

THE ROLE OF ADULT EDUCATION IN THE ADOPTION OF
INNOVATIONS BY COCOA GROWERS IN GHANA

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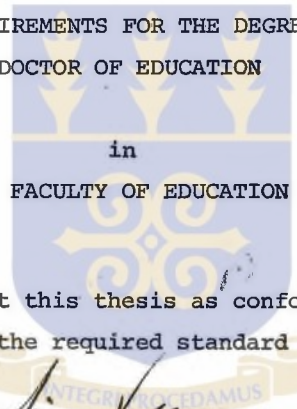
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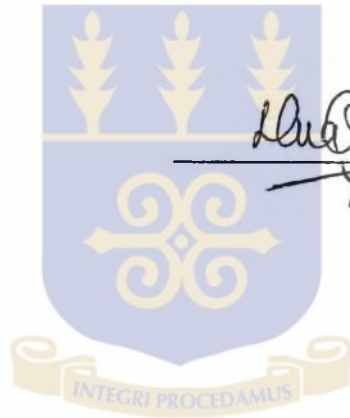
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ABSTRACT

This study was designed to analyse the adoption of recommended cocoa practices among cocoa growers in Ghana and to relate it to the correctness of their knowledge of principles underlying the recommended practices, the growers' sources of cocoa husbandry information, selected personal and economic characteristics of the growers; and to examine the relationships discovered and to draw recommendations which will assist the Ghana Government in programmes to increase cocoa production.

In order to study these relationships, a personal interview, using a structured interview schedule, was employed to collect the data from a sample of 1,191 cocoa growers in Ghana. Statistically significant associations were found between the adoption of recommended cocoa practices and

- 1) the correctness of growers' knowledge of principles underlying a recommended cocoa practice;
- 2) adult education sources of information; and
- 3) individual grower's output of cocoa.

The study indicated that although the possession of correct knowledge of principles was crucial to the adoption of the innovations, the mere possession was not always sufficient motivation to effect adoption. An equally important factor was adult education sources of information. In addition, there was no indication that the adoption of recommended practices was more closely linked with correctness of knowledge than with

adult education sources of information. Among the personal and economic characteristics studied, number of wives, number of children, advisory role and number of years engaged in cocoa growing were positively associated with adoption of recommended practices. Male growers were more apt to adopt innovations than female growers. Age was not related to adoption. Literacy was positively associated with adoption of recommended practices.

The study shows that possession of correct knowledge of principles is crucial to adoption of recommended cocoa practices. Thus, access to formal instructional activities could contribute to the improved performance of cocoa growers in Ghana. An obvious mechanism for improvement is adult education for the growers.

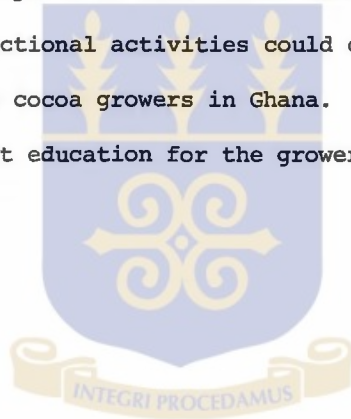


TABLE OF CONTENTS

	Page
LIST OF TABLES	vii
LIST OF FIGURES	ix
 Chapter	
I. THE PROBLEM SITUATION	1
INTRODUCTION	1
THE PROBLEM OF LOW COCOA PRODUCTION	2
SIGNIFICANCE OF THE STUDY	5
RATIONALE AND OBJECTIVES OF THE STUDY	9
METHODOLOGY	10
The Setting	10
The Sample	10
Data Collection	12
Validity of the Instrument	13
Reliability of the Instrument	14
Selection of Innovations	17
Measures of Adoption Behaviour	21
Estimates of Measurement Reliability	26
Measures of Personal Characteristics	26
Measures of Economic Characteristics	27
ORGANIZATION OF THE STUDY	28
II. THEORETICAL FRAME OF REFERENCE AND REVIEW OF RELATED LITERATURE	29

Chapter	Page
NATURAL SOCIETAL SETTING	29
FORMAL INSTRUCTIONAL SETTING	30
CLASSIFICATION OF SOURCES OF INFORMATION	35
PERSONAL AND ECONOMIC CHARACTERISTICS ASSOCIATED WITH ADOPTION	39
HYPOTHESES	44
DATA ANALYSIS	46
III. CHARACTERISTICS OF THE SAMPLE	48
PERSONAL CHARACTERISTICS	48
Age	48
Sex of Grower	49
Number of Wives	50
Number of Children	51
Literacy	52
ECONOMIC CHARACTERISTICS	53
Cocoa Growing Experience	53
Cocoa Production	54
ADOPTION BEHAVIOUR	56
Number of Practices Adopted	56
Correct Knowledge of Principles on Recommended Practices	59
Instructional Source of Information	61
Advisory Role	61
SUMMARY OF CHARACTERISTICS OF THE SAMPLE	64

Chapter	Page
ANALYSIS OF PREDICTORS OF ADOPTION	67
Testing of Hypotheses	67
Joint Influence of Adoption and Other Independent Variables on Cocoa Production	72
Joint Influence of Independent Variables and the Adoption of Recommended Cocoa Practices	73
DISCUSSION OF THE FINDINGS	75
IV. SUMMARY AND RECOMMENDATIONS	77
OVERVIEW OF THE STUDY	77
SUMMARY OF THE FINDINGS	77
RECOMMENDATIONS	78
REFERENCES	83
APPENDIX	90
INTERVIEW SCHEDULE	91

LIST OF TABLES

Table	Page
1. World Cocoa Statistics	7
2. Proportion of Perfect Matches between Test and Retest Response Scores to Selected Questions	16
3. Classification by Sources of Information	37
4. Percentage Distribution of Respondents by Age	48
5. Percentage Distribution of Respondents by Sex	49
6. Percentage Distribution of Respondents by Marital Status	50
7. Percentage Distribution of Respondents by Number of Wives	51
8. Percentage Distribution of Respondents by Number of Children	51
9. Percentage Distribution of Respondents by Literacy	52
10. Percentage Distribution of Respondents by Formal Education	53
11. Percentage Distribution of Respondents by Cocoa Growing Experience	54
12. Percentage Distribution of Respondents by Cocoa Production	55
13. Percentage Distribution of Respondents by their Advisory Role	61
14. Means, Standard Deviations and Possible Ranges for Ten Predictor Variables (1,191 Respondents)	64
15. Correlation of Ten Variables with Adoption and Cocoa Production	65
16. Intercorrelations of Three Predictor Variables with Cocoa Production	66

Table	Page
17. Six Variables which Predict Cocoa Production	73
18. Four Variables which Predict Adoption	74

LIST OF FIGURES

Figure	Page
1. Distribution of Cocoa in Ghana	6
2. Census Enumeration Areas in Cocoa Belt Selected for Field Survey.	11
3. Paradigm of Sources of Information and Resultant Adoption Behaviour	35
4. A Model of Adoption of Recommended Cocoa Practices Cycle	43
5. Number of Recommended Cocoa Practices which were Adopted	57
6. Discrepancies between Correct Knowledge and Actual Adoption	58
7. Correct Knowledge on Recommended Cocoa Practices	60
8. Formal Instructional Setting Sources of Information on Recommended Cocoa Practices	62
9. The Relationship between Correct Knowledge and Formal Instructional Setting Sources of Information	63

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CHAPTER I

THE PROBLEM SITUATION

INTRODUCTION

The cocoa tree, Theobroma cacao, an indigenous plant to the upper Amazon basin in South America, is documented to have been grown in the Gold Coast (Ghana) as early as 1815 but the crop did not spread due to internal wars (Beckett, 1972). The Basel Church Mission cultivated cocoa in a horticultural garden from pods they had brought from Surinam (Dutch Guiana). The first harvesting of the cocoa from the Mission garden was recorded in 1886 (Beckett, 1972). Out of the pods harvested, seeds were sown in other nearby Mission house gardens. This exotic plant attracted the attention of Ghanaians and the demand to try the new plant led to such pilfering that the Mission houses had to fence their gardens.

