.7%) of the respondents possessed Middle School Leaving Certificates.

The 79 respondents indicated that they had their initial in-service agricultural extension training at Bunso Cocoa College. The diplomate had his training at the University of Science and Technology (UST), Kumasi.

Educational level plays a very important role in FLS' ability to understand and transfer agricultural technologies to farmers. According to Sabihi (1978) extension agents with lower educational levels perceived a greater need for training in extension philosophy, organization, administration and evaluation.

Table 6: Level of education of extension frontline staff (FLS)

Level of Education	Frequency	%
Middle Sch. Certificate	79	98.7
Diploma	1	1.3

N = 80

Source: Field data, March, 2000

Table 7 below shows the results of working experience of respondents. Farmers had working experience ranging from 4 to 70 years with the mean of 23 years, Appendix 6). Majority of the farmers had worked between 10 and 16 years (Table 7).

A total of 17 (88.8%) respondents had grown cocoa up to 40 years; 54 (38%) had working experiences between 10 and 16 years. Twelve (12) constituting 8.1% were with less than 10 years experience.

This result shows a healthy situation since majority of the respondents had long experience, 10-40 years and only 12 with less than 10 years. It is therefore likely that their adoption levels of cocoa technologies would be high if their socio- economic problems were also addressed.

Table 7: Working experience of cocoa farmers

Experience in Years	Frequency	%	Cummulative %
Less than 10	12	8.1	8.1
10 – 16	54	33.8	41.9
17 - 22	13	8.1	50.0
23 - 28	27	16.9	66.9
29 - 34	18	11.3	78.2
35 - 40	17	10.6	88.8
41 - 46	5	3.1	91.9
47 - 52	9	5.6	97.5
52 - 58	1	0.6	98.1
59 - 64	2	1.3	99.4
65 - 70	1	0.6	100.0
TOTAL	160	100.0	-

Mean = 23 years Mode = 15 years

Source : Field data, March, 2000

Working experience of FLS was also examined in the study (Table 8).

Table 8: Working experience of FLS

Experience in Years	Frequency	%	Cummulative %
4 - 10	43	53.7	53.7
11 - 16	19	23.7	77.4
17 - 22	5	6.3	83.7
23 - 28	6	7.5	1.2
29 - 34	6	7.5	98.7
35 - 40	1	1.3	100.0
TOTAL	80	100.0	-

Mean = 13 Years Mode = 8 years

Source: Field data, March 2000

The working experience of FLS ranges from 4 to 37 years. Majority of the respondents (77.4%) had worked from 4 to 16 years. Only 18 (22.6%) were with experiences from 17 to 37 years (Table 8). The FLS in the region therefore have experience and they are likely to perform creditably when given the necessary logistics and incentives.

Objective 2 of the study determined the mode of land acquisition for cocoa farming.

Land, as a factor of production, is limited in quantity and quality for cocoa cultivation. There is a non-uniformity of land acquisition contracts and lack of a consistent and formalized regulatory system for cocoa farm

lands. (Ministry of Finance Report, 1998). This acts as a major constraint to the dissemination of new ideas by cocoa farmers.

An attempt was made to investigate mode and total land acquired for cocoa farming and sizes of cocoa farms cultivated in the region. It is believed that farm size has influence on the attitudes of farmers towards the adoption of new practices (Ogunfiditimia, 1981). Four sources (family land, purchased land, share-cropping and leasehold) were identified. In addition, approximate land under other crops were investigated.

The mode of land acquisition is presented in (Table 9). Most of the respondents (63.1%) established their cocoa farms on family lands while 12.5% and 17.5% farm on purchased and share-cropping lands, respectively. Only 11 (6.9%) respondents hold lands on leases.

It is not surprising that over 60% of cocoa farmers farm on family lands because such lands are usually less costly than other mode of land acquisition. However farming on family lands may not be the best for cocoa industry in the Region in terms of cocoa farm maintenance and expansion.

On family lands, when the farmer dies, the farm reverts back to the family and the next-of-kin may not be resourceful to maintain the farm. Sustained adoption of cocoa technologies will be affected adversely and yield from the farm declines.

Table 9: Mode of land acquisition for cocoa farming

Sources	Frequency	%
Family land	101	63.1
Purchased land	20	12.5
Share-cropping	28	17.5
Leasehold	11	6.9
Total	160	100.0

Source : Field data, March, 2000

Total land acquired by individual farmers is presented in Table 10. The total ranges from 4.0 – 125.0 acres (Appendix 7). One hundred and forty-four (90%) had plots of lands ranging between 4.0 and 48.0 acres (Table 10). Of the 144 respondents, 42 (29.2%) and 47 (32.6%) acquired total lands for cocoa and other crops cultivation ranging from 4.0 to 12.0 acres and from 13.0 to 21.0 acres, respectively. Sixteen (10%) respondents acquired total lands of over 48 acres. Two (2) farmers had 110.0 acres individually. One farmer acquired the largest land, 125.0 acres (Appendix 7).

The mean total land acquired was 25.8 acres with a mode of 10.0 acres which means that most of the cocoa farmers acquired about 10.0 acres of land for cocoa and other crops cultivation.

Table 10: Total land acquired for cocoa and other crop farming

Total Land in hectares (Acres)	Frequency	%	Cummulative %
4.0 – 12.0	42	26.3	26.3
13.0 – 21.0	47	29.3	55.6
22.0 – 30.0	33	20.6	76.3
31.0 – 39.0	8	5.0	81.3
40.0 – 48.0	14	8.7	90.0
49.0 – 57.0	6	3.8	93.8
58.0 – 66.0	2	1.2	95.0
67.0 – 75.0	1	0.6	95.6
76.0 – 84.0	2	1.3	96.9
85.0 – 93.0	2	1.3	98.2
94.0 and over	3	1.8	100.0
TOTAL	160	100.0	-

Mean = 25.8 acres Mode = 10.0 acres Range = 4.0-125.0acres

Source : Field data, March 2000

Responses to questions on sizes of cocoa farms showed that 151 farmers had cocoa farms ranging from 2.0 to 25.0 acres. This group constitutes 94.4% of the total (160) respondents (Table 11). Fifty-nine (39.1%) of the 151 respondents had cocoa farms between 6.0 and 10.0 acres. About 3.8% farmers had cocoa farms which exceeded 40.0 acres.

The mean size of the respondents' cocoa farms was 13.6 acres whilst the mode was 10.0 acres; (refer table 11). There were about 87.5% and 12.5% full-time and part-time/absentee cocoa farmers among the 160 respondents, respectively.

Most of the respondents, (57.6%) had crop farms, apart from cocoa which range from 1.0 to 50.0 acres (Appendix 9). This group is followed by those (31.3%) who had big crop farms of 6.0–10.0 acres. Only one respondent (0.7%) had a 50.0 acres farm apart from cocoa. The mean hectarage of the lands under other crops apart from the cocoa farm was 6.5 acres. The distribution had a mode of 2.0 acres.

The main alternative crops cultivated in the study areas were food crops and other tree crops. The food crops grown included cassava, plantain, cocoyam, yam, maize and rice. These were mainly grown for household consumption but significant surpluses were also produced for sale and contributed significantly to income. Oil palm, citrus, and coconut were the alternative tree crops. Coffee shrubs were also cultivated.

Vegetables grown were tomatoes, egg plants and onions, Some farmers also reared sheep, goats, poultry, and cattle in addition to the cocoa farming.

In this study, the results showed that a positive relationship between size of cocoa farm and adoption level of cocoa technologies exists but the relationship was not significant at 0.05 alpha level (Table 45).

Table 11: Approximate land under cocoa in acres

Total Land in Acres	Frequency	%	Cummulative %
1.0 – 5.0	30	18.8	18.8
6.0 – 10.0	59	36.8	55.6
11.0 – 15.0	30	18.8	74.4
16.0 – 20.0	18	11.2	85.6
21.0 – 25.0	14	8.8	94.4
26.0 – 30.0	1	0.6	95.0
31.0 – 35.0	1	0.6	95.6
36.0 – 40	1	0.6	96.2
41.0 – 45	3	1.9	98.1
46.0 and over	3	1.9	100.0
TOTAL	160	100.0	-

Mean = 13.6 acres Mode = 10.0 acres Range = 2.0-100.0 acres

Source : Field data, March 2000

Table 12: Appropriate land under other crops

Land Acres	Frequency	%	Cummulative %
1.0 – 5.0	83	57.6	57.6
6.0 – 10.0	45	31.3	88.9
11.0 – 15.0	8	5.5	94.4
16.0 – 20.0	3	2.1	96.5
21.0 – 25.0	4	2.8	99.3
26.0 or more	1	0.7	100.0
TOTAL	144	100.0	-

Mean = Mode = 2.0 acres Range = 1.0-50.0 acres

Source : Field data, March 2000

Objective 3 of the study sought to assess cocoa farmers' access to financial credit.

Finance plays a very important role in cocoa farming since it determines farmers' ability to secure cocoa farm inputs for farm establishment and maintenance. The low income level of many farmers means they do not have resources available to buy the necessary inputs when they are required. As a result, the crop is not sprayed and represents a major constraint. It is usually difficult for cocoa farmers to obtain credit to finance operations related to cocoa production. High interest rates, cumbersome processing procedures, lack of security, among others, have often been mentioned as problems which make credit to farmers unfeasible. The interest rates range from 43% to 50% for financial institutions and 100% and over for traditional sources. Tables 13, 14 and 15 show the results of cocoa farmers' responses to their sources of financial credit for farm establishment, their financial assistance from financial institutions and major problems they encountered in acquisition of financial credit.

Table 13: Sources of financial capital for establishing cocoa farm

Source	Frequency	%
Own savings	106	66.3
Family source	24	15.0
Money lender	17	10.6
Bank loan	9	5.6
Friends	4	2.5

Total No. of farmers : 160

Source : Field data, March 2000

Personal savings from farmers form a major source of financial capital for establishing cocoa farms in the study area. This is followed by family (15.0%) and money lender (10.6%) sources. In less than one out of 10 cases that farmers obtained loans form Bank to establish their farms and with financial assistance from friends. (Table 13).

Table 14: Cocoa farmers' descriptions of financial assistance from financial institutions

Description	Frequency	%	Cummulative %
Very easy	1	0.7	0.7
Easy	6	3.9	4.6
Difficult	46	30.3	34.9
Very difficult	60	39.4	74.4
Impossible	39	25.7	100.0

Total No. of farmers : 152

Source : Field data, March 2000

As shown in Table 13, 5.6% of the respondents had financial assistance from banks to establish their cocoa farms. This is a clear indication of the very limited access farmers have to credit from formal institutional sources. Majority of the cocoa farmers (95.4%) described access to financial assistance from Financial Institutions as being difficult, very difficult and impossible. A minority of the farmers (4.6%) indicated they easily and very easily secured financial assistance from Financial Institutions to establish the farms (Table 14). This may be due to sizes of their farms and credit worthiness of such cocoa farmers.

Responses to questions on problems encountered by cocoa farmers with regard to access to financial assistance from Financial Institutions revealed that high interest rates, cumbersome processing procedure and lack of collateral security were their major problems. The result is presented in Table 15.

Table 15: Major problems for credit acquisition encountered by cocoa farmers

Problem	Frequency	%
High interest rate	81	52.9
Cumbersome processing procedure	51	33.3
Lack of collateral security	21	13.8

Total No. of farmers : 153

Source : Field data, March 2000

Eighty-one (52.9%) of the 153 respondents indicated high interest rates as their major problem while 51 (33.3%) indicated that cumbersome processing procedure was their biggest problem. About 13.8% had a major problem to do with lack of collateral security.

The observation is similar to those observed by the MASDAR Consultants in 1997, Owusu Acheampong (1986) and Lele (1975) that high interest rates and lack of security were cocoa farmers' problems in securing credits from financial institutions. A need to evolve sound credit facilities for cocoa farmers cannot therefore be over-emphasized. It will help cocoa farmers maintain their cocoa farms properly.

This section assesses availability of labour and labour effectiveness to cocoa farmers. The availability and price of labour are frequently mentioned as major constraints to increased cocoa production. Andreae (1980) describes cocoa cultivation as being labour intensive and that labour expenditure is often the largest in the cost of production. This assertion by Andreae indicates the importance of labour in cocoa production. Generally, there is shortage of labour to assist cocoa farmers maintain their farms due to the fact that the educated youth do not want to work as labourers on farms, the living conditions in the rural areas do not usually favour conditions for the retention of literate labour, low daily rates as perceived by the labourers and competition of cocoa farmers with more rewarding opportunities for labour. Labour from family sources is also scarce because of the out-migration of children and other

dependents. Competition for labour from food crops on the same farm is also a limiting factor.

There is therefore seasonal bottlenecks of labour supply during periods of profuse weed growth. The result is the poor maintenance levels of cocoa farms as was observed during the present field study.

Tables 16, 17, 18 and 19 show analyses of responses of farmers to questions on sources of labour available to them, proportion of time provided by family, farmers' perceptions of availability of labour, cost of labour and rating of labour effectiveness.

Table 16: Sources of labour to cocoa farmers

Source	Frequency	%	Cummulative %
Caretaker	72	45.0	45.0
Family labour	41	25.6	70.6
Hired labour	32	20.0	90.6
Communal (Nnoboa)	15	9.4	100.0
Total	160	100.0	-

Source : Field data, March 2000

The analysis shows that 45.0% farmers had caretakers with other sources being, family labour (25.6%) and hired labour (20.0%). The least source was obtained from communal labour which forms about 9% (table 16).

Caretaking is seen as a strategy to overcome social problem of rather elderly cocoa farmers and plays an important role in Ashanti Region. The caretakers are useful for maintaining cocoa farms, particularly for aged and absentee farmers. However, some farmers perceive caretaking labour as being poor in the management of cocoa farms, resulting in high losses due to pests and diseases (Ministry of Finance Report, 1998).

About 61% of family members indicated they spent 30% or less of their time on cocoa farming and 70% on other activities (table 17). Only 27.5% responded they spent over 40% of their time on cocoa farming.

Table 17: Proportion of time provided by family labour

Proportion/Percentage	Frequency	%	Cummulative %
Less than 10%	42	26.3	26.3
10- 20%	21	13.1	39.4
21 - 30%	35	21.9	61.3
31 - 40%	18	11.2	72.5
Over 40%	44	27.5	100.0
Total	160	100.0	-

Source : Field data, March 2000

Most of the cocoa farmers had difficulty in securing labour (Table 18). There was a wide range of labour cost per manday in the study area. It ranges from ¢3000.00 to ¢10,000.00. The mean price per manday was

¢4884.00 and the mode of price was ¢5000.00. This means that the majority of the farmers hired labour at ¢5000.00 on their farms (Table 19). It is therefore likely that labour would move from cocoa areas with the low price for hired labour to areas of the high price for labour, assuming other factors are favourable.

Table 18: Cocoa farmers' perceptions of availability of hired labour

Perception	Frequency	%
Very easily available	19	11.9
Easy to come by	49	30.6
Difficult to come by	69	43.1
Very difficulty to come by	22	13.8
Not available	1	0.6
Totlal	160	100.0

Table 19: Labour cost per manday (by-day)

Cost per manday (g)	Frequency	%
3000.00	3	1.9
3500.00	7	4.4
4000.00	29	18.1
4500.00	23	14.3
5000.00	73	45.6
5500.00	2	1.3
6000.00	13	8.1
6500.00	3	1.9
7000.00	3	1.9
8000.00	3	1.9
10,000.00	1	0.6
Total	160	100.0

Mean = ¢4884.00 Mode = ¢5000.00 Range ¢3000-¢10,000

Source : Field data, March 2000

Table 19: Labour cost per manday (by-day)

Cost per manday (g)	Frequency	%
3000.00	3	1.9
3500.00	7	4.4
4000.00	29	18.1
4500.00	23	14.3
5000.00	73	45.6
5500.00	2	1.3
6000.00	13	8.1
6500.00	3	1.9
7000.00	3	1.9
8000.00	3	1.9
10,000.00	1	0.6
Total	160	100.0

Mean = ¢4884.00 Mode = ¢5000.00 Range ¢3000-¢10,000

Source : Field data, March 2000

Table 20: Rating of labour effectiveness

Labour	Effectiveness	
	Mean	SD
Family	3.48	1.25
Hired	3.45	2.52
Caretaker	3.38	1.40
Communal (Nnoboa)	2.32	1.31

Source : Field data, March 2000

Means were calculated from a scale of 5 = Very effective, 4 = Effective, 3 = Moderate, 2 = Less effective and 1 = Least effective.

The overall mean for labour effectiveness was moderate ($\bar{x}$ = 3.15). Table 20 shows labour effectiveness as perceived by the 160 respondents in the study areas. Family labour was perceived as the most effective, followed by hired and caretaking. Again, communal (nnoboa) system, as a form of labour, was rated the least effective.

Pertaining to objective 5 of the study which sought to find out the varieties of cocoa cultivated in the Ashanti Region, the results showed that Amelonado, Amazon and hybrid varieties had been cultivated. However, some farms carry mixed varieties of the cocoa (Table 21).

Table 21: Varieties of cocoa cultivated in Ashanti Region

Varieties	Frequency	%
Amelonado	8	5.0
Amazon	18	11.3
Hybrid	32	20.0
Mixed	102	63.7

N = 160

Source : Field data, March 2000

When the 160 cocoa farmers were asked to indicate the varieties of cocoa they had cultivated on their farms, 102 (63.7%) and 32 (20.0%) indicated they had planted mixed and hybrid varieties, respectively. Eighteen (11.3%) had planted Amazon. Only 8 (5.0%) planted Amelonado varieties, indicating that the Amazon and the hybrids had gradually replaced the Amelonado.

From discussions with District Officers, it was learnt that the hybrids were easier to establish, more tolerant to pests and diseases, early maturing, high yielding and carried pods throughout the year. It was observed that adoption level had been low even though the farmers were aware of the advantages/benefits of the hybrids.

This section examines cocoa farmers' contacts with extension Frontline Staff (FLS). The analysis in Table 22 shows that majority of the cocoa farmers 61.9% have worked with cocoa extension agents up to 10 years. Fifty (31.2%) and 43 (26.9%) of this group had 7 to 10 and 3-6

years working experience with the FLS, respectively. Fifty-nine (36.9%) of the total respondents (160) had worked with FLS for ten or more years. Two (1.3%) cocoa farmers were yet to work with any FLS. The farmers' mean years of working experience with extension FLS was 4 years.

Table 22: Number of years farmers have worked with FLS

Years with FLS	Frequency	%	Cummulative %
Not yet	2	1.3	1.3
Less than 3	6	3.7	5.0
3 - 6	43	26.9	31.9
7 - 10	50	31.2	63.1
More than 10	59	36.9	100.0
Total	160	100.0	-

Mean = 4 years

Source : Field data, March 2000

The highlight of the number of monthly visits to cocoa farmers by the FLS is presented in Table 23.

Table 23: Frequency table of monthly visits to cocoa farmers by FLS

Years	Frequency	%	Cummulative %
Once	90	56.3	56.3
Twice	41	25.6	81.9
Three	14	8.7	90.6
Four or more	15	9.4	100.0
Total	160	100.0	-

Source : Field data, March, 2000

The farmers' responses show that there are differences in the total number of visits cocoa farmers are visited by FLS. Out of the total 160 cocoa farmers sampled for the study, 41 (25.6%), 14(8.7%) and 15 (9.4%) had FLS visiting them twice, three and four or more times, respectively in a month. Together, this group represents 43.7%. The least number of visits was once in a month which 90 (56.3%) of the respondents received.

Visits are usually made to farmers by FLS mainly to disseminate innovations on cocoa and also to observe, whether such innovations are being adopted and whether there may be other farming constraints.

Such visits may be diagnostic where the FLS helps cocoa farmers to identify farming problems with the view of finding solutions to the problems. Problems that cannot be solved, by the FLS or the FLS' supervisors are passed on to researchers for further investigations and solutions.

The FLS may also undertake a method demonstration or a result demonstration visit. During the method demonstration visit, the FLS teach cocoa farmers about how to carry out a practice while the FLS show the result of an innovation to the farmers during the result demonstration visit.

Intermittently, the Deputy Regional Manager or the Regional Manager, visits cocoa farmers with FLS to interact with them.

It could be inferred from Table 22 that the cocoa farmers in the study had more working experiences with the extension FLS and were therefore more likely to adopt cocoa extension technologies if there was a healthy socio-economic environment.

Cocoa technologies being extended to cocoa farmers were identified in the study. The Regional Management of CSD revealed that the following cocoa technologies, developed by the Cocoa Research Institute of Ghana (CRIG) at Tafo for farmers' adoption had been extended to cocoa farmers;

1. raising of Amazon or hybrid cocoa seedlings in polythene bags or on beds before planting
2. lining and pegging at 3 x 3m (10ft x 10ft) spacing for the seedlings in the field.
3. brushing/weeding of cocoa farms, 3 to 4 times annually.
4. removal of unwanted basal chupons.
5. insecticidal spraying to control capsid pests.
6. removal of mistletoes, annually

7. fungicidal spraying to control black pod diseases.
8. provision of intermediate and overhead shade where necessary
9. reduction of shade if it is too much
10. harvesting of ripe cocoa pods at regular intervals
11. proper fermentation of cocoa beans and drying.

Many farmers have been using some of these cocoa technologies extended to them through extension education by FLS in the Ashanti Region. This section assesses cocoa farmers' preferences of extension education methods.

Extension education communication methods play a very important role in the delivery of extension recommended messages to cocoa farmers. The methods used have influences on farmers' understanding and adoption of technologies. Cocoa farmers' perceptions of methods employed by FLS in farmers' extension education were therefore assessed.

For the purposes of this study, communication materials refer to flipcharts, posters, booklets, leaflets, pamphlets and bulletins. Use of blackboards, photographs and actual objects were also observed. The main publishers have been CRIG and CSD of the COCOBOD.

Cocoa farmers were asked to rank, in order of their preferences, extension education methods which are usually used by the FLS during training. The methods are indicated below:

i. Group discussion

ii. Method demonstration

iii. Result demonstration

iv. Lecture

v. Farm trips/tours

vi. Farm visit and

vii. Home visit

Table 24: Cocoa farmers' preferences of extension education methods

METHOD	PERCENTAGE DEGREE OF PREFERENCE					MEAN	SD
	5	4	3	2	1		
Farm visit	68.1	26.9	2.5	0.6	1.9	4.588	0.747
Group discussion	52.5	35.0	11.9	0.6	0	4.394	0.719
Method demonstration	32.1	43.4	22.0	2.5	0	4.050	0.802
Result demonstration	18.2	27.0	46.5	6.9	1.3	3.541	0.912
Home visit	17.5	31.3	37.5	10.6	3.1	3.494	1.003
Farm trips/tours	12.7	17.7	36.7	17.7	15.2	2.949	1.215
Lecture	9.4	23.9	20.1	30.8	15.7	2.805	2.234

Source : Field data, March 2000

Scale of Means were calculated from 5 = Most preferred, 4 = Next preferred, 3 = Somewhat preferred, 2 = Least preferred, 1 = Not preferred

Analysis of results showed that cocoa farmers in Ashanti Region have been introduced to seven (7) extension education methods. Table

24 summarizes the results of the analysis of the farmers' preferences. The table showed that about 68% of the farmers indicated that they mostly preferred farm visits while 26% farmers responded that farm visits were their next preference.

Reasons cited by the farmers were that they most preferred the farm visits because they had the opportunity to ask practical questions in the field and also received ready answers. The farmers also indicated that they received relevant advice on recommended cocoa innovations from regular FLS' visits. Those visits encouraged them to adopt the innovations. The regular farm visits by the FLS built up their confidence in the extension system. However, the 1.9% farmers who did not prefer the farm visits, perceived the visits to be expensive, laborous and irregular because there was insufficient supply of logistics to the FLS, especially means of transport. Group discussions, method demonstrations, result demonstrations and home visits followed in that order of preference (Table 24).

In comparison with all the extension education methods listed, lecture was the least preferred. Only 9.4% respondents perceived the lecture as the most preferred. The respondents, who most preferred the lecture method, indicated that the lecture method gives them theoretical ideas about cocoa cultivation practices. Others stated that more farmers are 'taught' at a time. About 30% and 15% of the respondents indicated they either least preferred or did not prefer the lecture method.

The farmers who least or did not prefer the lecture method cited insufficient time allowed for discussions among the farmers (audience) as a limitation. Of the total 160 farmer respondents for the study, 48.8% had no formal education (Refer Table 3). The mean age of the respondents was also 54 years (Table 2). It is therefore not surprising that the lecture method of extension education was the least or not preferred by the cocoa farmers.

The extent to which cocoa farmers participate in extension programme planning, implementation, monitoring and evaluation was also determined in the study. The results are presented in Table 25.

Table 25: Importance of cocoa farmers' involvement in all aspects of extension_ programmes as perceived by the farmers

Importance	No. of Farmers	%
Very important	116	72.9
Important	37	23.3
Somewhat important	2	1.3
Not important	4	2.5
Total	159	100.0

Source : Field data, March 2000

The farmers' responses show that majority of them (116, 72.9%) and 37 (23.3%) found it very important and important, respectively that they should be involved in all aspects of extension programming. Majority of the farmers believed that they know their problems and needs better.

Some of them also indicated that their involvement in the programming would help them endure the sustainability of such extension programmes.

Cocoa farmers were also asked to indicate on whose initiative they participated in extension programmes. Analysis of their responses are shown in Table 26.

The study revealed that mostly (65.8%) cocoa farmers participated in extension programmes through FLS' initiative. Only 11 (7.0%) indicated that they participated in programmes through their own initiative and 34 (21.0), through group discussions Table 26).

Table 26: Source of initiative for farmers' participation in extension programmes

Source of initiative	No. of Farmers	%
Own initiative	11	7.0
Group discussion	34	21.0
Extension FLS	104	65.8
Executive member of a group	9	5.7
Total	158	100.0

Source : Field data, March 2000

The results are very encouraging since FLS usually assist and lead in the initiation of programmes. It is also obvious from the results as tabulated above that FLS continue to be a major channel for extension

programmes. There is therefore the need to adequately train, equip and motivate the FLS to help the cocoa farmers.

To determine the extent of farmer participation in extension programme planning, cocoa farmers were further asked to specify which activities under planning, (as indicated in Table 27) they actually participated in.

One hundred and twenty-seven (79.4%) said they participated in identification of problems while 88 (55%) participated in setting up of objectives. Sixty-four (40%) respondents participated in prioritization of problems or review of objectives, respectively.

The result is quite encouraging because identification of problems and setting up of objectives are very important in extension programme planning.

Table 27: Cocoa farmers participation in each component of planning.

Participation Component	No. of Farmers	%
Identification of problems	127	79.4
Prioritization of problems	64	40.0
Setting up of objectives	88	55.0
Review of objectives	64	40.0

Total number of farmers = 160

Source : Survey data, March 2000

The analysis of results in Table 28 shows that all the 160 cocoa farmers did participate in activities meant to identify problems, set up and prioritize objectives and review objectives at different degrees.

Sixty-three (39.4%) of the respondents indicated they were or highly involved in planning extension programmes while 59 (36.9%) were minimally involved. Thirty-eight farmers (23.7%) indicated they occasionally did participate in planning of extension programmes.

Table 28: Extent of cocoa farmers' participation in extension programme planning

Extent of participation	Frequency	%	Cummulative %
Very low	26	16.3	16.3
Low	33	20.6	36.9
Occasionally	38	23.7	60.6
High	49	30.6	91.2
Very high	14	8.8	100.0
Total	160	100.0	-

Source : Field data, March 2000

Note: Planning means direct involvement in identification of problems, prioritization of problems, setting up of objectives and review of objectives.

It could be observed from the results that only 39.4% showed that they were highly involved in planning (Table 28). This situation usually

does not augur well with successful extension programmes and adoption of technologies because when farmers are involved in planning of programmes, they see the programmes as theirs; they put in more efforts and support the programmes to succeed.

Similar views were expressed by Lele, (1975), Lance and Mckeena (1975) that people's participation in programme planning is essential for programme success.

Table 29 shows the distribution of cocoa farmer participation in each activity of the implementation of cocoa extension programme (by multiple responses).

Table 29: Frequency table of cocoa farmers participation in each practice of programme implementation

Practices of farmers	Frequency	%
Acquiring cocoa farm inputs	90	56.3
Raising of cocoa seedlings	120	75.0
Brushing of cocoa farms	151	94.4
Removal of unwanted basal chupons	152	95.0
Removal of mistletoes	147	91.9
Insecticidal spraying to control pests	129	80.6
Fungicidal spraying to control black pod disease	94	58.8
Harvesting of cocoa pods	145	90.6
Fermentation of cocoa beans	151	94.4
Drying of fermented cocoa beans	149	93.1

No. of farmers = 160 (Multiple responses)

Source : Field data, March 2000

The table shows that most farmers participated in brushing of cocoa farms (94.4%), removal of unwanted basal chupons (95.0%), removal of mistletoes (91.9%) harvesting of ripe cocoa pods (90.6%), fermentation of cocoa beans (94.4%) and drying of cocoa beans (93.1%). The distribution ranges between 90 and 95% for this group.

About 80% and 75% cocoa farmers respondents were involved in insecticidal and raising of cocoa seedlings, respectively. About 58%

farmers participated in fungicidal spraying; and 56% in the acquiring of cocoa farm inputs (Table 29).

The extent of farmer participation in the implementation of extension programmes is presented in Table 30.

Table 30: Extent of cocoa farmers' participation in implementation.

Extent of participation	Frequency	%
Very low	9	5.9
Low	17	11.0
Occasionally	30	19.5
High	51	33.1
Very high	47	30.5
Total	154	100.0

Source : Field data, March 2000

In general, the table shows that the overall farmer participation in implementation of cocoa extension programmes was high (63.6%). Thirty (19.5%) out of the 154 cocoa farmers, who answered the questions on the extent of cocoa farmer participation in implementation, indicated they were occasionally involved. Low (16.9%) participation was recorded for 26 respondents (see Table 30).

As presented in Table 30, farmer participation in the implementation of extension programs was generally high in the Ashanti Region (63.6%).

This is a good situation since target beneficiary participation in implementation of programmes has been identified as one of the major problems of plan failures. Such failures often result from low involvement of the target beneficiary.

Similar results have been reported by some earlier researchers such as Meier (1970), Botchie (1986), Lance and Mckeena (1986). Though their findings were not in the Ashanti region, they serve as a useful literature.

Table 31 shows the analysis of the responses of 160 cocoa farmers for monitoring activities of extension programmes.