Cocoa became an important commercial crop and spread to all parts of the forest belt after the return of a Ghanaian, Tetteh Quarshie, from Fernando Po, an Island in the Gulf of Guinea, in 1879. Having worked in Fernando Po, Tetteh Quarshie saw the importance of cocoa as a commercial crop and brought pods to sow in Ghana. Cocoa had been introduced into the Islands of the Gulf of Guinea in the seventeenth century by the Spanish, the Dutch, and the Portuguese.

The importance of cocoa in Ghana economy resulted in the establishment of a Cocoa Research Station at Tafo in 1938 to investigate cocoa husbandry problems. The Cocoa Research Station became the West African Cocoa Research Institute (W.A.C.R.I.) in 1944 serving Ghana and other

West African cocoa growing areas. In 1963, the research organization became the national cocoa research organization, Cocoa Research Institute of Ghana (Beckett, 1972). Although cocoa research has been going on in Ghana for at least thirty-seven years, the average yield achieved by cocoa grower is about 300 pounds of dry cocoa beans per acre compared with about 800 pounds on research farms.

THE PROBLEM OF LOW COCOA PRODUCTION

The Cocoa Research Institute of Ghana, which scientifically supports the cocoa industry; the Cocoa Division of the Ministry of Cocoa Affairs, whose main function is to "sell" and diffuse the research findings of cocoa research to cocoa growers; and the Ghana Government are all concerned with the wide gap between research findings and what the average cocoa grower in Ghana practices on his farm. Their concern stems from the fact that modernization of the cocoa industry is of major importance to Ghana since her economy depends, to a large extent, on the incomes that accrue from the sale of cocoa on the international market.

In most developing countries, there are research findings available to increase food production and to reduce child-births while there is lack of technical know-how on how rapidly and effectively to teach people to use these research findings. Hagerstrand (1968:177) indicated that "diffusion of innovation is all-important part of the economic growth in all countries but particularly so in those that need development. Thus a significant question is to find out how the diffusion of innovations can be accelerated." Pool (1963:249) suggested that

transforming traditional agriculture will require "the development of a scientific attitude towards the adoption of new practice. It is only that kind of internal change in the latent structure of his (the peasant's) attitudes that would produce self-sustained movement toward modernization."

Jones, quoted by the Association for the Advancement of Agricultural Sciences in Africa stated:

The lag between knowledge and practice is usually long, but in some parts of Africa it has seemed to be infinite. The value of research findings, however great, remains potential only until they are transmitted to him who will use them in productive practices. Agricultural research stations in many parts of tropical Africa now are repositories of knowledge that would profoundly affect productivity but they have encountered continuing difficulty in putting this knowledge to work. Both continued research and expanded and more imaginative educational programmes will be required (O.E.C.D., 1975:iii)

Commenting on the performance of cocoa growers in Ghana, a Commissioner for Ministry of Cocoa Affairs stated:

One is tempted to admit that Government has not been getting the value for the money spent on cocoa research and cocoa rehabilitation. (Benasko, 1973:6)

A Cabinet Minister in the erstwhile Progress Party Government Administration indicated:

The stagnation of agriculture over large areas of the world is due to failure by agricultural science to evolve suitable technologies and to propagate them effectively among farmers. (Mensah, 1966: 1979)

Hoffer and Strangland (1958) stressed that perhaps profit alone is not

sufficient motivation to influence adoption of farm practices since in most cases the innovation being introduced has proved to be remunerative but adoption fails to occur, nonetheless. Rogers and Shoemaker (1971: 142) have indicated that "economic profitability may be even less important for peasant farmers in less developed countries." This view is supported by studies among peasant farmers in Punjabi, India (Fliegel et al., 1968). Rogers and Shoemaker (1971:143) further quoted from the President's Science Advisory Committee report of 1967 which states that "to induce farmers [in the United States] to change, the potential pay-off must be high--not 5 to 10 per cent but 50 to 100 per cent." This suggests that a broader and more comprehensive explanation of the adoption behaviour of farmers needs to be achieved.

This study was designed to analyse the adoption of recommended cocoa practices among cocoa growers in Ghana and to relate it to the growers' sources of cocoa husbandry information, their knowledge of the principles underlying the innovation and their personal and economic status indicators; and to relate these findings to the theory of method and other research on the adoption of innovations. Although this study draws heavily upon literature on the theory of method (Verner, 1962, 1975) and on the concept of adoption of innovation, it is unique in some respects due to the fact that the association between formality of the source of growers' information, correctness of growers' knowledge of principles underlying innovations and their ultimate effect on changes in behaviour (adoption) have not been put forth per se in any adoption study in Ghana.

SIGNIFICANCE OF THE STUDY

Cocoa is grown on 3.6 million acres representing about 70 per cent of the cultivated land in Southern Ghana or 56 per cent of all cultivated land in Ghana (Figure 1). The cocoa industry provides employment for about 15 per cent of the labour force and contributes about 65 per cent of the foreign exchange from exports. The contribution of the cocoa industry to the Government's revenue is about 30 per cent (Bank of Ghana, 1974).

The importance of Ghana in international trade is due to the country's position as the largest producer and exporter of cocoa, accounting for about 30 per cent of the world cocoa exports. In recent years Ghana's cocoa production has been declining although the price of cocoa on the world market is high (Table 1). The decline of cocoa production in Ghana and the increase in the production of cocoa by other countries, threatens Ghana's role as the dominant cocoa producing country in the world. Another concern for the decline in Ghana's cocoa production is due to the fact that Ghana's current cocoa production is far below the quota granted her under the International Cocoa Agreement (580,900 tons), but the mechanisms of the Agreement provide that if Ghana's production falls below 465,000 tons in any of the crop seasons,¹ the quota will have to be renegotiated and reduced (Bank of Ghana, 1974).

The declining trend in Ghana's cocoa production is alleged to be due to a number of factors, prominent among which is the unscientific farm husbandry of growers in Ghana despite the fact that researchers have made discoveries which when adopted can lead to increases in yields.

¹ Refers to cocoa seasons before September 1976.