Table 31: Cocoa farmers participation in monitoring

Activity of Monitoring	Frequency	%
No involvement	96	60.0
Farm visits	36	24.4
Home visits	8	5.0
Maintenance of cocoa farms	27	16.9
Demonstrations	35	21.9
Formation of communal labour groups	3	1.9

No. of farmers = 160 (Multiple responses)

Source : Field data, March 2000

Table 32: Frequency table of cocoa farmers' participation in evaluation

Activity of Evaluation	No of Farmers	%
No involvement	13	8.1
Acquisition of farm inputs	81	50.6
Maintenance of farms	141	88.1
Effectiveness of labour	87	54.4
Efficiency of labour	96	60.0
Relative advantage of technologies	106	66.3
Compatibility of programme	83	51.9
Relevance of programme	97	60.6
Impact of programme	102	63.8

No. of farmers = 160 (Multiple responses)

Source : Field data, March 2000

Table 33: Percentage distribution of extent of cocoa farmers' participation in evaluation of extension programme

Extent of participation	No. of farmers	%	Cummulative %
Very low	20	12.8	12.8
Low	22	14.1	26.9
Occasionally	41	26.3	53.2
High	45	28.9	82.1
Very high	28	17.9	100.0
Total	156	100.0	-

Source : Field data, March 2000

Thirteen (8.1%) of the cocoa farmers pointed out that they were not involved in any activities of evaluation. Most (88.1%) of the farmers were involved in the evaluation of maintenance level of cocoa farms, while others were involved in efficiency of labour, relative advantage of technologies, relevance and impact of programmes.

By comparison, extent of farmer participation in evaluation of extension programmes was high (46.8%). Forty-one (26.3%) were involved occasionally while 42 (26.9%) were lowly involved.

Cocoa farmers and FLS' perceptions of constraints which adversely affect cocoa production in the region are identified in this section. Tables 34 and 35 show the results of their perceptions of major technical, economic and socio-economic constraints which adversely affect cocoa production.

Table 34: Major constraints affecting cocoa production as perceived by the farmers

Constraints	No of Farmers	%
Supply and high price of cocoa farm inputs	140	87.5
Scarcity and high price of labour	94	58.8
Lack of credit and high interest rate	93	58.1
Marketing problems	52	32.5
Acquisition and high price of land	26	16.3
Old age and poor health of farmers	24	15.0
Bushfires and timber firm activities	9	5.6
Illiteracy and low level of education	8	5.0
Insufficient FLS	2	1.3

No. of farmers = 160 (Multiple responses)
Source : Field data, March, 2000

Table 35: Cocoa production constraints in Ashanti region as perceived by FLS

Constraints	No of Farmers	%
Supply and high price of cocoa farm inputs	72	90.0
Lack of credit facilities	46	57.5
Scarcity and high price of labour	45	56.3
Old age and poor health of farmers	39	48.8
Poor farm maintenance	23	28.8
Marketing problems	16	20.0
Lack of social amenities	8	10.0
Inheritance and litigation	8	10.0
Timing of programme	4	6.3
Illiteracy and low level of education	5	5.0
Low incomes of farmers	4	5.0
Absentee and part-time farmers	1	1.3

No. of FLS = 80 (Multiple responses)

Source : Field data, March 2000

The issue of supply and high price of cocoa farm inputs was described by 87.5% of the farmers, as being a major problem. They stated that inputs were not available on time and needed to be purchased when cocoa provided little revenue.

Table 34 shows that 58.8% farmers indicated scarcity and high price of labour as a major problem to increased cocoa production. Only

68 (42.5%) out of the 160 cocoa farmers said that hired labour was available (Table 18). Thus, to the majority of the cocoa farmers, labour also added to the high cost of production.

Table 2 has shown that over 54% of the respondents were over 54 years in age who, sooner or later, will not be able to work effectively on their farms and thus require labour from elsewhere. Young people and educated youth do not usually want to work as labourers on farms. Poor living conditions in the rural areas do not favour the retention of literate labour. Again, the farmers stated that hired labour was expensive. The mean price of labour was approximately ¢5000.00 per manday in the study areas (Refer Table 19) and about 58% respondents cited lack of credit and high interest rates charged by Financial Institutions as another major problem affecting cocoa production.

From Table 13, 75.6% cocoa farmers said they established their farms with their own savings, 11.9% with loans from money lenders and only 11.3% farmers, with assistance from financial institutions. When the farmers were asked to describe the assistance from the financial institutions, 106 (69.7%) described it as being difficult while 39 (25.7%) said it was impossible to obtain bank loans. Only 7 (4.6%) indicated that it was easy to obtain financial assistance from the banks. Eight respondents did not answer that question (refer Table 14).

Problems cited by the farmers for credit assistance were high interest rate, cumbersome processing procedure, and lack of collateral

security. Of the problems, 51.3% of the respondents mentioned high rate of interest as the most important problems, followed by cumbersome processing procedure (32.3%).

From the point of view of marketing problems, 52 (32.5%) respondents indicated low producer price, delays in the payment of 'Akuafo' cheques and poor condition of rural feeder roads.

The farmers also stated that the producer price has been continually and progressively increased since the start of Cocoa Rehabilitation Project (MASDAR Consultancy Report, 1997). They have responded positively by increasing production rather than productivity, in spite of inflation and devaluation of the cedi meaning that they are suffering in real terms. It has also been shown by various studies that farmers are responsive to producer price changes. An increase in the producer price tends to motivate farmers to maintain their farms better and also serves to increase planting effort.

This is supported by the findings of Ewusi (1987) study on the effect of Structural Adjustment on Agriculture. He noted that farmer response to the use of hybrid cocoa and new plantings increased by 72% over the three-year period (1984-1986) when the nominal producer price was increased from ¢30,000.00 to ¢85,000.00 per tonne at the beginning of the government's ERP and SAP programmes. He noted that 109 out of 115 farmers interviewed reported planting an average of 1.72 ha over the

period. Available records also show that cocoa output increased by 38.36% from 159000 tonnes to 220,000 tonnes over the same period.

It was observed that Banks delayed the payment of 'Akuafo' cheques which was a disincentive and adversely affected cocoa production. Again, the farmers indicated that they were sometimes unable to send their produce to cocoa buying centres, because of poor conditions of rural feeder roads especially during the rainy season.

Other constraints mentioned by cocoa farmers were acquisition and high price of land, bush fires and activities of timber firms which destroyed cocoa farms, illiteracy and low level of education and insufficient FLS.

Analyses of FLS' perceptions of cocoa farmers' constraints which affect cocoa production in Ashanti region are presented in Table 35.

From the analyses, 72(90%) FLS indicated supply and high price of cocoa farm inputs as the most important farmers' constraints, followed by lack of credit (57.5%) respondents, scarcity and high price of labour (56.3 FLS), old age and poor health of cocoa farmers (56.3%). Other constraints cited by FLS were poor farm maintenance, marketing problems, lack of social amenities, inheritance and litigation, among others.

About 77% of the FLS' perceptions of farmers' constraints were in agreement with those enumerated by the cocoa farmers themselves. It shows that the cocoa farmers and the FLS are in close touch with each other and that FLS know farmers' constraints. To increase cocoa

production in the Region therefore, these constraints need to be addressed. The farmers' levels of adoption of cocoa technologies were also determined in the study.

Responses from farmers indicate 100% rate of adoption for brushing of cocoa farms and removal of unwanted basal chupons. Other technologies with high adoption rates are harvesting method of ripe cocoa pods (99.4%), breaking and fermentation of beans (99.4%), reduction of shade (97.5%) and removal of mistletoes (93.8%). Technologies with low adoption rates are fungicidal spraying (54.4%), pegging and line planting. In general, the practices which require major capital outlay and are complex were found to have low adoption rates, e.g. fungicidal spraying.

Table 36: Frequency of adopted technologies

Technology	Frequency of adoption	%
Brushing of cocoa farms	160	100.0
Removal of unwanted basal chupons	160	100.0
Harvesting of ripe cocoa pods	159	99.4
Breaking of pods and beans fermentation	159	99.4
Reduction of shade	156	97.5
Removal of mistletoes	150	93.8
Provision of shade	133	83.1
Insecticidal spraying to control capsid pest	129	80.6
Raising of cocoa seedlings before planting	113	70.6
Fungicidal spraying to control black pod diseases	87	54.4
Pegging and line planting	65	40.6

No. of farmers = 160 (Multiple responses)
Source: Field data, March, 2000

Table 37 below refers to the technologies listed in Table 36.

Table 37: Mean level of adoption of cocoa technologies

Adoption	Frequency	%
Low adoption	1	0.6
Moderate adoption	5	3.1
High adoption	43	26.9
Very high adoption	111	69.4
Total	160	100.0

Source : Field data, March 2000

Table 37 showed that the overall level of adoption of cocoa technologies in Ashanti region was generally high. Means, standard deviations and analysis of variance (ANOVA) were computed to compare adoption levels in the study areas in the Region.

The results showed that each district also has a high mean level of the adoption of cocoa technologies (Table 38). This is probably due to the long working experience of the cocoa farmers and their working contacts with the FLS (Tables 7 and 22).

The result of the ANOVA showed 5% level of significance. (Table 39). Comparisons made revealed significant mean differences in the adoption levels between Fumso and Tepa and also between Fumso and Nkawie districts (Table 40). It shows that Fumso district cocoa farmers

have adopted more cocoa technologies than the farmers in either Tepa or Nkawie district. The mean difference between Fumso and Offinso district was not significant. Among Offinso, Nkawie and Tepa districts, the mean differences in the adoption levels were not significant (Table 40).

The rating scale of adoption is based on the number of technologies being adopted by cocoa farmers out of the eleven (11) recommended practices (Table 36). Low adoption = 3-4 technologies adopted; moderate adoption = 5-6 technologies; high adoption = 7-8 technologies and very high adoption = 9 or more technologies.

Table 38: Level of adoption of Cocoa technologies (District by District)

District	No. of farmers	Mean	Std deviation
Fumso	40	4.8500	0.4267
Offinso	40	4.6500	0.4830
Nkawie	40	4.5750	0.5495
Tepa	40	4.5250	0.7506

N = 160

Source: Field data, March, 2000

Table 39: Analysis of variance (ANOVA) for level of adoption

	Sum of Squares	Degree of freedom	Mean Square	F	Sig
Between groups	2.450	3	0.817	2.551	0.058
Within groups	49.950	156	0.320		
Total	52.400	159			

Source : Field data, March, 2000

Table 40: Multiple Comparisons of level of adoption for Districts (LSD)

District (A)	District (B)	Mean difference (A - B)	Std deviation	Sig
Fumso	Tepa	0.3250 *	0.127	0.011
	Offinso	0.2000	0.127	0.116
	Nkawie	0.2750 *	0.127	0.031
Offinso	Fumso	-0.2000	0.127	0.116
	Tepa	0.1250	0.127	0.325
	Nkawie	7.500E-02	0.127	0.554
Nkawie	Fumso	-0.2750*	0.127	0.031
	Tepa	5.000E-02	0.127	0.693
	Offinso	-7.5000E-02	0.127	0.554
Tepa	Fumso	-0.3250	0.127	0.011
	Offinso	-0.1250	0.127	0.325
	Nkawie	-5.0000E-02	0.127	0.693

* The mean difference is significant at the 0.05 level

When asked to indicate factors which influence their adoption of cocoa technologies about 86% of the farmers indicated that income from farms had influence on their adoption of cocoa technologies. Also, about 84% and 81% farmers indicated that the price of farm inputs and price of labour influenced their adoption, respectively. Farmers perceive complexity of the technology as the least factor to influencing their adoption of cocoa technologies. (Refer Table 41).

Table 41: Factors influencing adoption of cocoa technologies as perceived by farmers

Influencing factors	Frequency	%
Income from farm	138	86.3
Price of cocoa farm inputs	135	84.4
Price of labour	131	81.9
Credibility of extension FLS	118	73.8
Farming experience	116	72.5
Relative benefit of technology	116	72.5
Access to credit	105	65.6
Size of farm	85	53.1
Compactibility	82	51.6
Complexity	65	40.6

No. of farmers = 160 (Multiple responses)

Source : Field data, March 2000

Cocoa farmers were also asked to rank factors which influence their adoption levels of cocoa technologies. The analysis of their responses is presented in Table 42.

Table 42: Rating of factors influencing farmers' adoption of cocoa technologies

Influencing factors	No. of farmers	Mean weight of factors
Income from cocoa farm	136	113.5
Price of cocoa farm inputs	138	106.3
Price of labour	132	86.4
Credibility of extension FLS	117	80.9
Farming experience	115	79.7
Access to credit	107	77.9
Size of farm	91	66.0
Relative benefit of technology	111	63.2
Compatibility of technology	84	40.0
Complexity of technology	60	21.3

N = 160 (Multiple responses)

Source : Field data, March, 2000

The result showed that income from cocoa farm was rated the most important with a mean weight of 113.5; followed by price of farm inputs (106.3) and cost of labour (86.4), respectively. The farmers perceived complexity of the technology as the least important factor influencing the adoption of cocoa technologies.

No wonder the farmers rated income from their farms as the most important and major factor influencing adoption of cocoa technologies; followed by prices of farm inputs since it is believed that many farmers usually have low incomes. The prices of inputs and cost of labour are also very high. Therefore, to be able to adopt any technology, the farmers will usually consider the incomes they will derive from their cocoa farms and decide whether they will be able to purchase farm inputs and also have money to hire labour.

Prices of farm inputs and labour have been identified by cocoa farmers as one of the major and most important constraints to cocoa production. This has been supported by extension FLS' perceptions of farmers' constraints. From this study, over 95% cocoa farmers indicated that it was difficult and impossible to have access to assistance from financial institutions.

The farmers have a mean working experience of 23 years with a mode of 15 years. This means that most cocoa farmers are experienced and have been practising certain technologies. Some complexities of technologies may not 'scare' them. Their experience confirms the old adage that 'experience is the best teacher'.

In sum, adoption of technological innovations in agriculture has for many years attracted considerable attention among development economists because the majority of the population of developing countries derive their livelihood from agricultural production and because new

technology seems to offer an opportunity to increase production and income substantially (Feder, 1985).

As observed from the anlayses of the data, brushing of cocoa farms and removal of unwanted basal chupons practices had been adopted by all cocoa farmers (100%). The two (2) practices are usually performed together. It was observed that when a farmer undertakes brushing, the farmer also removes unwanted basal chupons. This is because the farmer does not want to encourage growth of basal chupons which will later compete with the main cocoa tree for nutrients. The researcher was, however, informed that some basal chupons are encouraged to grow when the main cocoa tree is found weak or moribund, so that the chupons would grow to replace them.

Lining and pegging was the least adopted technology due to difficulties involved. As indicated, mean age of the cocoa farmers was over 50 years. It was therefore possible that cutting and conveying pegs to carry out the lining and pegging was a problem. The findings are consistent with Rogers (1983)'s view that the perceived characteristics of the technology are the key determinants of adoption behaviour at the persuasion stage in the innovation –decision process model. He also found that between 49% and 87% of the variance in the rate of adoption were explained by the perceived attributes of the innovation.

Year of first adoption of cocoa technologies by cocoa farmers and frequency of adopted cocoa technologies of farmers are presented in Table 43 and figure 2, respectively.

The analysis of the results (Table 43) showed that few cocoa farmers adopted cocoa technologies, for the first time, in the region between 1946 and 1960. The number of the farmers ranges from one (0.6%) to 5(4.0%).

This finding may be due to the non-existence of an extension organization solely for cocoa extension duties. The Cocoa Services Division, responsible for cocoa extension, was not absorbed by the COCOBOD until 1973 (COCOBOD, 1998; Ampofo, 1999).

Table 43: Year of first adoption of cocoa technologies.

TECHNOLOGY	YEAR	FREQUENCY	%
Raising of cocoa seedlings	1956	5	4.(
Pegging and Line planting	1960	3	3.(
Weeding of farms	1940	1	0.(
Removal of unwanted basal chupons	1949	3	3.(
Insecticidal spraying to control capsid pests	1956	7	4.7
Mistletoes removal	1949	2	1.4
Fungicidal spraying to control black pod disease	1949	2	1.4
Shade manipulation	1949	3	3.(
Harvesting and fermentation of cocoa beans	1946	5	4.(

N = 160 (Multiple responses)

Source : Field data, March, 2000

Frequency curves of adopted cocoa technologies shown in Figures 2a – 2e are raising of cocoa seedlings, lining and pegging, brushing of cocoa farms, removal of unwanted basal chupons, insecticidal spraying and mistletoes removal. Others are fungicidal spraying, shade manipulation, harvesting and fermentation of cocoa beans.

Majority of the adoption curves show gradual growth up to 1970s, followed by a more rapid growth between 1970s and 1980s. The technologies, mistletoes removal, shade manipulation and fungicidal spraying recorded the highest percentage adoption rates by cocoa farmers.

Discussions and interviews with district officers and farmers revealed that, until 1973 cocoa extension was carried out by the MOFA in addition to extension on other crops. Cocoa extension never received special attention. Direct services of Block Planting, Plant-as-you-cut schemes, raising of seedlings and line planting and free mass spraying by the MOFA never encouraged adoption. Few farmers raised seedlings and planted in lines (refer Figure 2). There was therefore a low and gradual rise in adoption rates of technologies from 1960s to 1970s.

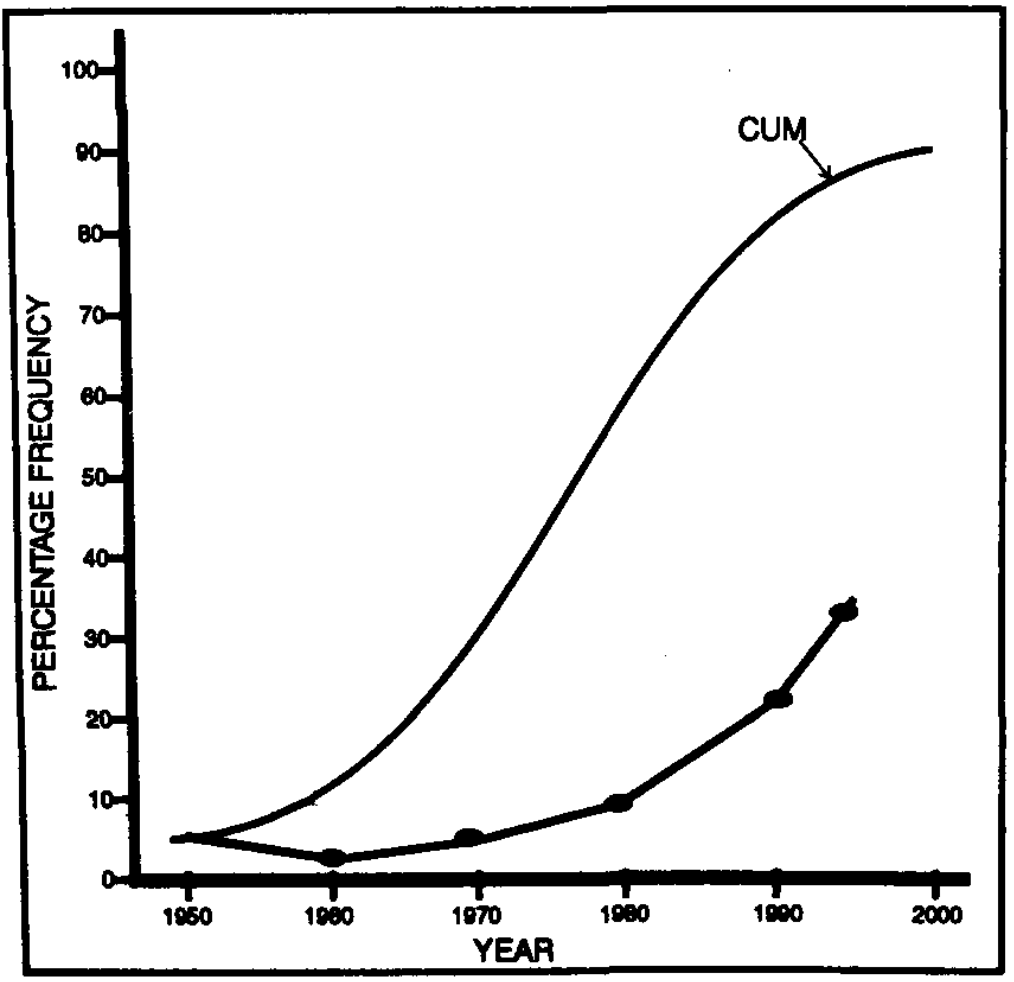
In 1973, the district officers explained that, the COCOBOD absorbed CSD which then became the extension wing of the Board. Cocoa extension (T & V system) became intensified which is reflected in the high and rapid adoption rates shown in Figure 2.

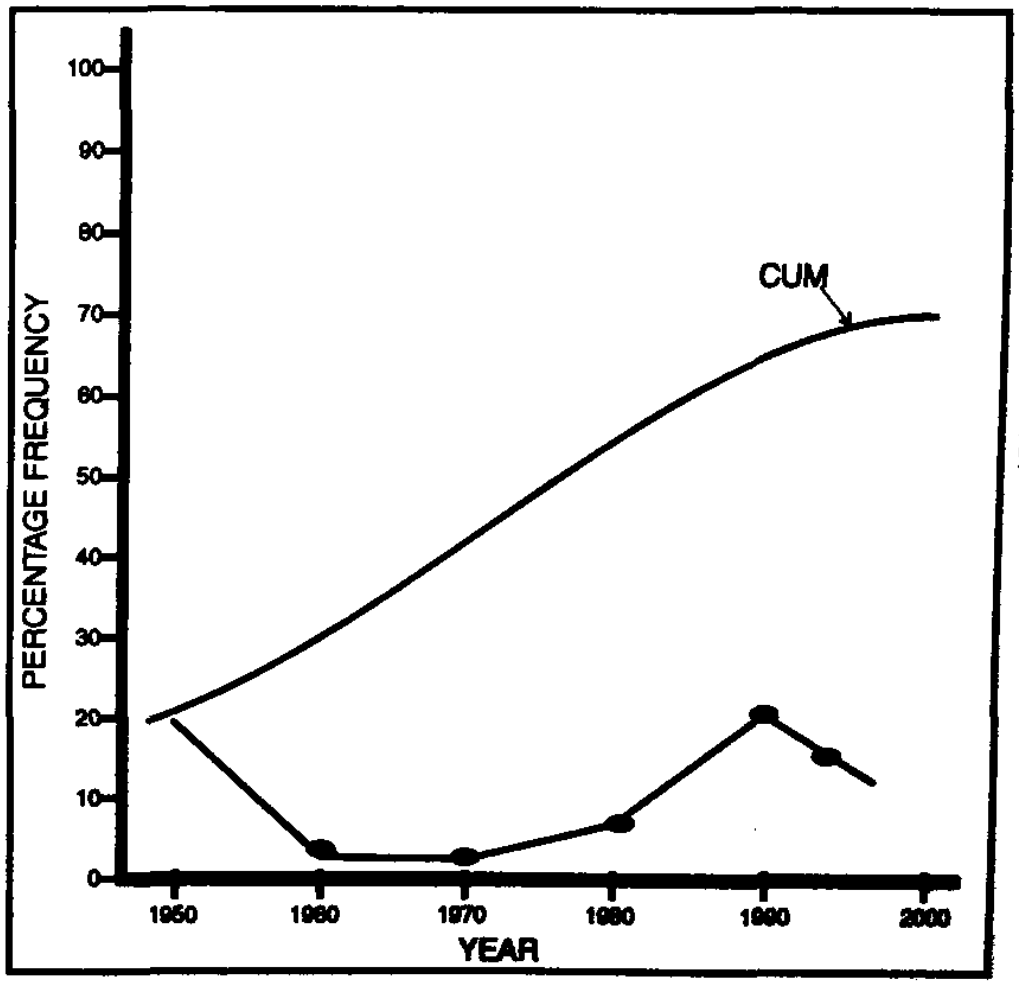
The government's Economic Recovery Programme (ERP) and Cocoa Rehabilitation Project (CRP) in 1985s also helped to encourage farmers' adoption. The producer price of cocoa was increased annually, among other incentives. The adoption rates were sustained up to 1990s except the raising of seedlings and line planting.

The district officers further stated that during the 1990s, the CSD labour pool which assisted cocoa farmers was withdrawn. Direct services which, hitherto, had been undertaken by CSD was also stopped. No doubt some farmers resorted to planting without lining and pegging and poor brushing of cocoa farms which perhaps resulted in the fall in adoption of the two (2) technologies by cocoa farmers (Figures. 2a and 2b).

PERCENTAGE FREQUENCY OF ADOPTED COCOA TECHNOLOGIES

FIG. 2a





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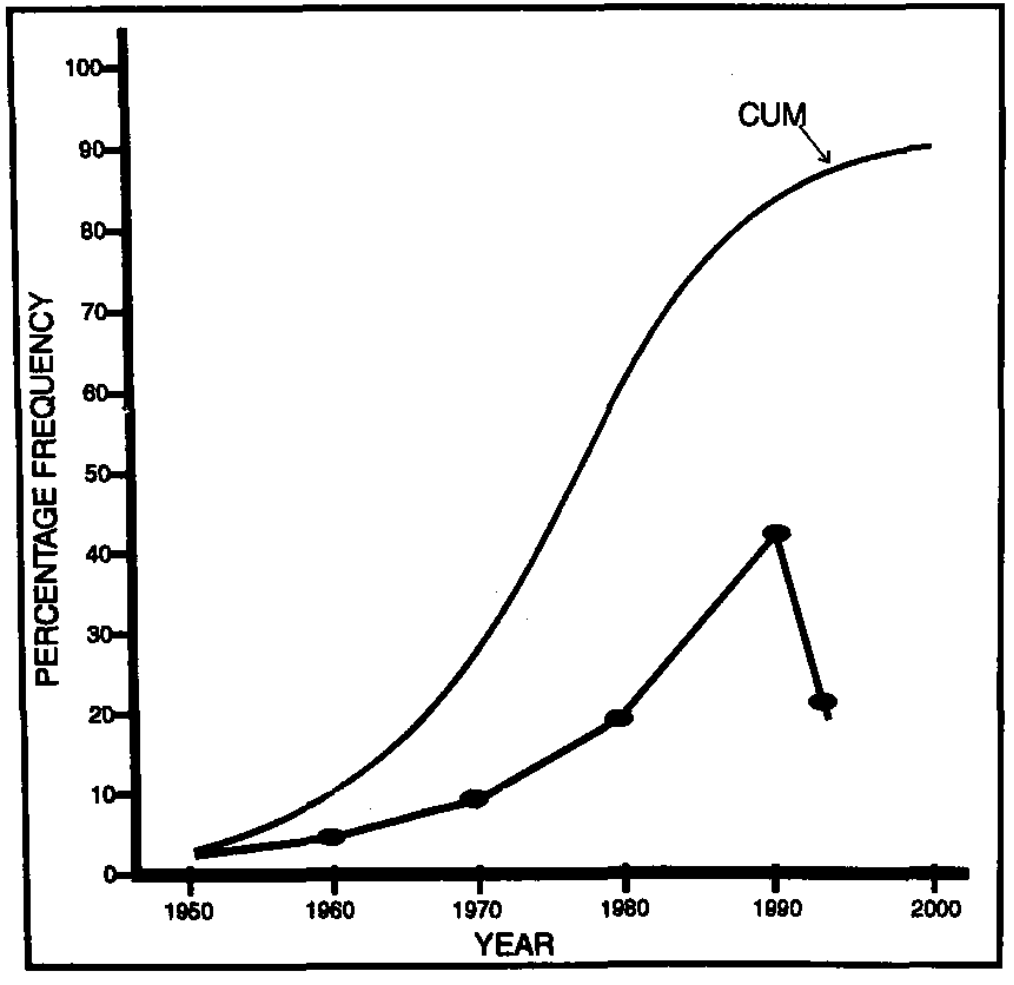
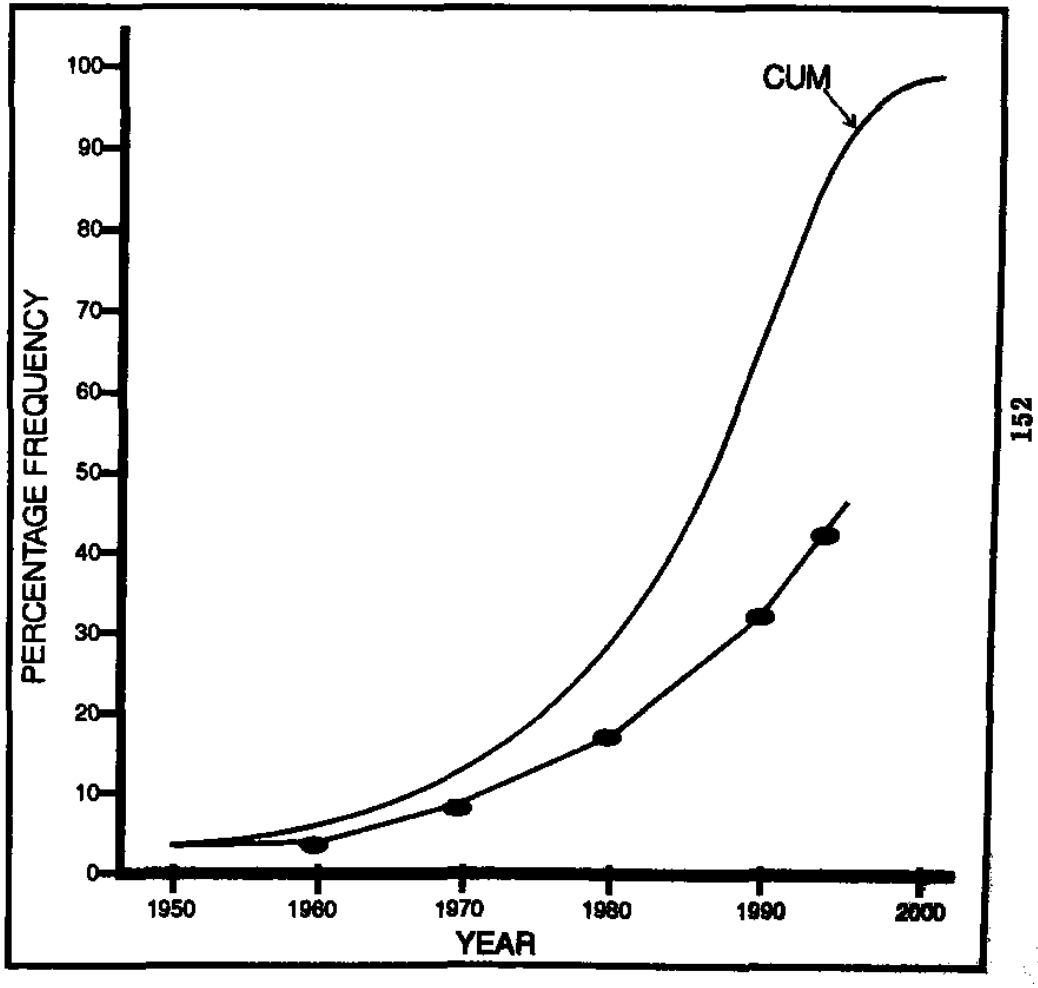
RAISING OF COCOA SEEDLINGS