FIGURE 1
DISTRIBUTION OF COCOA

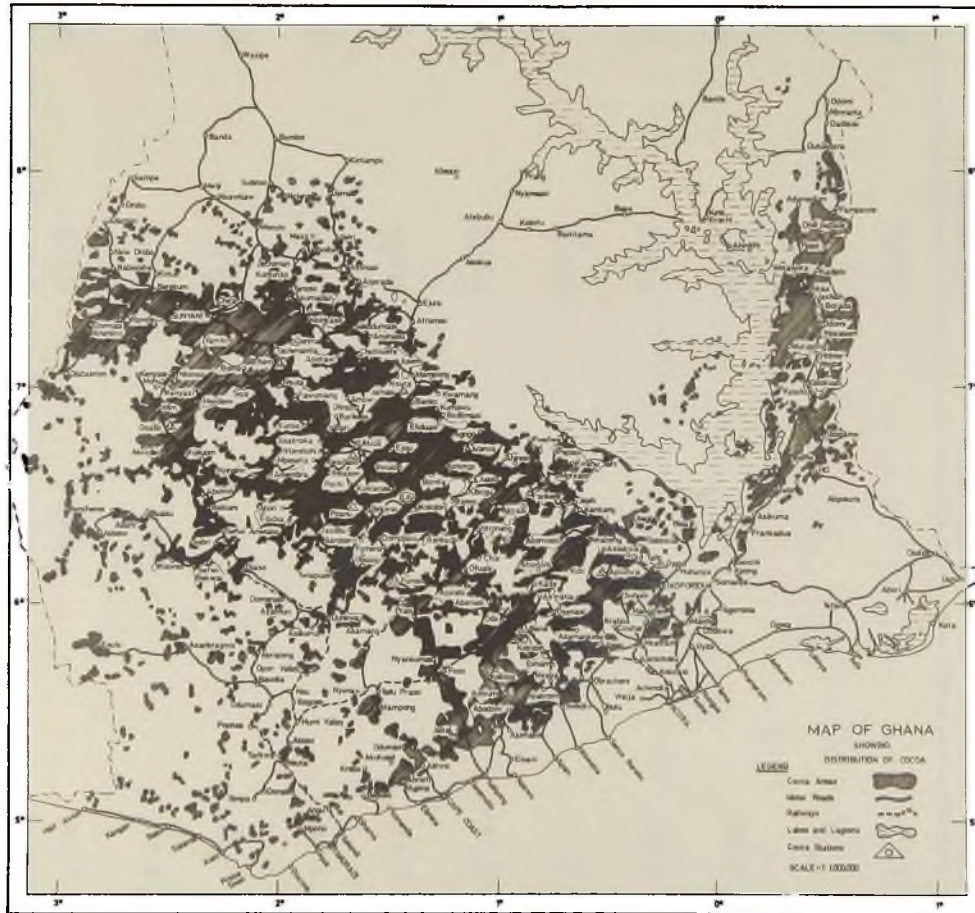


TABLE 1
WORLD COCOA STATISTICS

Year	Total World's Output (Kilotons)	Ghana's Output (Kilotons)	Ghana's Fraction of World Production
1959-60	1,039	317	30.5
1960-61	1,173	433	36.9
1961-62	1,124	410	36.5
1962-63	1,158	422	36.4
1963-64	1,218	436	35.8
1964-65	1,484	557	37.5
1965-66	1,208	410	33.9
1966-67	1,336	376	28.1
1967-68	1,341	415	30.9
1968-69	1,227	334	27.2
1969-70	1,424	409	28.7

Source: J. E. A. Manu, "Cocoa In Ghana's Economy," Cocoa Economics Research Conference, Accra, 9-12 April 1973, p. 2.

An editorial in the Ghana Daily Graphic (1974:24 May) stated "it appears that one of the leading causes of the decline in production is that cocoa farming has remained far too long a traditional industry which has been denied a basis for modernization."

The Cocoa Research Institute of Ghana is constantly developing and testing new ideas to solve cocoa husbandry problems. The Institute conducts research under controlled laboratory conditions as well as on small scale field experiments in the various ecological zones. The Cocoa Production Division repeats the research findings of the Institute on a large scale on farms and on agronomy stations. A discovery made is passed to a joint technical committee of the Cocoa Research Institute and Cocoa Production Division for critical evaluation of its adaptability and finally, if the committee is convinced of the usefulness of the finding, the Government is then advised to take the required action. The Cocoa Production Division then carries out the Government's cocoa policy through the provision of inputs and extension services.

There are, therefore, research findings available in the research stations in Ghana to increase cocoa production but there is lack of ability to rapidly and efficiently effect adoption of the research findings by cocoa growers. The adoption of recommended cocoa practices is of great importance if cocoa production is to improve. Rogers and Shoemaker stated that:

A further reason for the prime focus on innovativeness in diffusion research, especially in less developed countries, is that innovativeness is the best single indicator of modernization. Innovativeness indicates behavioural change, the ultimate goal of modernization programs, rather than cognitive or attitudinal change. (1971:175-76)

RATIONALE AND OBJECTIVES OF THE STUDY

The decision to adopt a recommended cocoa practice by a cocoa grower is influenced by many factors, among which are the source from which the grower obtains information about the new practice, the correctness of the grower's knowledge of the principles underlying the recommended practice as well as the personal and economic status of the grower.

Ghana Government and organizations interested in the modernization of cocoa husbandry cannot successfully effect the adoption of improved cocoa practices through legislation but can influence the decision making process of the grower through adult education. Adult educators can provide the cocoa grower with correct information of the principles underlying a recommended cocoa practice through organized educational programmes.

The objectives of this study, therefore, are twofold. The first objective is to establish the relationships between the adoption of recommended cocoa practices among Ghana cocoa growers, and:

- 1) the correct understanding of the principles underlying the recommended practices;
- 2) the educational formality of the information source;
- 3) whether adoption of recommended cocoa practices is more closely linked with the correctness of the grower's knowledge of the principles underlying the recommended practices than with the educational formality of the information source; and

- 4) personal and economic characteristics of cocoa growers.

The second objective is to examine the relationships discovered and to draw recommendations which will assist the Ghana Government in programmes to increase cocoa production.

METHODOLOGY

The Setting

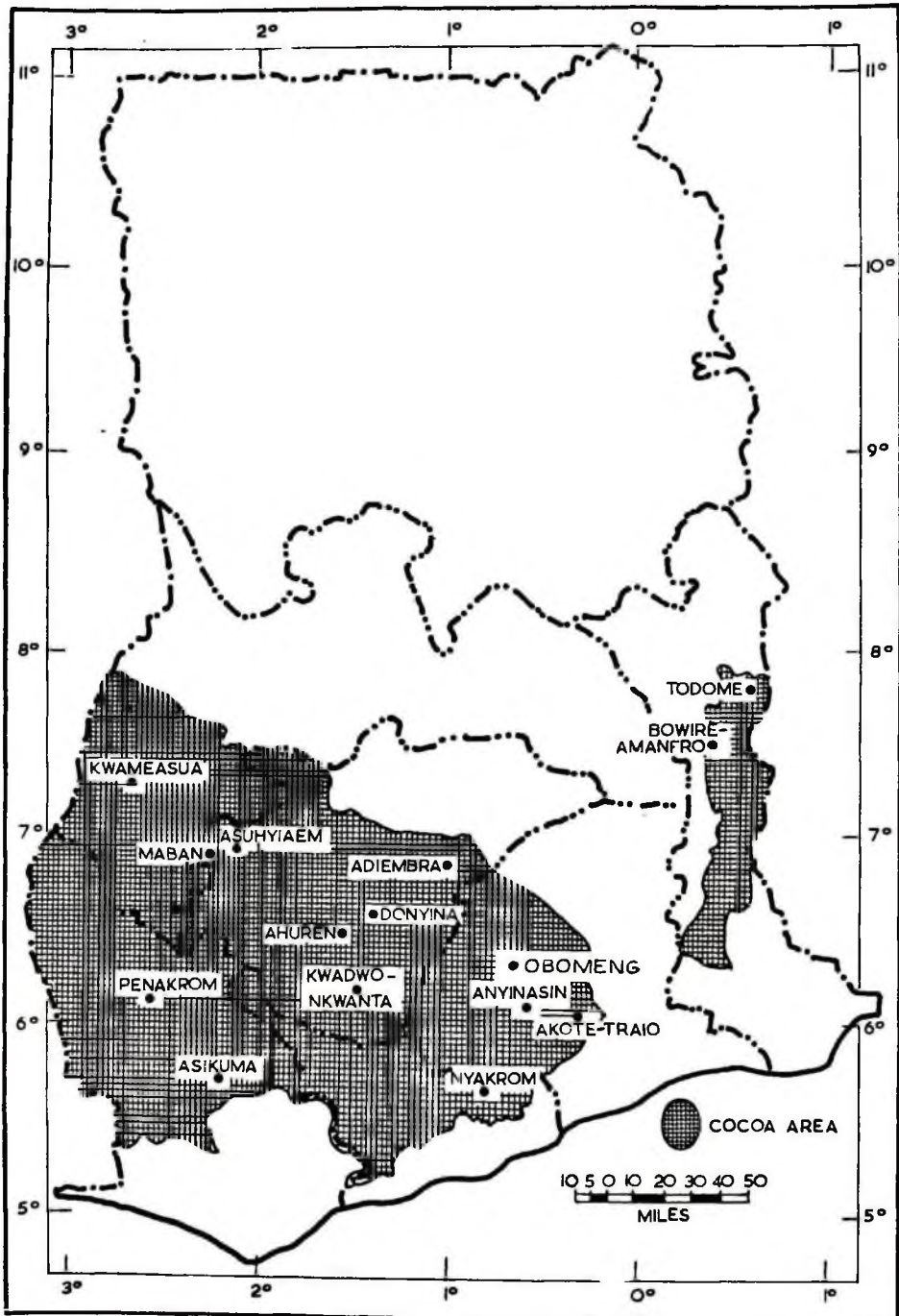
No one cocoa growing area could confidently be considered to be representative of all cocoa areas in Ghana. In this study, therefore, a random sample of 1,191 cocoa growers was selected from all parts of the cocoa growing belt to represent the estimated 300,000 cocoa growers in Ghana.