LINING AND PEGGING

PERCENTAGE FREQUENCY OF ADOPTED COCOA TECHNOLOGIES

FIG. 2b





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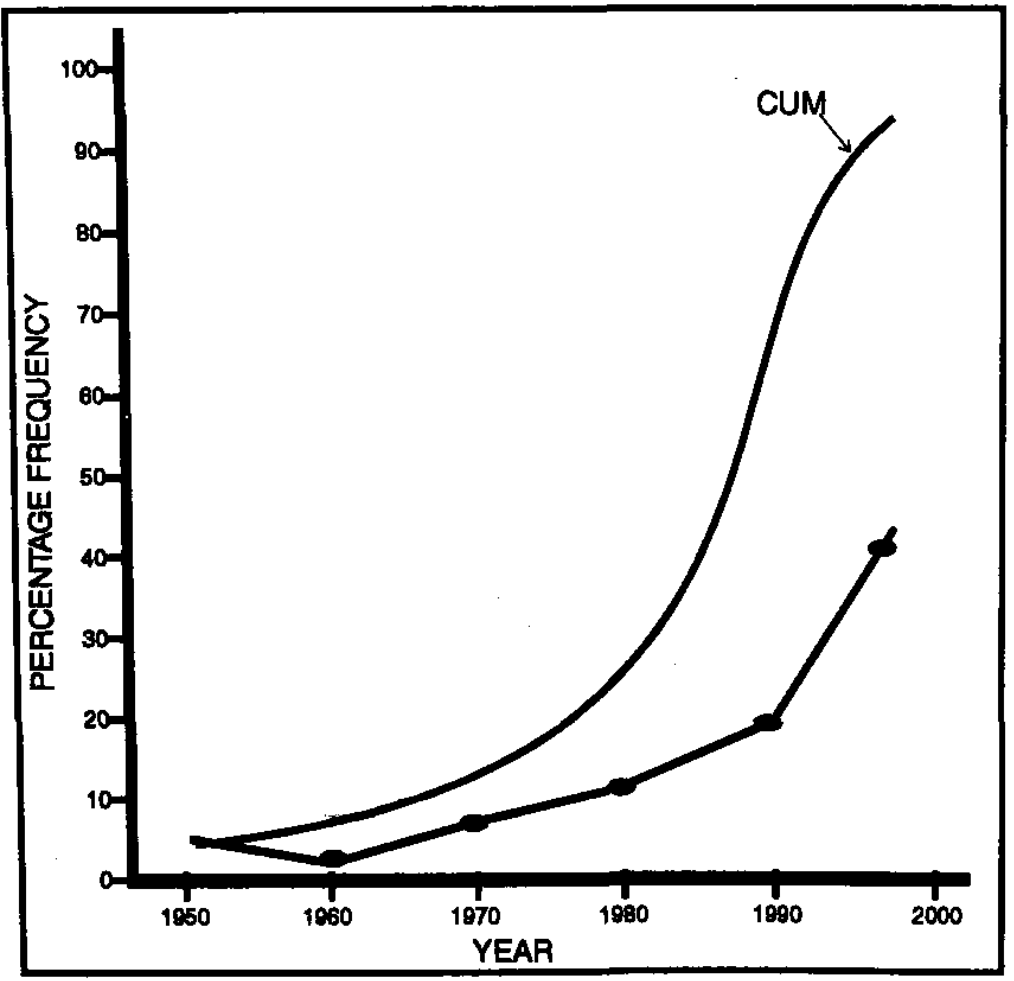
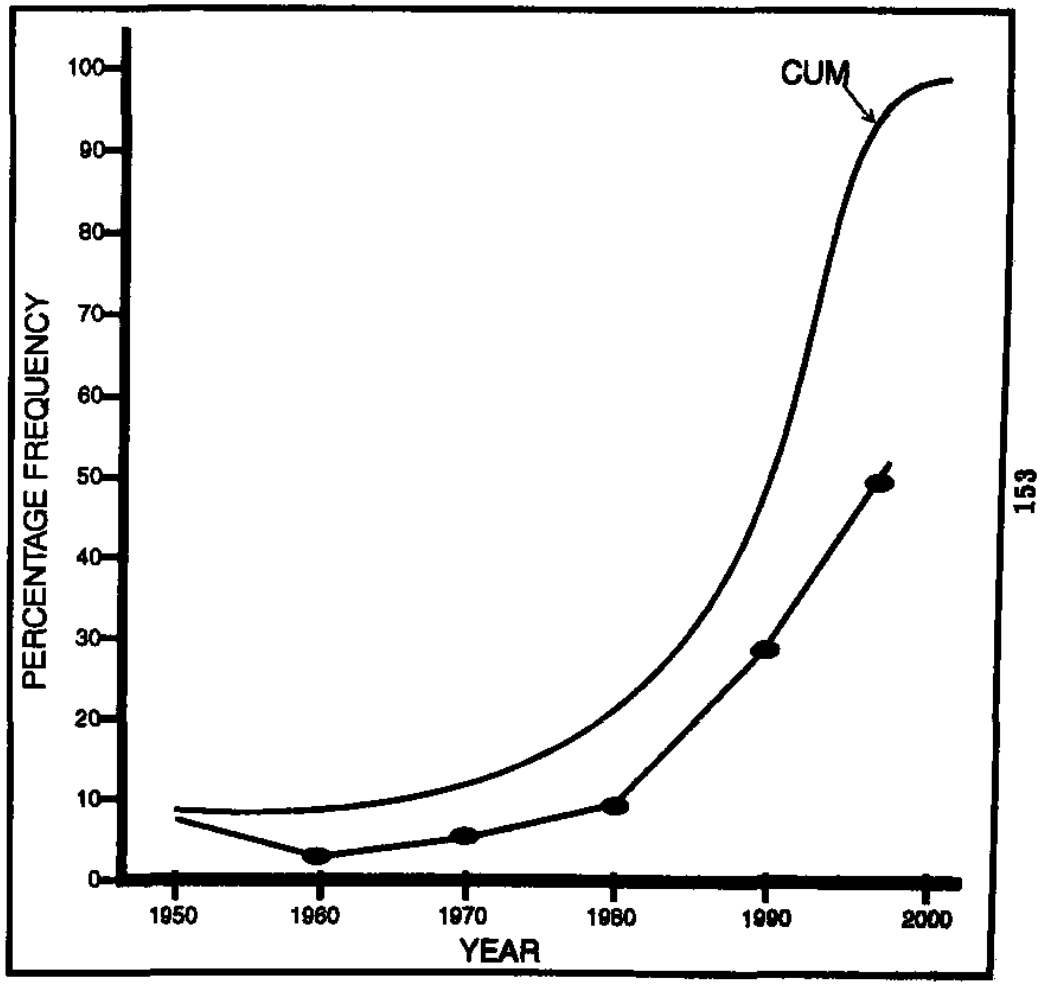
BRUSHING OF COCOA FARMS

REMOVAL OF UNWANTED BASAL CHUPONS

PERCENTAGE FREQUENCY OF ADOPTED COCOA TECHNOLOGIES

FIG. 2c



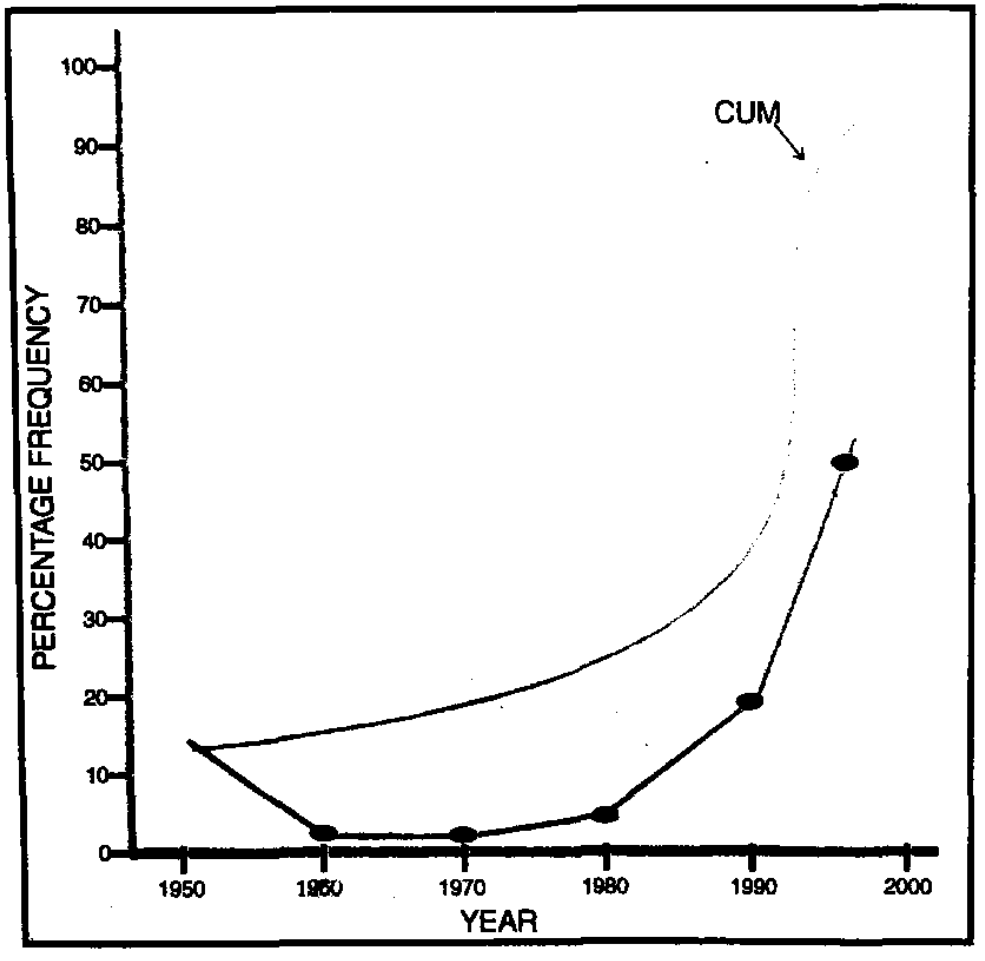


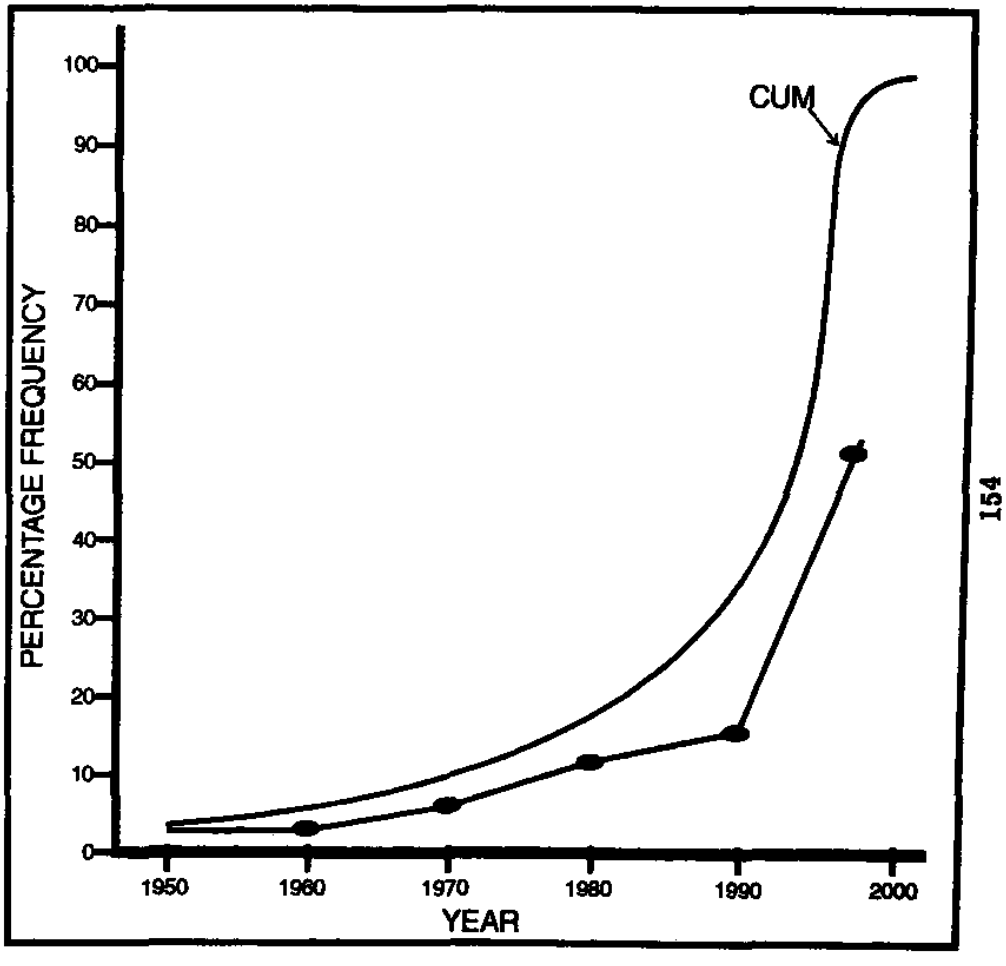
153

INSECTICIDAL SPRAYING

MISTLETOES REMOVAL

FIG. 2d





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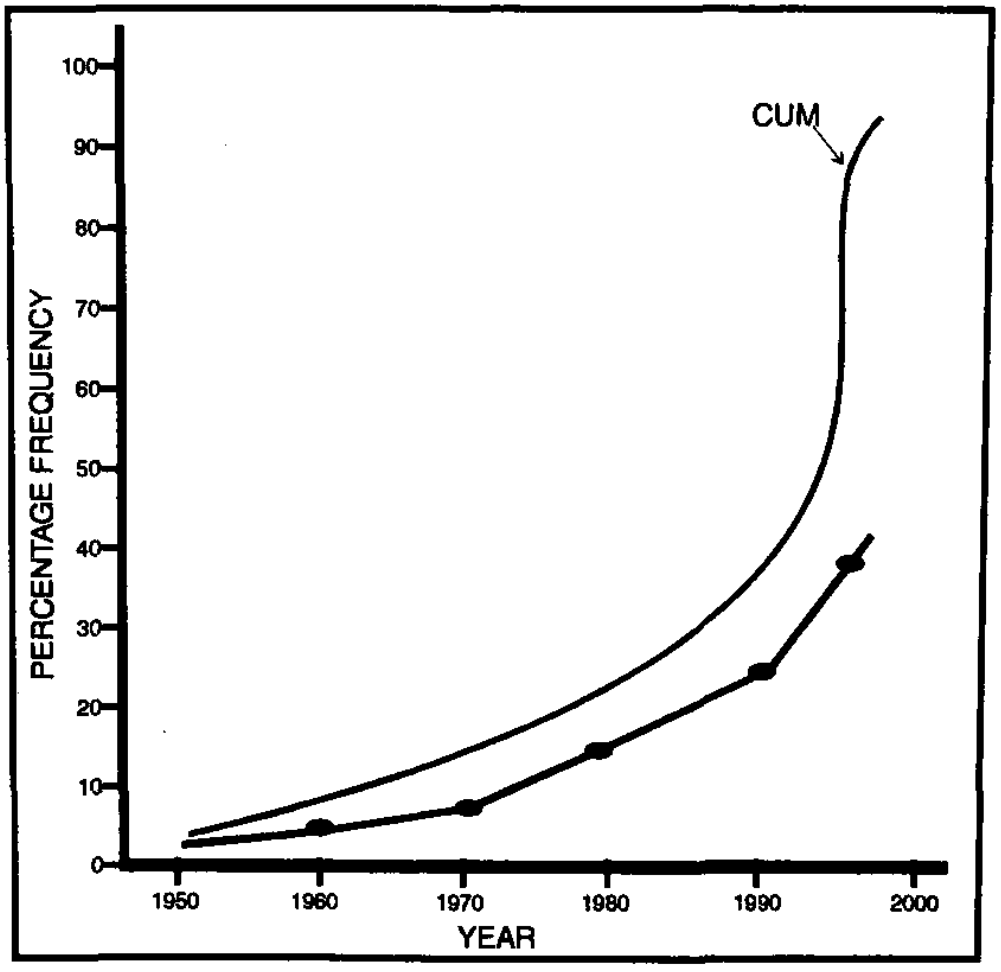
FUNGICIDAL SPRAYING

SHADE MANIPULATION

CUM: CUMULATIVE PERCENTAGE

FIG. 2e



HARVESTING AND FERMENTATION

CUM: CUMULATIVE PERCENTAGE

Cocoa farmers have a role to play in planning, implementation and evaluation of extension programmes. One of the specific objectives of this study was to determine the relationships between cocoa farmers' perceived extent of participation in planning, implementation and evaluation of extension programmes and adoption levels of cocoa technologies.

To do this, the following hypotheses were set and tested at 0.05 alpha level.

1. H_o : There is no significant relationship between cocoa farmers' perceived extent of participation in planning extension programmes and adoption level of cocoa technologies .

   H_1 : There is significant relationship between cocoa farmers' perceived extent of participation in planning extension programmes and adoption level of cocoa technologies.

Table 44 shows that significant relationship exists between farmers' perception of the extent of planning and adoption levels of cocoa technologies ($r = .228$) in Ashanti Region.

This does not support the null hypothesis that there is no significant relationship between cocoa farmers perceived extent of participation in planning of extension programmes and Adoption levels of cocoa technologies. The researcher therefore failed to accept the null hypothesis.

The result has therefore shown that the extent of cocoa farmers perceived participation in the planning of extension programmes is ver important if high adoption levels of cocoa technologies by cocoa farmer were to be achieved.

When extension programmes are planned with cocoa farmers desirable changes in their behaviour are achieved (bin Yahya, 1996) Planning controls the order of a sequence of operations to be performe (Meier, 1970).

Planning is concerned with looking forward and thinking ahead an taking accounts of future development (Mosher, 1986). Hagan (1992 also argued that planning processes should basically require a direct inpu from peasant farmers, fishermen and animal rearers since they form th bulk of the beneficiaries. He also talks of planning as a process o methodical reasoning involving the systematic identification, collation an correlation of elements that are necessary or can contribute to the solutio of a problem or the realisation of a desired goal.

In this study, 96.2% of the respondents said it was important t involve cocoa farmers in all aspects of planning. About 79.4%, 40.0% 55.0% and 40% respondents, respectively indicated they were involved i identification and prioritization of problems, setting up of objectives an review of objectives (Table 25 and 27). When farmers are involved i planning, they are likely to co-operate in the implementation o programmes to make them successful.

2. H_o : There is no significant relationship between cocoa farmers' perceived extent of participation in implementation c extension programmes and adoption level of coco technologies.

H_1 : There is significant relationship between cocoa farmers' Perceived extent of participation in implementation o extension programmes and adoption level of cocoa technologies.

The Pearson product moment correlation coefficients showing relationships are presented in Table 44. The results indicate a highly significant relationship between cocoa farmers' perceived extent of participation in implementation of extension programmes and adoption levels of cocoa technologies, (r = .432). Relationship between planning and implementation was also highly significant (r = .318), indicating that good planning and implementation lead to success or failure of extension programmes.

This is supported by the views of Meier (1970) and Botchie (1986) that poor implementation of plans has been identified as one of the major problems of plan failure. Similarly, Waterson (1965) states that plan formulation should not be divorced from plan implementation. This he said had been the practice for sometime which had led to the failure of some plans. He concludes that nothing is more conclusive to bad

planning than the separation of a plan formulation from provision for follc up in its implementation.

To determine relationship between cocoa farmers' perceived exte of participation in evaluation of extension programmes and adoption lev of cocoa technologies, the following hypothesis was also set and tested 0.05 alpha level.

3. H_o : There is no significant relationship between cocoa farmers' perceived extent of participation in evaluation of extensic programmes and adoption level of cocoa technologies.

H_1: There is significant relationship between cocoa farmers' perceived extent of participation in evaluation of extensic programmes and adoption level of cocoa technologies.

As seen in Table 44, the results of the study indicate a hig significant relationship between cocoa farmers' perceived participation i evaluation of extension programmes and adoption levels of coco technologies (r = .171).

The result does not support the null hypothesis that there is n significant relationship between cocoa farmers' perceived participation i evaluation of extension programmes and Adoption levels of coco technologies. The researcher, therefore rejects the null hypothesis.

By evaluation, farmers learn from experience so as to improv upon the relevance, methods and results of programmes for current an

future work (Appiah and Kannae, 1998). The farmers are helped decision making focusing on where action should be taken, where trainir or specialist help is needed or where further research would be helpfu Evaluation will indicate the effectiveness of extension programm planning, implementation and adoption level.

Table 44: **Pearson product moment correlation co-efficient between cocoa farmers perceived participation in planning, implementation and evaluation of extension programmes and adoption level of coca technologies.**

	X_1	X_2	X_3	X_4
X_1	1.00			
X_2	.228**	1.00		
X_3	.432**	.318**	1.00	
X_4	.171**	.531**	.485**	1.00

X_1 = Adoption X_3 = Implementation

X_2 = planning X_4 = Evaluation

Source : Field data, March 2000

Relationships among demographic characteristics (sex, age, leve of education, working experience) of cocoa farmers and adoption level o cocoa technologies are examined in this section. The relationships are presented in Table 45.

In this study, 135 respondents were males and only 25 we females (Table 1). The long standing emphasis on women's domes labour, principally child rearing has always masked their visit participation in the area of production. As Whatmore (1988) argu women's labour may be divided into two, domestic and wage labo Therefore, where a woman has low income to hire labour and sl provides a high proportion of labour (herself), adoption of technologies likely to be low.

While not significant at the 0.05 alpha level, it is worthy of note th a positive relationship was observed between the age of the responden and adoption level

(r = .089).

Table 3 showed that the mean age of the cocoa farmers was 5 years. La-Anyane (1985) reports that the average age of the farmir community in Ghana lies between 50 and 60 years and affec productivity. He states that in many cases, health and declining age hav a positive relationship between age and work a farmer can do. About ag MASDAR Consultants (1997) also report that it is one of the maj constraints to increased production of cocoa. The older farmers are les able to perform heavy tasks such as spraying which also involve transporting large quantities of water as well as manipulating heav spraying machines. It could therefore be inferred from Table 45 that ag of cocoa farmer has positive influence on adoption of cocoa technologies

The result also identified a significant relationship between coco farmer's level of education and adoption of cocoa technologies. It similar to one observed by Ogunfiditimia (1981) who investigated th relationship between selected socio-economic variables and adoption maize and cocoa varieties in Oyo and Ondo States of Nigeria. Similarl Hailu (1990) finds out that education, farm size, family labour and farm extension contacts determine adoption and use of new technologies whe he studied household characteristics and input supply factors affectin adoption and use level of improved farm practices in small agriculture i northern Ghana.

Table 45: Pearson product moment correlation coefficients, showin relationships among the selected demographic characteristics cocoa farmers and adoption level.

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
X_1	1.00							
X_2	-.158*	1.00						
X_3	.089	-.173*						
X_4	.159*	-.260*	-.317**	1.00				
X_5	.029	-.260*	.692**	-.248	1.00			
X_6	.130	.096	.058	.107	.029	1.00		
X_7	.201*	-.156*	.024	.193*	.022	.207**	1.00	
X_8	.083	-.116	.203	-.077	.271**	.125	.128	1.00

Source : Field data, March, 2000

X_1 = Adoption
X_2 = Sex
X_3 = Age of farmers
X_4 = Level of education
X_5 = Working experience of farmers
X_6 = Working experience with FLS
X_7 = No. of monthly visits to farmer by FLS
X_8 = Size of cocoa farm

Analysis of results of the study show that six(6) independe variables were significantly correlated with adoption level (depende variable) (Tables 44 and 45). The independent variables were sex respondents, educational level of the respondents, number of FLS' vis to cocoa farmer in a month, farmer participation in plannin implementation or evaluation in extension programmes

With the exception of the overall farmer participation implementation of extension programmes, the other statistically significa independent variables were not significant predictors of adoption wh stepwise multiple regression of the independent variables on adopti level was run. This indicates that the implementation variable was tl best predictor of farmer adoption level of cocoa technologies.

From Table 46, R square and Adjusted R square were 0.1 (18.7%) and 0.181 (18.1%) respectively. Farmer participation implementation of extension programmes therefore accounted for 18.1 of the variance in adoption level, the dependent variable.

The result implies that the more a cocoa farmer is engaged in tl implementation of extension programmes, the better for the farmer adopt cocoa technologies. It is therefore, very critical to planners a executors of plans to always ensure farmer participation in tl implementation of extension programmes in Ashanti Region.

The results of this study are similar to one observed by Waters (1968). He states that plan formulation should not be divorced from pl

implementation of programmes. Similarly, Meier (1970) identifie implementation of programmes as one of the major problems of pla failure. He further states that the record of development planning reveal that problems of plan implementation need more attention than problem of plan formulation

Table 46: Stepwise Multiple Regression of variables influencin Adoption Level of cocoa technologies

Factor	Step of Entry	Beta	R Square	Adjusted R Square	Overa
Constant	-	2.977	-	-	-
TOTIMPLE	1	0.432	0.187	0.181	36.25

Source : Field data, March 2000

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 GENERAL OVERIVIEW

This chapter presents the summary of findings of the study, conclusio and recommendations. Suggested areas for further studies have al been indicated.

1.5 SUMMARY OF FINDINGS

Cocoa yield in Ghana is generally low, averaging 391 kg/l (MASDAR Consultancy Report, 1997). Ashanti Region is no exception the low yields and produces 256kg/ha on the average, which is far belc the national average of 391 kg/ha..

This study examined factors that affect farmer adoption levels cocoa technologies in Ashanti Region.

Specifically, the study was directed by the following objectives:

1. to describe the demographic characteristics of cocoa farmers a extension staff (FLS) in respect of Sex, Age, Level of educati and Farmers' working experience.
2. to determine mode of land acquisition for cocoa farming
3. to assess cocoa farmers' access to credit facilities.
4. to assess sources of labour to cocoa farmers.

5. to identify cocoa varieties cultivated in Ashanti Region of Ghana.
6. to determine cocoa farmers' contacts with extension FLS.
7. to identify cocoa technologies being extended to cocoa farmers.
8. to assess cocoa farmers' preferences of extension methods use by FLS.
9. to determine cocoa farmer participation in plannin implementation, monitoring and evaluation of extensic programmes.
10. to determine cocoa farmers and FLS' perceived problen associated with cocoa production.
11. to determine farmers' adoption levels of cocoa technologies.
12. to determine the relationships of farmers' participation in plannin implementation and evaluation of extension programmes ar adoption levels of cocoa technologies.
13. to examine relationships among the selected demograph characteristics and farmers' adoption levels of cocoa technologies

To describe relationships between the selected demograph characteristics and farmer participation in planning, implementation ar evaluation of extension programmes on adoption levels of farmers, descriptive-correlational design was used to conduct the study.

The main study was conducted in Fumso, Tepa, Offinso an Nkawie districts in Ashanti Region. Target population were cocoa farmer and extension FLS. Sample sizes were 160 cocoa farmers and 80 FL

Separate questionnaires were designed for the farmers and the FLS. Pi testing of questionnaires were done in Obuasi district. Data collect were analyzed with computer software, Statistical Package for Soc Sciences (SPSS).

A majority (75%) of the cocoa farmers were males and 25% we females for the study. The age of farmers ranged from 29 to 90 years w a mean and mode of 54 years and 45 years, respectively. Farmers bel 40 years were 14.4% of the total respondents.

Of the total 80 FLS sampled for the study, 96.2% were males a 3.8%, females. Their ages ranged from 27 to 59 years. Most of the Fl were 40 years of age. However, their mean age was 42 years.

According to the results 48.8% farmers had no formal educati while 49.4% had certificates. Only 2 (1.3%) and one 0.6%) responder possessed diploma and BSc degree, respectively.

The findings of the study also showed that farmers' worki experiences ranged from 4 to 70 years with a mean of 23 years. Most them had 15 years working experience.

The result further revealed that the highest level of education of t FLS was a Middle School Leaving Certificate. Only one had a diplom They had working experiences from 4 to 37 years. The FLS mean yea of experience was 13 years but many of them had 8 years worki experience.

Sources of land for cocoa cultivation in the region were main family land, purchased land, share-cropping contract and leasehold. Ov 61% respondents farmed on family lands; 17.5% were share-croppers ar 12.5% farmed on purchased lands. Only 6.9% of the respondents we leaseholders.

Most (75.8%) farmers established farms from their own savings ar 11.9%, did establish their farms with loans from money-lenders. Fe (6.3%) farmers established farms with bank loans.

About 70% farmers indicated that, it was difficult to receive financi assistance from banks because of high interest rates, cumberson processing procedures and lack of security.

The source, availability, effectiveness, percentage of labo provided by family and prices of labour per manday in the region we assessed. Four (4) sources, caretaker labour, family labour, hired labou communal labour were identified. Of the 4 sources, caretaker provide labour to 45% farmers, followed by family labour (25.6%) and hired labo (20.6%). Communal labour accounted for only 9.4% labour. Howeve over 57% of cocoa farmers had difficulty in obtaining labour to work c their farms.

The overall effectiveness of labour was moderate as perceived b the farmers. Family labour was the most effective ($\bar{x}$ = 3.481) a perceived by the farmers; followed by hired labour ($\bar{x}$ = 3.450) ar caretaker labour ($\bar{x}$ = 3.381). The least effective source of labour wa

communal labour ($\bar{x}$ = 2.319). The price of hired labour per mand ranged from ¢3000.00 to ¢10,000.00 with a mean price of ¢4884.3 approximately ¢5000.

In the Region three cocoa varieties, Amelonado, Amazor a hybrids have been cultivated. Five percent (5%), 11.3% and 20% of t respondents, have planted Amelonado, Amazon and hybrids in th farms. About 63% have mixed stands or plantings in their farms.