The Sample

A three-stage random sampling procedure was used to select the sample for this study. Fifteen census enumeration areas (Figure 2) covering the whole cocoa growing belt were drawn from a list of cocoa producing enumeration areas compiled by the Institute of Statistical, Social and Economic Research of the University of Ghana, Legon, using a table of random numbers. One locality was randomly selected from a list of localities in each enumeration area and a number of households were then selected randomly in each locality. The number of enumeration areas, localities and respondents selected was determined by financial and time restrictions.

Rogers et al. commented:

FIGURE 2
CENSUS ENUMERATION AREAS IN COCOA BELT SELECTED FOR FIELD SURVEY



. . . In less developed countries, and particularly in the rural sections of such nations, the most important, and often the most frustrating problem facing the survey researcher is the absence of reliable frames from which to sample . . . Under these circumstances, creative sampling techniques must be used in order to approximate a random sample which allows one to confidently generalize from the sample to the population. (1970:2-31)

Ghana rural areas are no exception to the non-existence of sampling frames. Selected localities were divided into sample blocks defined by roads and footpaths entering the locality. Depending on the estimated number of houses in a locality, a number of households were selected randomly starting from a randomly selected household to ensure that the households selected were dispersed geographically, and also to give each household a chance to be included in the sample. Every principal decision-maker of a cocoa farm living in a selected household was interviewed.

Data Collection

The analytical survey method was used and the principal means of data collection was a personal interview, using a structured interview schedule (see Appendix). The interview schedule was aimed at soliciting information on:

- 1) Adoption Behaviour--Respondents were asked questions regarding their adoption of recommended cocoa practices, their correct understanding of the principles underlying recommended practices, their sources of information and advisory role.

- 2) Economic Characteristics--Questions asked in this section consisted of their cocoa growing experience and production.
- 3) Personal Characteristics--Respondents were asked questions regarding their age, sex, marital status, number of wives, number of children, and literacy.

Validity of the Instrument

In order to ensure that the schedule would measure what it was intended to measure, it was drawn in the English language and it was discussed with personnel from the Cocoa Economic Research Unit of the University of Ghana to determine the content and face validity. Their comments and suggestions were related to the logical order of the questions as well as wording.

The schedule was then revised and administered to twenty cocoa farmers. This pretest resulted in changing some of the questions. For example, it was found that the linguistic measurement units, such as a 'rope' (of a fixed length) and 'arm stretch' (a space covered by a man's extended arms) were unreliable measurements of size of farms since the words meant different lengths in different areas. Certain terms in vogue with the growers were encountered and these helped in translating some of the English words into the vernacular during interviews.

Some of the original questions, such as: "How many children are in your household?" was reworded to read: "How many children do you (yourself) have?" This change was imperative since all children from the extended family would be included in the respondent's answer.

In order to measure literacy, respondents were asked to read a passage on a card which stated: "Many thanks for your co-operation in this study, please write your name at the back of the card." This approach did not meet with the approval of most respondents; therefore, the self-defined measure of literacy was substituted.

It was found that most of the respondents did not know their age; therefore, historical events were used to get an approximate measure including: "Were you born in the year King Prempeh I was exiled to the Seychelles Island by the Colonial Government?" (1900). "Were you born in the year King Prempeh I returned from exile?" (1924). "Were you born in the Yaa Asantewaa War?" (1900). "Were you born in the year of the major earthquake in Ghana?" (1939). "Were you born during the eclipse of the sun?" (1947).

Reliability of the Instrument

The retest method was used to determine the stability of response scores of ten randomly selected cocoa growers over a period of one month. Ten questions selected randomly from the interview schedule were administered to these respondents. One point was awarded for every response at the initial test. After the initial test, no indication was made to show any signs that the test may be repeated at another time.

After a period of one month, the same ten cocoa growers were retested using the same questions but in a different sequence. Each retest response which perfectly matched the earlier test was assigned a score of one, however, if the response at the retest differed from the earlier

test, a zero point was awarded. The test and retest scores were matched to find the proportion of perfect matches in each of the ten questions. The main objective was to find out whether the response scores at the earlier testing were consistent with the retest responses. The mean proportion of pre/post test matches was .80 which shows a high consistency reliability. Table 2 is presented to show the questions as well as the proportions of perfect matches between the test and retest scores. (See p. 26 for estimates of respective reliabilities of the content areas.)

The interviews were conducted between July and September, 1973 by six students from the Faculty of Agriculture, University of Ghana, who had had several years field experience in agriculture. Training was provided to ensure consistent interpretation of the questions in the local dialects and to standardize interviewing techniques. The author travelled with the survey team to inform the chiefs of the purpose of the survey and to seek co-operation from the cocoa growers in the localities visited.

There are basically two main forms of agrarian farm organizations in Ghana cocoa growing areas, (1) the village settlement with cocoa farms scattered around a village, and (2) homesteads in bigger farms where the grower lives on his production unit. A cocoa grower who lives in a homestead maintains a home in his village which he visits on market days, festive days, or when summoned by the village chief. The customary drinks (schnapps) were presented to the chiefs for legitimation of the survey and to inform growers living in homesteads to come to the village for the purpose of the survey.

TABLE 2

PROPORTION OF PERFECT MATCHES BETWEEN TEST AND RE-TEST
RESPONSE SCORES TO SELECTED QUESTIONS

Questions	Proportion of Pre/Post Test Matches
1. For how many years have you been engaged in cocoa growing?	0.80
2. How many loads of cocoa from your own farm did you actually sell last cocoa season?	0.80
3. What is your age?	0.60
4. Can you read a newspaper (e.g., <u>Graphic</u> , <u>Times</u>)?	0.90
5. How many children do you (yourself) have?	0.90
6. When mistletoes appear on your cocoa trees do you remove them or leave them on the cocoa tree (refers to the last five years)?	0.80
7. Why do you remove or do not remove the mistletoes?	0.80
8. Which source of information provided you with the most influential information leading you to remove or not to remove these mistletoes?	0.90
9. What do you do when you spot a swollen shoot diseased cocoa tree on your farm? Do you remove the diseased tree only, remove the diseased tree plus healthy trees in contact with the diseased tree, do not remove it or report to Cocoa Production Division Officials to remove it (refers to the last five years)?	0.80
10. Why do you remove the diseased tree only, remove diseased tree plus healthy trees in contact, not remove it or report the disease to Cocoa Production Division officials to remove it?	0.70
Mean Proportion of Perfect Matches	0.80

In order to encourage good responses and valid answers, interviews with respondents were conducted in the homes of the growers in the evenings after they had returned from their farms. This informal approach was necessary to establish proper rapport with respondents as well as to make them feel free and be frank about their responses without fear. Through this approach, the enumerators had an opportunity to observe respondents' personal reactions to the questions, to probe responses and to encourage talking.

The legitimization of the survey by the chiefs made the respondents who were not used to such investigations not resistant to the interviews since the chiefs communicated the purpose and implications of the survey to the respondents before the survey.

This informal atmosphere in which the interviews were conducted and the legitimization of the survey by the chiefs encouraged good responses, provided valid answers and prevented refusals.