All farmers have contacts with FLS except 2(1.3%) responden About 68% of them have worked with FLS between seven (7) and over t (10) years. The farmers mean working experience in years with FLS w four (4) years and they receive one to four or more monthly visits fr extension FLS. Majority of them (56.3%) received one visit in a mon 9.4% respondents had four or more visits in a month while others receiv two or three visits.

Cocoa technologies which were being extended to farmers in t Ashanti region were the raising of cocoa seedlings before planting; lini and pegging of cocoa fields; brushing of undergrow of cocoa farm removal of unwanted basal chupons; insecticidal and fungicidal sprayi to control mirid pests and black pod disease. Others were removal mistletoes; shade manipulation, regular harvest of pods, breaking a fermentation of cocoa beans and proper drying techniques.

Extension education methods used by the FLS were gro discussions, method and result demonstrations, lecture, farm trip/to

farm visits and home visits. The farm visit was the most preferred metho as perceived by the farmers. The least preferred method was the lectur The order of preference by the respondents were farm visit ($\bar{x}$ = 4.588 group discussion ($\bar{x}$ = 4.394), method demonstration ($\bar{x}$ = 4.050) resu demonstration ($\bar{x}$ = 3.541), home visit ($\bar{x}$ = 3.494), farm trips/tours ($\bar{x}$ 2.945) and lecture ($\bar{x}$ = 2.805).

The farmers stated that they preferred the farm visit because the had the opportunity to ask questions in the field and also received reac answers. In addition they stated that frequent farm visits encourage them to adopt recommended practices. The lecture method was n preferred because the farmers cited their old age and low levels education as their limitations. They also stated that enough time was n given to farmers' questions.

The analysis of results of the study also showed that cocoa farme participated in identification and prioritization of problems, Setting up ar Review of objectives in planning of extension programmes.

Generally, over 94% of the cocoa farmers participated in extensio programmes through FLS' initiative. More cocoa farmers (60%) we highly involved in the identification of problems than any other aspect planning; 37.5% of the respondents participated in setting up of objective Occasionally, 31.3% respondents were involved in the prioritization problems and 53.8% lowly participated in the review of objectives.

The results also revealed that 80% of the respondents participat in implementation of cocoa technologies which the FLS extend particularly in brushing, harvesting of cocoa pods, breaking a fermentation of cocoa beans, drying and marketing. Low participation w observed for fungicidal spraying to control black pod disease.

The findings further revealed that about 59% of the responde were not involved in monitoring of programmes. Those who participat were involved through farm visits, rallies, group meetings, demonstratic and farm maintenance levels of cocoa farms. The farmers participated evaluation of extension programmes through brushing of cocoa farn removal of mistletoes, harvesting and breaking of cocoa po fermentation and drying of cocoa beans was high. Low participation evaluation was revealed by the results. Occasionally, farmers w involved in evaluation of effectiveness and efficiency of labour a relative advantage of the technology.

Problems identified which adversely affected cocoa production the region were high price of land, unavailability and high price of coc farm inputs, lack and high price of labour, and lack of credit facilities farmers and poor maintenance of cocoa farms, particularly brushing a ineffective pests and disease control.

Others problems were old age and poor health of cocoa farme illiteracy and low level of education of cocoa farmers, absentee and pa time farmers. Insufficient extension FLS, poor condition of feeder roa

low producer price of cocoa and delays in the payments of 'Akuaf cheques were also identified. In addition destruction of cocoa farm through timber firm activities and bush fires posed problem.

According to the results, the overall adoption level of cocc technologies in the region was high; 96.3% of the respondents ha adopted seven (7) to nine (9) and more technologies. Five (3.1% respondents had adopted five (5) to six (6) technologies while only or (1.3%) had adopted three (3) to four (4) of the cocoa technologies. Th adoption levels were also high in the districts.

The results further showed high significance between the over planning and implementation of extension programmes and cocc farmers' adoption levels of cocoa technologies at .05 alpha leve Statistically, the relationship between the overall farmer evaluation extension programmes and adoption levels was also significant.

From the findings, the selected demographic characteristics (se age, level of education and working experience) of cocoa farme correlated with adoption levels of cocoa technologies at .05 alpha level.

Correlation between sex and adoption levels of cocoa technologie was significant but negative (r = -.158)) at .05 alpha level. Age, level education and working experience were positively correlated with th adoption levels. The correlation between the level of education ar adoption level was also significant at .05 alpha level.

The results of a stepwise multiple regression run for the significa variables (sex, level of education, number of monthly visits to farmers FLS, farmer participation in the overall planning, overall implementati and overall evaluation) on adoption level showed that the farm participation in the overall implementation of extension programmes w the best predictor of the adoption level. The adjusted R square was 0.1 (18%) indicating that 18% of the variance in adoption can be explained its linear relationship with participation in implementation.

5.2 CONCLUSIONS

The following conclusions can be drawn from the study:

Conclusion 1

Most of the cocoa farmers in the Ashanti region are males and f are females. This might have accounted for family labour being rated an effective source of labour.

Conclusion 2

Cocoa farmers in the region have rich working experien averaging 23 years. Majority of them have worked for 15 years.

Again, it would appear that lack of technical knowledge on the p of many farmers is not a constraint to increased production of coc Most of the respondents had rich working contact with extension FLS.

The inference is that majority of the farmers interviewed were w aware of the recommended practices, how, why and when they should b applied. The main constraint to increased productivity have bee identified as being related to socio-economic conditions.

Conclusion 3

The percentage of cocoa farmers who had no formal education w about the same as those with certificates. Handling of these two (heterogenous populations by the FLS would pose a limitation. Ma cocoa farmers would find it difficult to decode extension information a messages.

Conclusion 4

Most cocoa farmers farmed on family lands. It was observed th sizes of cocoa farms in the region were small, perhaps due fragmentation of cocoa farms to other family members. It also becam clear from interviews and discussions that litigations on family lan usually abound. This was supported by FLS' perceptions of coc farmers' constraints to cocoa farming.

Conclusion 5

Eleven cocoa technologies have been recommended to cocc farmers in the Ashanti Region as a package, but this was not feasib because of capital scarcity and risk considerations perceived by farmers.

Majority of the farmers do not have access to financial credit fro banks. It was observed that farmer's capacity to repay credit was low.

Conclusion 6

Cocoa farmers ranked individual farm visits as the most preferre extension method, followed by group discussions. This is laudable sinc the farmers would have the opportunity to ask practical questions in tl field and also receive ready answers.

However, individual farm visits are usually expensive and son farmers would not be covered. On the other hand, more farmers a educated through group discussions.

Conclusion 7

The results showed that over 94% of the cocoa farmers d participate in planning, implementation, monitoring and evaluation extension programmes through extension FLS' initiative. The farme were more involved in implementation activities than in plannin monitoring and evaluation of programmes.

Taking into consideration that majority of the farmers depend FLS for information and messages, there is the need to deeply involve t FLS in programming since extension programming has always been a t down approach and FLS only act as implementers.

Conclusion 8

The adoption level of cocoa technologies was high in the distri and in the Region as a whole. However farmers in Fumso district ha adopted more cocoa technologies than other districts in the study areas

Conclusion 9

The importance of socio-economic and other perso characteristics which influenced adoption in previous research w supported in this study.

Variables such as sex, age of the farmers (at an average age of years), their level of education and working experience correlated w adoption levels of cocoa technologies. However, sex relationship with adoption level was significantly negative. All other demograp characteristics were positively correlated with adoption level of co technologies.

Conclusion 10

Effectiveness of family, communal, hired, caretaker labour and siz of farms were positively correlated with adoption levels, though n significant statistically (0.05 level).

Conclusion 11

Farmer participation in implementation of extension programmes wa the best predictor of adoption of cocoa technologies in the Ashanti Regio This accounted for 18.1% of its association with the adoption level. Th adjusted R square was .181 (18.1%). It is therefore critical and importa that planners and executors of extension programmes focus mo attention to implementation of programmes . This supports Meier (197 and Botchie's (1986) statement that the record of development planni reveals that problems of implementation need more attention tha problems of formulation.

5.3 RECOMMENDATIONS

Based on the findings of this study and discussions, the followi recommendations are being made for consideration in improving adopti of cocoa technologies in the Ashanti Region of Ghana.

Recommendation 1

Land, as a factor of production, is limited and scarce both quantity and quality. Land-owners should therefore be encouraged release land on lease to prospective investors if the land cannot be s outright.

Also, farmers should be encouraged to replant cocoa on previou cropped lands in old cocoa growing areas.

Recommendations 2

The availability and cost of labour are frequently mentioned major constraints to increased cocoa production. Labour has a pervas influence on cocoa farm maintenance. Andreae (1980) quotes manc per hectare of cocoa as 25.7 – 96.0 depending on the intensity cultivation.

Cocoa farmers also perceive the cost of labour as high. In t study, about 86% of the respondents indicated that the mean price ¢4884.36 (approximately ¢5000.00) per manday was high.

To assist cocoa farmers have easy access to labour, a labour p should be formed in cocoa growing districts in the region by the Gha Cocoa, Coffee and Sheanuts Farmers' Association (GCCSFA).

Recommendation 3

The supply of cocoa farm inputs to farmers continues to be problem in that the recommended inputs are not available on time and ar expensive and needed to be purchased when cocoa is in the lean seasor

The findings of this study and discussions have revealed tha distances from the cocoa farm input stores to the villages of farmers rang from less than 16km (10 miles) to 80km (50 miles) and over.

Most of the farmers (90%) buy inputs from less than 16km to 32kr (20miles). The researcher of this study therefore recommends that mor cocoa farm inputs stores be set up in the Ashanti Region to reduc farmers' fares to and from the input stores.

Vigilance should be kept on declining balances in the stores t ensure prompt orders for replenishments. Over 63.1% of the respondent indicated that farm inputs were not always available.

The issue of subsidy on cocoa farm inputs should be revisited.

Recommendation 4

It is usually difficult for cocoa farmers to obtain credit to financ operations related to cocoa production. High interest rates, cumbersom processing procedures and lack of security and confidence in the coco farmers' ability and willingness to repay loans have been identified a constraints influencing farmers' access to credit.

The researcher therefore recommends that COCOBOD wc provide 'seed money' to banks for on-lending to farmers at lower inte rates to purchase cocoa farm inputs to enable farmers step maintenance of cocoa farms.

Recommendation 5

Education supports farmers' ability to decode information messages. About 48% of the respondents have no formal education about 49% possess certificates. Intensive extension education of farn on the need for effective crop management practices is recommended

To do this, the researcher recommends that all farmers hoste the CSD cocoa stations be renovated for the education on cc technologies.

Recommendation 6

Ineffective and inefficient extension services have been cited as a re: in the past for poor adoption rates by farmers of the impr recommendations (MASDAR Consultancy Report, 1997).

This study has, however, indicated high adoption levels of c technologies. To sustain the adoption levels and diffusion of the adc technologies, it is recommended that FLS should be supported adequate logistics, especially accommodation and motor-bikes, to er the FLS visit the cocoa farmers regularly.

Recommendation 7

The study identified low producer price of cocoa, delays in t payments of 'Akuafo Cheques' for cocoa produce purchased and p conditions of feeder roads in cocoa growing areas as constraints to coc production in the region.

The producer price of cocoa has been progressively increas since the start of the Cocoa Rehabilitation Project (CRP). The coc farmers still perceive the price as low inspite of the gradual increases the price because of inflation and devaluation of the cedi.

To sustain farmers motivation to increase production, the produ price should be further increased. Hindrances to prompt payments of 'Akuafo cheque' should be identified and addressed and feeder roads cocoa growing districts in the region need be improved.

Recommendation 8

Finally it has been observed that bush fires and activities of timber fi destroy some cocoa farms. Intensive education programmes avoidance of bush fires and formation of more bush fire squads in districts are recommended.

Sanctions should be applied to timber firms which destroy co farms through their activities. In addition to compensations which are p to the affected farmers, the timber firms should be compelled to r cocoa seedlings for supply to the farmers.

5.4 SUGGESTED AREAS FOR FURTHER STUDY

1. Socio-economic survey of cocoa farmers in the Region should done in relation to their access to land and financing.
2. It is suggested that the study be extended to other districts in Region.
3. This study should be repeated with time to show the general tr of adoption rates and the factors, which influence adoption of cc technologies.
4. A study on the re-introduction of subsidies on cocoa farm inp and
5. A more critical look at the credit delivery to cocoa farmers.

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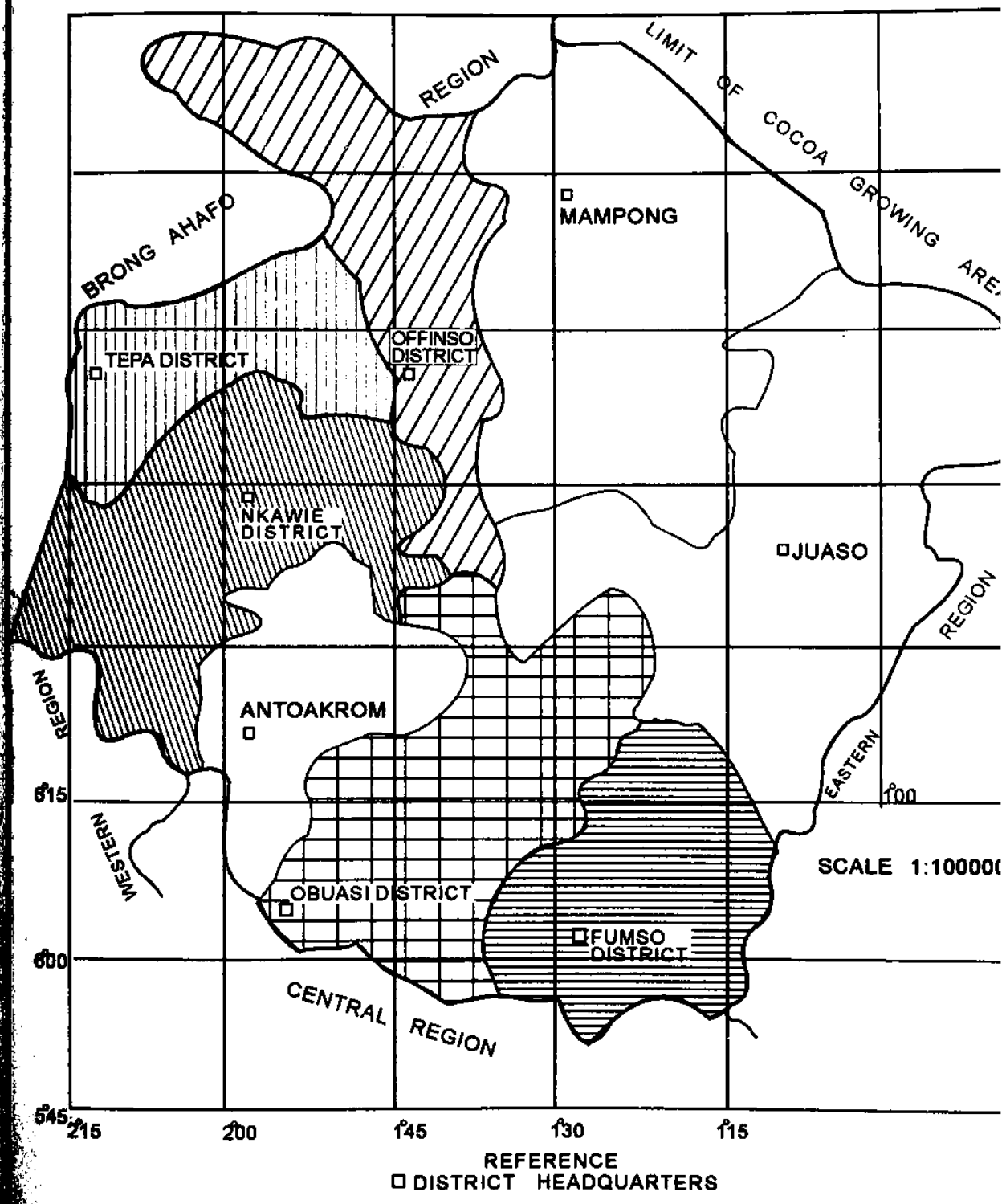
DISTRICT MAP OF ASHANTI REGION SHOWING STUDY AREAS



APPENDIX II

QUESTIONNAIRES FOR COCOA FARMERS PERCEPTIONS OF EXTENSION PROGRAMMES AND ADOPTION LEVELS OF COCC TECHNOLOGIES.