Selection of Innovations

The Cocoa Research Institute of Ghana and the Cocoa Production Division of the Ministry of Cocoa Affairs recommend a number of improved cocoa husbandry practices to Ghana cocoa growers. For the purpose of this study, a group of cocoa experts from the Cocoa Research Institute, Cocoa Production Division and the Cocoa Economic Research Unit of the University of Ghana selected a number of cocoa recommendations which, when adopted, should result in increased yields. The selected practices were as follows:

1. Mistletoe--The mistletoe, Tapinanthus bangowensis, is the commonest semi-parasitic plant which affects the yield of cocoa trees. By means of a haustorium, the mistletoe attaches itself to a branch of the cocoa tree resulting in the formation of a cankerous growth with the surrounding host tissues. The semi-parasitic nature of the mistletoe results in the reduction of the photosynthetic potential of the cocoa tree as well as drawing on some of the food for the plant and finally it kills the branch to which it is attached. Heavy infestation of mistletoe results in reduced yields and the ultimate death of the tree. The broken canopy caused by the death of the cocoa trees, resulting from the mistletoe attack, attracts the cocoa capsids (Room, 1969:522-27).

Birds are frequent visitors to the mistletoe plant. The fleshy part of the fruits is eaten by olive-bellied sunbird, Cinnyris chloropygius. The birds disperse the seeds of the fruit by rubbing their beaks onto other branches to get rid of the sticky seeds glued to their beaks. Insects, especially ants, Crematogaster and Oecophylla, carry the seeds to other plants.

Mistletoe is effectively controlled by pruning the parasite from the cocoa branches to which it is attached.

2. Swollen Shoot--The Swollen Shoot is a virus disease transmitted by the Mealy bug, Pseudococcus njalensis, Pseudococcus citri, or Ferrisia virgata. The mealy bug sucks the sap of the cocoa tree by piercing the tissue of the plant, thus transmitting the virus

it had collected from a diseased tree to a healthy one. The adult mealy bug is usually sedentary and cryptic in habit and is therefore ineffective in the spread of the disease. The nymphs, however, are very active during the first instar and move from tree to tree, thus spreading the virus. The mealy bug is occasionally carried over long distances by the wind. The control of Swollen Shoot is to remove diseased trees together with all the adjacent trees in contact with the diseased tree.

3. Turning--Good fermentation is required if the final cocoa is to have the necessary flavour required for the manufacture of chocolate. This is achieved through heat and a temperature ranging between 47° and 51° Centigrade is maintained during the entire fermentation period. Underfermentation results in slaty and deep purple beans and overfermentation reduces the required qualities, such beans do not lend themselves to the manufacture of good chocolate as they result in bitter and stringent taste. Such poor quality cocoa fetches lower prices.

The cocoa pods harvested are cracked open with a blunt cutlass and the placenta is then removed. The commonest fermentation practice is to place banana leaves on the ground in a radial fashion with the bases overlapping. The fresh cocoa beans are heaped at the centre and the banana leaves folded over to cover the whole pile of cocoa. The heap is then weighted with sticks or stones to make the cover secure. Cocoa growers are advised to turn and mix their cocoa on the third and fifth day of

fermentation. The turning and mixing ensure even fermentation.

4. Spraying--Capsids, Distantiella theobroma and Sahlbergella singu-
laris, are serious pests of cocoa in Ghana. Taylor (1954) esti-
mated losses due to capsid as between 60,000 and 80,000 tons of
cocoa beans per year (15% to 20% of national production). Elliot
(1974) estimated yield increases through capsid control in the
Ivory Coast as 25 per cent.

During feeding capsids inject poisonous saliva (which prob-
ably assists in the extraction of sap from the plant) into the
cocoa plant tissue leaving a black puncture which is easily in-
fected by a fungus, Colonedri regidiussula. The lesions caused
through the feeding of the insect either kills the plant or at
the least delays young plants from reaching bearing stage by
several years. The shoots of mature trees as well as the pods
are also attacked by capsids. Capsid infestation becomes serious
when more trees in an area are attacked forming a "capsid pocket."
Capsid pockets join to form a vast continuum of complete devesta-
tion--"a capsid blast." The cocoa trees severely attacked
scarcely survive if left untreated.

The pest is controlled by a routine spraying of cocoa trees
using Gammalin 20 (lindane B.H.C.) at the rate of 15 ounces in
5 gallons of water per acre. Both the spraying machines and the
insecticides used in spraying are heavily subsidized by the
Government (C.R.I.G., n.d.:2).

5. Harvesting--Much cocoa is lost through infrequent harvesting,

especially the Amazon and Hybrid varieties. Since the optimum interval between harvests is twenty-one days, growers are advised to harvest their cocoa pods at that interval. Frequent harvesting also prevents the incidence of blackpod disease--a fungal disease caused by Phytophthora palmivora (Urquhart, 1961).

Measures of Adoption Behaviour

The measures of adoption behaviour were computed in the following ways:

1. Adoption Score--The extent of a cocoa grower's adoption practices was defined operationally in terms of his scores on ad hoc indices. A numerical value of zero was assigned to non-adoption and of one to the adoption of each practice. Thus, a respondent who had followed all the five recommended cocoa practices in the preceding five years attained a total score of five points.

One point was attained by a grower who reported to operate according to each of the following categories and zero point was awarded for non-conformance to each of the recommended cocoa practices:

- a) Mistletoe control--Grower who states that he prunes the semi-parasitic mistletoe plant from the cocoa branch to which it is attached.
- b) Swollen shoot--Grower who claims to uproot a swollen shoot diseased cocoa tree as well as all healthy cocoa trees in contact with the diseased tree or invites the Cocoa Production

Division to perform the uprooting.

- c) Turning fermenting cocoa--Grower who reports turning and mixing the fermenting heap of cocoa twice, the third and fifth day, during the fermenting period.
 - d) Spraying against capsids--Grower who says that he sprays his mature trees with Gammalin 20 at the rate of 15 ounces per 5 gallons water per acre of cocoa farm in August, September, October, and December.
 - e) Harvesting--Grower who reports harvesting ripe cocoa pods at an interval of twenty-one days throughout the whole year.
2. Correctness of Knowledge Index Computation--A cocoa grower who had correct knowledge of the principles underlying each of the five recommended cocoa practices was awarded two points while incorrect knowledge received one point. A numerical value of zero was assigned to respondents who had no knowledge--either correct or incorrect. (The zero scores were not used in the statistical analysis.) The total correctness of knowledge index for each grower could range from zero to ten points.

Two points were awarded to each grower who made the following correct responses:

- a) Mistletoe control--Mistletoe reduces the cocoa plant's potential in food preparation as well as drawing on some of the food for the plant and finally kills the branch to which it is attached.
- b) Swollen shoot disease control--Swollen shoot is a virus

- disease spread by mealy bugs onto healthy trees in contact with diseased tree. There is no cure apart from cutting out.
- c) Turning of fermenting heap--Turning and mixing of fermenting cocoa beans on the third and fifth day of fermentation. This procedure results in even fermentation and prevents poor quality beans--slaty and deep purple beans.
- d) Spraying--Spraying kills the cocoa capsids which feed on the cocoa plants resulting in retarded growth, lesions and death of the cocoa tree.
- e) Harvesting--The harvesting of ripe cocoa pods at twenty-one days interval prevents germination of the beans and the spread of cocoa diseases (e.g., blackpod).

Incorrect Knowledge Principles--The following are examples of the incorrect knowledge of principles underlying recommended cocoa practices that some respondents indicated. These responses received a score of one.

- a) Mistletoe control--
- *Another plant growing on a cocoa tree is normal for some plants. (Probably, the respondents are comparing the growth of mistletoe on cocoa trees with budding and grafting among some horticultural plants, such as citrus.)
 - *Mistletoe, a small plant, cannot harm a big cocoa tree.
- b) Swollen shoot disease control--
- *The sickness of the cocoa tree is due to the exhausted condition of nutrients in the soil.
 - *When a human being is sick, he is cured why should a

diseased cocoa tree be "killed" and not cured.

- The incidence of a disease in my farm is beyond my control, I believe I am unlucky.

- The diseased cocoa plant still bears fruits therefore it cannot be all that "sick."

c) Turning of fermenting cocoa heap--

- Good drying compensates for not turning the fermenting heap.

- Good fermentation can be achieved without turning the fermenting heap.

d) Spraying against capsid pest--

- The insect pest will move after a while.

- The insect pest cannot live for any length of time, therefore, why should money and effort be wasted in spraying.

e) Harvesting--

- The beans are not heavy if harvested in the "Agriculture way"; and weigh less when the cocoa is sold resulting in less return in money.

3. Formality of Source of Information Index--Operationally, the sources of information used by Ghana cocoa growers were dichotomized into formal instructional sources and natural societal sources of information. This classification is based on the categories of Verner and Gubbels (1967:30); Verner (1975:2); and Uwakah (1975:138).

The classification of sources of information is, therefore, as follows:

a) Formal Instructional Sources of Information--

- Cocoa Division Technical Officers.
- Cocoa Division Demonstrations and Shows involving Technical Officers.
- Commercial Salesmen.
- Farmers' Training Schools.
- Purchasing Agents (Cocoa Graders).
- Information Services Technical Officers.

b) Natural Societal Sources of Information--

- News Bulletins or Posters.
- Radio or Rediffusion.
- Fellow Farmers.
- Peddlers.
- Family or Relatives.
- Own Experience.

In computing the formality index, one point was awarded for each recommended innovation for which the respondent obtained information from the natural societal sources of information. Two points were assigned to a respondent who used instructional sources of information for each practice. A numerical value of zero was assigned to respondents who did not remember their source of information. (The zero scores were not used in the statistical analysis.) The total score for each respondent, therefore, is made up of the total score for each of the five recommended cocoa practices and this ranges from zero to ten points.

4. Advisory Role Index Computation--Advisory role was measured by a "Yes" (2) or "No" (1) response to a question if the respondent had advised another cocoa grower in the preceding five years.

Estimates of Measurement Reliability

In interpreting social research, the matter of measurement reliability merits considerable attention since in the absence of a measurement reliability coefficient, one does not know whether ones instrument is consistent in measuring what it is designed to measure.

The three measurements, adoption score, correctness of knowledge index and formality index were, therefore, subjected to the coefficient alpha (Nunnally, 1967) measurement of internal consistency to find the proportion of the total variance in the measurement that is true variance. Coefficient alpha provides an accurate estimate of content reliability. The measure of internal consistency (coefficient alpha) for each of the three measurements is reasonably satisfactory. The estimates of measurement reliability are .76 for Adoption of recommended cocoa practices score, .64 for Correctness of Knowledge index, and .80 for Formality of the source of information index.

Measures of Personal Characteristics

The personal characteristics of respondents were measured as follows:

1. Age--was self-defined and given in years.
2. Sex--was categorised as male or female. Values assigned were "1"

for male and "2" for female.

3. Number of Wives--was measured by the number of females a grower was married to at the time of the survey.
4. Children--was defined as the number of children in the immediate family regardless of their ages or current residences.
5. Literacy--(self-defined) was measured by the ability of the respondent to read a few lines of any of the local newspaper. Respondents were grouped into illiterates (1) and literates (2).
6. Formal Education--was defined as the number of years of formal schooling completed as gleaned from a direct question.

Measures of Economic Characteristics

Economic characteristics of respondents were measured in the following manner:

1. Experience--was measured by the number of years the grower had been engaged in cocoa growing.
2. Cocoa Production--was defined as the number of loads (each load being 60 pounds dry cocoa) of cocoa delivered to the market that cocoa season and was used to measure both income and farm size. This measurement approach was taken because most growers do not know the size of their farms. Rogers et al. (1970:4-9) indicated that "such quantification is simply not part of the villager's life style." Polly Hill (1956:85) suggested that "anyone studying the [Ghana] cocoa farmer must therefore collect information on size [of farms] for himself."

Resources did not permit this approach in this study. Polly Hill (1956:84) indicated that "measurement in terms of loads not only reflect the way the economist thinks, but it is also inevitable when resources for field-work are small." Cocoa production in this research does not, therefore, necessarily indicate efficiency.

ORGANIZATION OF THE STUDY

The report began with an outline of the problem this study was designed to investigate and an explanation of the objectives of the research as well as the methodology used in collecting the data. The second chapter provides the theoretical frame of reference underlying the research and a review of the literature related to the study. The results of the empirical analysis of the data and the major findings as well as a discussion of the findings are included in Chapter three. A fourth chapter concludes the report with a summary and recommendations reached as a result of the analysis.

CHAPTER II

THEORETICAL FRAME OF REFERENCE AND
REVIEW OF RELATED LITERATURE

A review of related literature influenced the formulation of the hypotheses tested as well as the selection of predictor variables and the directions of the predictions.

The theoretical framework which guided this study was the theory of method in adult education postulated by Verner (1962, 1975) and the concept of adoption; these provided the basis for examining the adoption behaviour of cocoa growers in Ghana.

Adult learning normally takes place either in the natural societal setting or in a formal instructional setting that is designed to facilitate learning.

NATURAL SOCIETAL SETTING

In the Natural Societal Setting adults learn:

in the every day experiences at work or at leisure. They pass their life span in an environment in which new information and the opportunities for new experiences surround and permeates their consciousness like the air they breathe. An adult can learn by reading, by conversation, by observing and by participating in the on going life about him. Such learning as may occur in this setting is achieved largely by chance and it tends to be sporadic and unsystematic. Furthermore, it is casual and incidental as well as inefficient and uncertain. Institutions that operate on the level of the general diffusion of information are a part of this complex societal setting. The information which they diffuse spreads into the total environment of the person where chance alone determines its reception and impact which it makes in the life of the individual. The general dissemination of information is used by an institution when it seeks to induce

changes in knowledge, attitudes, values, or behaviour in general through persuasion or psychic contagion. Institutions employ mass media to this end, thus, newspapers, radio, television, bulletins, exhibits and advertisements are the principal means for the general dissemination of information. (Verner, 1975:3)

When adults learn in the natural societal setting, information on innovations is received mainly through devices, such as bulletins, radio and television, but such devices cannot teach by themselves nor do they have a feedback mechanism between the learner and the source of information that is critical to successful learning. Although some self-education may occur in the natural societal setting, such learning is largely by chance and inefficient when compared with learning achieved under the supervision of an instructional agent. Societies that need rapid change among people, will find it unwise to depend on self-education due to the complexity of the information being communicated.

FORMAL INSTRUCTIONAL SETTING

Learning in the Formal Instructional Setting is provided:

when an individual or institution purposely creates a situation in which the achievement of specific learning by a specific population is under the direction and continuing supervision of an instructional agent. This process is employed by those institutions that seek to provide opportunities for continuous learning through systematic education. (Verner, 1975:3)

The involvement of an instructional agent in the formal instructional setting results in creating situations "so that adults have experiences in which both information and control of the appropriate intellectual behaviour are systematically acquired simultaneously"

(Verner, 1975:4). The instructional agent arranges a developmental sequence of intellectual behaviour such as reading, thinking and observing that are structured around the material to be learnt. To assist learning, the learning tasks are arranged from the known to the unknown, from concrete to abstract, and from simple to the complex. The instructional agent not only arranges the learning tasks in order to effect a change in behaviour but also selects the appropriate instructional technique that will help the learner to perform each learning task. Instructional agents, who are external to the learner, have special skills, insights and objectivity to direct the educational process.

The formal instructional setting is a function of adult education since adult education

is any planned and organized activity provided by an individual, an institution, or any other social instrumentality that is intended specifically to assist an adult learn and which is under the immediate and continuing supervision of an instructional agent who manages the conditions for learning in such a way as to facilitate the successful achievement of the learning objectives. (Verner, 1975:8)

The definition is interpreted to exclude all those activities and experiences which occur by chance and includes all learning experiences which result from supervised instruction.