1. District
   (a) Where do you live? .....
   (b) Name of Extension Unit .....
2. Gender (please tick)
   (a) Male ( )
   (b) Female ( )
3. Please indicate your age at your last birthday ( ) years.
4. Please indicate your highest level of education. (Please tick)
   (a) No formal education ( )
   (b) Certificate ( )
   (c) Diploma ( )
   (d) Degree (BSc) ( )
   (e) Other (specify) ( )
5. How many years have you been a cocoa farmers ..... Ye
6. Please indicate the size of your cocoa farm in acres .....
7. Which type of cocoa is grown in your farm? Tick all the apply
   (a) Amelonado ( )
   (b) Amazon ( )
   (c) Hybrid ( )
   (d) Mixed ( )
8. Which of the following crops do you grow apart from cocoa? all that apply
   (a) Coffee ( )(b) Maize ( ) (c) Cassava (
   (d) Plantain ( ) (e) Citrus ( ) (f) Oil Palm (
   (g) Coconut ( ) (h) Others (specify) .....

9. Are you resident in your cocoa farm? Yes ( ) No (

10. How far is your village from the cocoa farm? Please tick

(a) less than 5 miles ( ) (b) 5 - 10 miles ( )

(c) 11 - 15 miles ( ) (d) 16 - 20 miles ( )

11. Indicate the size of your total land

(a) Less than 5 acres (b) 5 - 10 acres

(c) 11 - 15 acres (d) 16 - 20 acres

(e) Over 20 acres

12. What is the approximate size of your total land under:

(a) Cocoa ..... acres (b) Other crops ..... acres

(c) Uncultivated/bush ..... acres

13. Do you always have labour to maintain your cocoa farm?

Yes ( ) No ( )

14. Kindly indicate your source(s) of labour for maintenance of cocoa farm. (a) Family ( ) (b) Hired ( )

(c) Communal (Nnoboa) ( ) (d) Caretaker ( )

(e) Other (specify) .....

15. What proportion/percentage of labour is provided by your fa (yourself, wife and children) during cocoa season? Tick

(a) Less than 10% ( ) (b) 10 – 20% ( )

(c) 21 – 30% ( ) (d) 31 – 40%

(e) Over 40% ( )

16. How will you assess the availability of hired labour in your are maintenance of cocoa farms. Please tick

(a) Very easy to come by ( ) (b) Easy to come by (

(c) Difficult to come by ( ) (d) Very difficult to come b

(e) Not available ( )

17. How will you rate cost of hired labour in your area?

(a) Very high (b) High (c) Moderate

(d) Low (e) Very low

18. Please indicate labour cost per manday (by-day) in your a
.....cedis

19. Is communal labour (Nnoboa system) in existence in your area'
Yes ( ) No ( )

20. Do you also take part in 'Nnoboa' operation? Yes ( ) No (

21. If yes, what period of the farming season do you use 'Nnoboa' syst
.....
.....

22. For what farming operation(s) do your use 'Nnoboa system?
.....
.....

23. If you do not take part in 'Nnoboa' system what are your reasons?
.....
.....

24. In your perception, rate the effectiveness of the sources of lal
Please circle your rating against each source.

Source of Labour	Perception of Effectiveness				
	Very Effective	Effective	Moderate	Less Effective	Least Effecti
Family	5	4	3	2	1
Hired	5	4	3	2	1
Communal (Nnoboa)	5	4	3	2	1
Caretaker	5	4	3	2	1

25. From what source(s) of finance did you get capital to establish cocoa farm(s)? (a) Own savings ( ) (b) Family (c) Bank Loan ( ) (d) Friends ( ) (e) Money Lender Other (specify) .....

26. Have you ever received any financial assistance from any fina institution? Yes ( ) No ( )

27 How do you describe access to financial assistance from the institution? (a) Very easy ( ) (b) Easy ( ) (c) Difficult (d) Very difficult ( ) (e) Very difficult ( ) (f) Impossible (g) State any other .....

28. What has been the major problem in credit acquisition? (a) High interest rate ( ) (b) Cumbersome proce procedure ( ) (c) No collateral security ( ) (d) State others .....

29. Do you get necessary cocoa farm inputs to buy when you need th Always ( ) No ( ) sometimes but not always (

30. Which of the following cocoa farm input(s) do you possess? (a) Cutlass ( ) (b) Spraying machine ( ) (c) Standard pruner ( ) (d) Insecticides ( ) (e) Fungicides ( ) (f) Fertilizers ( ) (g) Others (specify) .....

31. How far is the cocoa farm inputs store from your village? (a) Less than 16 km 910 miles) (b) 16-32 km (11-20 miles (c) 33-48 km (21-30 miles) (d) 49-64 km (31-40 miles (e) 65-80 km (41050 miles) (f) More than 50 miles.

32. How long have you been working with extension worker in your locality? Please tick. (a) Not yet ( ) (b) Less than 3 years (c) 3-6 years ( ) (d) 7 – 10 years ( ) (e) More than 10 year

33. How many times in a month does the extension agent visit you Please tick. (a) Once ( ) (b) Twice ( ) (c) Three (d) Four or more ( )

34. Have you been involved in planning extension programmes for area? Yes ( ) No ( )

35. Through whose initiative do you take part in extension programme (a) Own initiative ( ) (b) Group discussion ( ) (c) Extension Agent ( ) (d) Leader (executive memb a group) ( ) (e) Other (please state) .....

36. Which aspects of planning are you involved?

(a) Identification of problems ( )

(b) Prioritization of problems ( )

(c) Setting up of objectives ( )

(d) Review of objectives ( )

37. How do you consider the involvement of cocoa farmers ir aspects of extension programmes? (a) Very important ( )

(b) Important ( ) (c) Somewhat important ( )

(d) Not important ( ) (e) Not very important ( )

38. To what extent do you participate in the following plan activities?

Aspects of Planning	Extent of Involvement				
	Very High	High	Occasionally	Low	Very
Identification of problems	5	4	3	2	1
Prioritization of problems	5	4	3	2	1
Setting up of objectives	5	4	3	2	1
Review of objectives	5	4	3	2	1

39. Which aspects of implementation/delivery of cocoa extension programmes are you involved? Please tick all that apply.

	Yes	No
i. Acquiring cocoa farm inputs	( )	( )
ii. Raising of cocoa seedlings	( )	( )
iii. Brushing of cocoa farms	( )	( )
iv. Removal of unwanted basal chupons	( )	( )
v. Removal of mistletoes	( )	( )
vi. Spraying insecticides to control pests in cocoa farm	( )	( )
vii. Spraying fungicides to control blackpod disease in cocoa farm	( )	( )
viii Harvesting of cocoa pods	( )	( )
ix. Fermentation of cocoa beans	( )	( )

x. Drying of fermented cocoa beans ( ) ( )

40. To what extent do you participate in the follov delivery/implementation activities?

Aspects of Delivery/ Implementation	Extent of Involvement				
	Very High	High	Occasionally	Low	Ver
Acquisition of farm inputs	5	4	3	2	
Raising of cocoa seedlings	5	4	3	2	
Brushing of cocoa farms	5	4	3	2	
Removal of mistletoes	5	4	3	2	
Spraying of insecticides to control pests	5	4	3	2	
Spraying fungicides to control blackpod disease of cocoa	5	4	3	2	
Harvesting of cocoa pods	5	4	3	2	
Fermentation of cocoa beans	5	4	3	2	
Drying of fermented cocoa beans	5	4	3	2	
Marketing of dried cocoa beans	5	4	3	2	
Removal of unwanted basal chupons	5	4	3	2	

41. Are you involved in the monitoring of extension programmes?

Yes ( ) No ( )

42. Indicate how you are involved in extension programme monitorir

i .....

Ii .....

iii .....

iv .....

v. .....

43. Which aspects of evaluation are you involved in cocoa exter programmes?

	Yes
Assessment of credit	( )
Acquisition of farm inputs	( )
Maintenance of cocoa farms	( )
Effectiveness of Labour	( )
Efficiency of labour	( )
Relative advantage of technologies	( )
Compatibility of technologies	( )
Relevance of programme	( )
Impact of programme	( )

44. Indicate how you are involved in Extension programme evaluat

i. .....

ii. .....

iii. .....

iv. .....

v. .....

45. To what extent do you participate in the following evalua activities?

Aspects of Evaluation	Extent of Involvement				
	Very High	High	Occasionally	Low	Very Lo
Assessment of credit	5	4	3	2	1
Acquisition of cocoa farm inputs	5	4	3	2	1
Raising of cocoa seedlings	5	4	3	2	1
Brushing of cocoa farms	5	4	3	2	1
Removal of mistletoes	5	4	3	2	1
Spraying of insecticides to control pests	5	4	3	2	1
Spraying fungicides to control blackpod disease of cocoa	5	4	3	2	1
Harvesting of cocoa pods	5	4	3	2	1
Fermentation of cocoa beans	5	4	3	2	1
Drying of fermented cocoa beans	5	4	3	2	1
Marketing of dried cocoa beans	5	4	3	2	1
Effectiveness of labour	5	4	3	2	1
Efficiency of labour	5	4	3	2	1
Relative advantage of programme	5	4	3	2	1
Compatibility of programme	5	4	3	2	1
Complexity of programme	5	4	3	2	1
Observability of programme	5	4	3	2	1
Relevance of programme	5	4	3	2	1
Impact of programme	5	4	3	2	1

46. Kindly rank in order of preference extension methods which extension agents uses during your training. Please circle the nu which corresponds to your perception.

Method	Preference scale				
	Most Preferred	Next Preferred	Somewhat Preferred	Least Preferred	Not Prefen
Group discussion					
Method	5	4	3	2	1
demonstration	5	4	3	2	1
Result demonstration	5	4	3	2	1
Lecture	5	4	3	2	1
Farm trips/tours	5	4	3	2	1
Farm visit	5	4	3	2	1
Home visit	5	4	3	2	1

47. Which of the methods (indicated in Q. 46) do you like?

Methods	Reasons for liking this metho
Group discussion	
Method demonstration	
Result demonstration	
Lecture	
Farm trips/tours	
Farm visit	
Home visit	

48. Kindly indicate other source(s) of information you receive for c farming. Please tick

(a) From contact farmers ( )

(b) From non-contact farmers ( )

(c) Bulletins on cocoa cultivation ( )

(d) Other (specify) .....

49. Which of the following factors listed below will urge you participate in cocoa extension programme planning? Please tic that apply?

(a) Level of education ( ) (b) Cost of farm inputs (

(c) Access to credit ( ) (d) Timing of programme

(e) Farm size ( ) (f) Incomes from cocoa farms

(g) Farmers perceived compatibility of programme ( )

(h) Trialability of technologies ( )

(i) Observability of technologies ( )

50. Which of the following factors listed below will urge you participate in cocoa extension programme implementation?

(a) Gender balance ( ) (b) Age ( )

(c) Level of education ( ) (d) Working experience (

(e) Cost of inputs ( ) (f) Access to credit (

(g) Timing of programme ( ) (h) Complexity (

(i) Farm size ( ) (j) Income from cocoa farms

(k) Compatibility of programme ( )

(l) Trialability of technologies ( )

(m) Observability of technologies ( )

51. Which of the following factors listed below will urge you participate in cocoa extension programme evaluation.

		Explain
(a)	Gender balance	(.....)
(b)	Complexity	(.....)
(c)	Farm size	(.....)
(d)	Age	(.....)
(e)	Income from cocoa farm	(..... .....)
(f)	Compatibility of programme	(.....)
(g)	Trialability of technologies	(.....)

(h) Observability of technologies (.....)

52. Adoption

Please tick ( ) against any of the following practices which have been actually doing on your cocoa farm:

		Yes	
(a)	I have been raising cocoa seedlings before planting	( )	(
(b)	I line and peg before I transplant my seedlings	( )	(
(c)	I brush my cocoa farm	( )	(
(d)	I remove unwanted basal chupons	( )	(
(e)	I spray insecticides to control pests	( )	(
(f)	I remove mistletoes	( )	(
(g)	I have been spraying fungicides to control blackpod	( )	(
(h)	I provide shade where necessary	( )	(
(i)	I remove shade trees if they are too much	( )	(
(j)	I harvest ripe cocoa pods regularly	( )	(
(k)	I ferment cocoa beans before drying	( )	(

53. Kindly indicate below the year of first use of adoption of the co technologies

Technologies	Year of first use of adopt
(a) Raising of cocoa seedlings before planting	.....
(b) Lining and pegging	.....
(c) Brushing of cocoa farm	.....
(d) Removal of unwanted basal chupons	.....
(e) Spraying insecticides to control pests	.....
(f) Removal of mistletoes	.....
(g) Spraying fungicides to control blackpod disease	.....
(h) Shade augmentation or reduction	.....
(i) Harvesting and fermentation	.....

54. Which of the following factors listed below have effect(s) on whether to adopt or accept cocoa technologies being extende you. Please tick all that apply.

		Yes	No
(a)	Farm size	( )	( )
(b)	Income from cocoa farm	( )	( )
(c)	Access to credit	( )	( )
(d)	Farming experience	( )	( )
(e)	Credibility of extension agent	( )	( )
(f)	Relative benefit of the technology	( )	( )
(g)	Compatibility	( )	( )
(h)	Complexity	( )	( )
(i)	Cost of farm inputs	( )	( )
(j)	Cost of labour	( )	( )
(k)	Other (specify)	( )	( )

55. Kindly rank and list in Q. 54 factors you have ticked accordin their importance in influencing your adoption level.

(1 – very important factor; 2 – the next very important and so o

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....
10. .....

56 Finally, indicate below major problems which affect cocoa farmin

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57 What recommendations do you make for improving adoption cocoa technologies?

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APPENDIX III

QUESTIONNAIRES FOR FLS

1. Rank

   District

   Name of your Extension Unit

2. Gender (please tick) Male ( ) Female ( )

3. Please indicate your age at your last birthday: .....years

4. Indicate your highest level of education, (Please tick)

   a. No formal education ( ) b. Certificate ( )

   c. Diploma ( ) d. Degree (BSc) (

   e. Other (specify) .....

5. How many years have you worked as an extension frontline st

   .....years

6. Where did you receive your initial training to become an exten frontline staff?

   i. Bunso Cocoa College ( ) ii. Kwadaso Agricultural Colleg

   iii. District Extension Office ( ) iv. Other (specify) .....

7. Rank in order of importance your perceptions of farm constraints/ problems which adversely affect cocoa productio Ashanti Region.

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