Economic growth is generated through investment in capital equipment and men. Therefore, in order to improve the quality of manpower, it is essential to provide education. A report by the Organization for Economic Co-operation and Development stated:

. . . the improvement in the "human factor" accounts for a major part of economic growth. In practice, of course, improvements in the

quality of manpower and of machinery go hand in hand; they both reflect the greater effectiveness of the human factor--which is, or should be, an aim as well as a result of education. (1961:23-24).

Formal instructional setting sources of information may be even more important among illiterate growers in developing countries since self-education may be minimal in such societies.

Verner and Millerd stated that:

an adult education activity may present information but because it is instructional it also facilitates learning and encourages the use of the information. Thus, the crucial measure is that of participation in adult education and, . . . this participation does have a significant relationship to the adoption of innovations. Reducing the educational component therefore, may not materially affect the diffusion of information but it will affect the ultimate adoption of innovations. (1966:49)

Verner and Millerd concluded:

In view of the significant relationship of adult education to adoption, an increase in systematic educational activities would enhance the increased rate of adoption of new innovations among farmers. (1966:74)

Rogers and Capener (1960:24-25) observed that farmers who use the extension agent [instructional agent] as a source of information have higher adoption scores.

Rogers (1973:174) reported an observation made by Srinivasan and Kachirayan that "the proportion of malpractices . . . appears to be much less among those informed (about vasectomy) by the village officials or health staff than among those informed by canvassers or other vasectomized persons."

Wilkening et al. (1962) indicated that farmers who depend least

upon other farmers adopt more innovations. It is evident that 'friends and neighbours' do not have the same advantages in spreading information as the instructional agent and again 'friends and neighbours' are not paid to spread information since their major role, unlike the instructional agent, is not to teach other farmers about new practices. The inability of farmers to induce adoption of innovation in any significant way among other farmers may be a result of "a prophet is not without honour except in his home town and among his own relatives and in his own household."

Lionberger (1960:103) stated that "high dependence on relatives and friends as sources of information is usually negatively associated with the adoption of farm practices," but there is a positive relationship between adoption and "the use of such sources as the county agent, college of agriculture, and vocational agricultural teachers [instructional agents]." The negative relationship between adoption and the reliance on relatives and friends may be due to a general low level of knowledge on new practices by the informants.

Commenting on the spread of innovations through other farmers Rogers stated:

learning of a practice from relatives and other farmers is somewhat analogous to lifting oneself by one's bootstrap, for ego's peers are not likely to be much better informed than ego. The farmer who learns from his peers is learning second or third-hand information, which may have lost much of its original accuracy. (1958:156)

A farmer who had tried an innovation and had failed to obtain good results, may give a biased report about the innovation which may hinder

the adoption of the innovation by other farmers seeking information from him (Rogers, 1958). Sometimes opinion leaders who spread information on new practices do not keep up-to-date in current recommendations and may therefore diffuse inaccurate information. Wilkening (1952b) found that local sources of information are just slightly better than the average farmer who seeks information from the source.

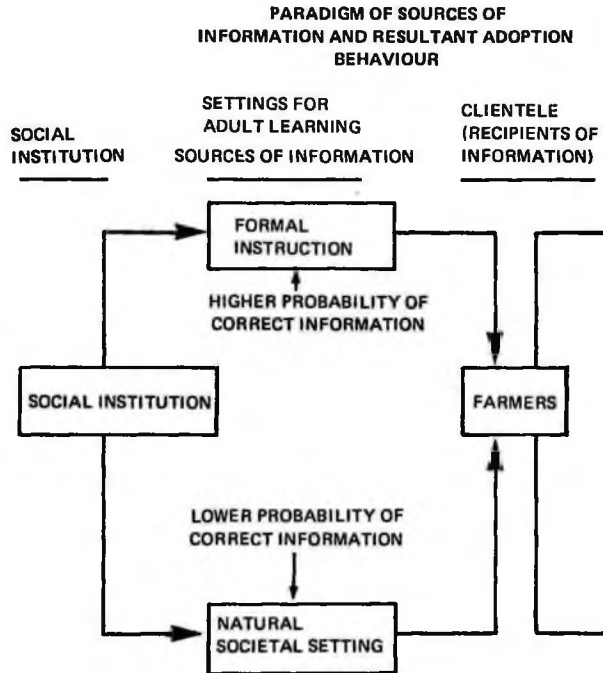
Figure 3 is presented to show diagrammatically the relationship between adoption of innovations, correctness of the grower's knowledge of the principles underlying the recommended practices and sources from which the grower obtains information about new practices.

CLASSIFICATION OF SOURCES OF INFORMATION

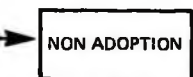
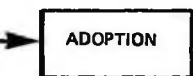
Various researchers have used different methods to classify information sources in the analysis of adoption research. Early classification schemes consisted of sub-divisions such as impersonal, personal, and self-categories--mass media, peers, oral extension and commercial sources (Mason, 1964:40-52). Rogers and others (1962:179ff.; 1969:149; 1971: 252-60) have classified sources of information into personal and impersonal, and cosmopolite versus localite.

Verner and others (1966, 1967) have developed alternative classifications of a source based on origin or the nature of its activity. Their classification by origin resembles the traditional classification model and consists of the following sub-categories:

Government--information sources originating with federal or provincial governments.

Figure 3

ADOPTION/NON-ADOPTION



Commercial--information sources originating with business agents or establishments dealing with farmers.

Farm Organization--information sources originating from farmers' organizations, such as co-operatives or commodity associations.

Personal--information sources that lie within the farmer's personal orbit such as his friends or neighbours, his family or his own observation and experience.

Classification of sources of information by nature of the activity results in a differentiation between those sources of information which are instructional in nature and those that accomplish the general dissemination of information. This classification introduces the concept of education in relation to the directed behavioural change desired.

The sub-categories in this classification are as follows:

Personal--direct face-to-face communication between communicator and the receiver.

Mass--information media directed to farmers in general and in which there is no provision for two-way communication.

Instructional Group--educational activities in which information is presented to a number of farmers simultaneously and in which there is an opportunity for two-way communication.

Individual Instructional--educational activities conducted with one farmer at a time, such as farm visits by the District Agriculturist.

Verner and Gubbels (1967:30) used classification of sources of

TABLE 3
CLASSIFICATION BY SOURCES OF INFORMATION

Source of Information	Nature of the Activity	
General farm magazines	M	NATURAL SOCIETAL SETTING
Special dairy magazines	M	
B.C. Dept. of Agriculture publications	M	
Canada Dept. of Agriculture publications	M	
Radio	M	
Television	M	
Newspapers	M	
Neighbours and friends	M	
Wife, children or relatives	M	
Observation of other farms	P	
Foreign travel	P	FORMAL INSTRUCTIONAL SETTING
Own experience	P	
Agriculture field days	IG	
Agriculture meetings & adult education courses	IG	
Vocational agriculture courses	IG	
Farm organization meetings	IG	
District Agriculturist	II	
Veterinarian	II	
Dairy Herd Improvement Assoc. Supervisor	II	
Salesmen or dealers	II	
Visit to experimental farm	II	
Milk vendor fieldman	II	

Key: M = Mass
P = Personal
IG = Instructional Group
II = Individual Instructional

information by nature of the activity to classify twenty-eight different sources of information reported in their study of Dairy Farm Operators in the Lower Fraser Valley (Table 3).

Similar classification of a source of information by the nature of the activity has been reported by Uwakah (1975) in Nigeria, a West African country. The Nigerian classifications are as follows (Uwakah, 1975:138):

Individual Instructional--

1. Farm visits by agents
2. Home visits by agents
3. Office visits by farmers
4. [Agents] Home visits by farmers
5. Telephone calls

Instructional Group (Involving an agent)--

6. Demonstrations
7. Field trips
8. Special meetings
9. Short courses
10. Lectures and talks
11. Field days
12. Film shows

Mass Communication (Devices)--

13. Circular letters
14. Extension newsletters
15. Newspaper articles

16. Radio
17. Television
18. Messages and Announcements

PERSONAL AND ECONOMIC CHARACTERISTICS ASSOCIATED WITH ADOPTION

The settings for adult learning, knowledge of innovations and adoption do not exist in vacuo but are influenced by certain personal and economic characteristics of the grower. Therefore, in order to better understand adoption, an analysis of personal and economic characteristics may provide some direction. A number of factors have been identified by other researchers which consistently discriminate between adopters and non-adopters.

In certain studies, age has been found to be related to less motivation and risk taking. As age advances, one is not motivated to find new means of solving problems. Age has therefore been found to be negatively related to adoption behaviour (Leuthold, 1966; Anderson et al., 1956). Verner and Gubbels (1967) found that age per se is not related to adoption. Research data on the relationship between age and adoption behaviour seems inconclusive, though the trend indicates that younger farmers are more likely to adopt an innovation than are older farmers.

In a farm enterprise, the role of the farm wife is related to the performance of the husband in his farm business. The wife acts as an accountant, supervises the business sometimes and purchases inputs for the farm when she travels to market centres (Sawer, 1974). Leuthold (1966) has suggested that the farm wife's education is a slightly better

predictor of the adoption behaviour than is the husband's education.

The number of children living at home was observed by South, Hansbrought and Betrand (1965) as positively related to the adoption of recommended practices. This may be due to the fact that younger people are more susceptible to new ideas and therefore influence their parents to accept them. The adoption of an innovation may also be a means of security or investment for the children. Verner and Gubbels (1967) found that as income increases, the number of children in the family increases; and as the income goes up, the District Agriculturist makes more farm visits resulting in an increase in adoption scores.

Education prepares one to make rational decisions between alternatives based on the analysis of facts presented. Certain research studies have observed a positive relationship between education (as measured by years of school completed) and adoption (Gross, 1949) while many others have found no relationship between education and adoption (Belcher, 1958; Verner and Millerd, 1966; Graham, 1954). This inconsistency led to an examination of the kind of education rather than the number of years one had spent at school. This indepth analysis revealed interesting results. The recency of the education and its relevance was found to be positively related to adoption (Leuthold, 1966; Van den Ban, 1957; Wilkening, 1952; Verner and Gubbels, 1967; Verner and Millerd, 1966).

The relationship between size of farm and adoption behaviour has been studied frequently but the findings have not been consistent regarding the direction of the relationship. Some have observed a positive

relationship between size of farm and adoption (Wilkening, 1952; Van den Ban, 1957). Some others have observed no relationship. Copp (1956) stated that the operator's scale of operations and productivity are better indicators of adoption. McMillion (1960) also found that the capital value of a farm is positively related to adoption. Verner and Gubbels (1967) observed that the number of young stock a Lower Fraser Valley dairy farmer has on his farm is positively related to the adoption of farm innovations.

The relationship between adoption and farm income has been found to be intermingled (Copp, 1956; Verner and Gubbels, 1967). Verner and Gubbels (1967) observed that as dairy farmers incomes go up, the District Agriculturist visits the farms more often and this appears to result in a higher adoption score. Copp (1956) found that where incomes are high, adoption is also high, and where adoption is high, income is likely to be high also.

Wilson and Gallup (1955) reported that education, size of farm, contact with extension staff, and socio-economic characteristics of a farmer are related to his adoption of recommended farm practices in the United States. From Holland, Van den Ban (1957) found progressive farmers were those with larger farms, younger, had received vocational training in agriculture, were more modern in their style of living and were members of farmers' organizations. Copp (1958) stated that the social position of a farmer as indicated by his age, education, level of living, and activity in community affairs is associated with his adoption behaviour.

Verner and Millerd (1966:71) concluded that "earlier adopters have a better than average economic status and a higher average participation in educational programs. Age per se, is not an important characteristic and neither are years of school completed, tenure, community participation, or community perception." Verner and Millerd (1966) suggested that certain socio-economic variables are interrelated, as such they are not independently related to the adoption of farm practices (age, schooling, income and adoption).

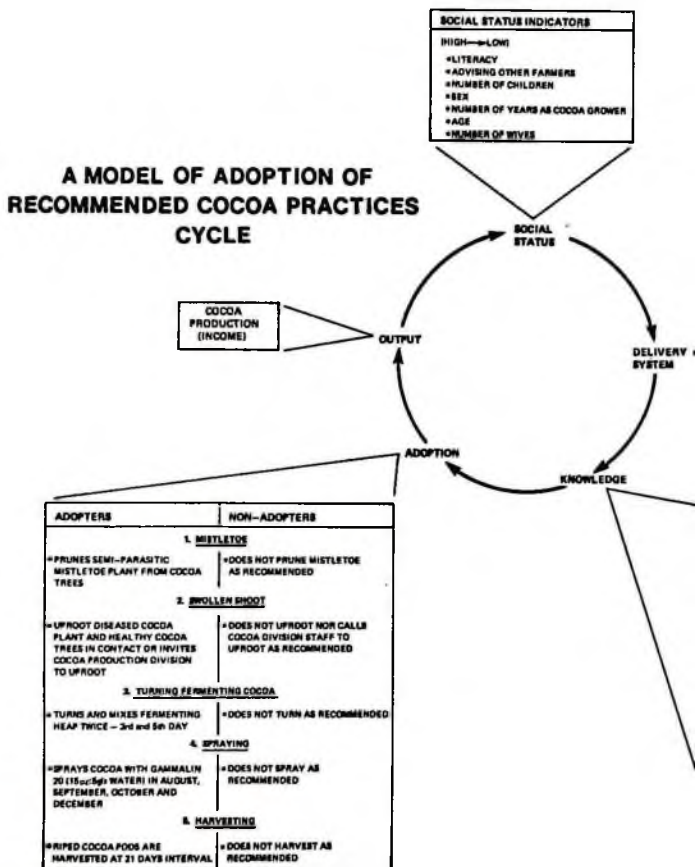
Gross and Taves, in their Iowa study, concluded that:

In all instances, acceptors read more college bulletins than non-acceptors, participated more actively in community affairs, had larger farms, and moved less frequently after they began to farm; in addition, for each of the ten practices studied, a greater proportion of acceptors than non-acceptors balanced their accounts regularly, had children who participated in the 4-H and F.F.A. programs, and were participants in A.A.A. (1952:322)

Evidence presented by the theoretical frame of reference and the literature reviewed, related to the theory of method and the concept of adoption, postulates relationships between variables which have resulted in a derivation of a model of adoption of recommended cocoa practices cycle (Figure 4).

In this model the delivery system (formal instructional setting and natural societal setting sources of information) provides the grower with knowledge (correct or incorrect) and the knowledge made available to the grower may or may not result in adoption of recommended practices. The adoption of recommended practices leads to increased cocoa production or revenue from the farm and higher socio-economic status which in turn

Figure 4



FORMAL INSTRUCTIONAL SETTINGS SOURCES OF INFORMATION	NATURAL SOCIETAL SETTINGS SOURCES OF INFORMATION
<ul style="list-style-type: none"> • COCOA DIVISION TECHNICAL OFFICERS • COCOA DIVISION VISITS INVOLVING TECHNICAL OFFICER • COMMERCIAL SALESMEN • FARMERS TRAINING COURSES • INFORMATION SERVICES TECHNICAL OFFICERS 	<ul style="list-style-type: none"> • NEWS BULLETINS • RADIO OR REDIFFUSION • FAMILY OR RELATIVES • FELLOW FARMERS • INFORMATION SERVICES • OWN EXPERIENCE • PEDDLERS

CORRECT KNOWLEDGE	INCORRECT KNOWLEDGE
1. MISTLETOE	
<ul style="list-style-type: none"> • REDUCES PHOTOSYNTHETIC POTENTIAL • DRAWS ON HOST PLANT FOOD • KILLS HOST PLANT 	<ul style="list-style-type: none"> • REASONS OTHER THAN THE CORRECT REASONS
2. DROPPEN SHOOT	
<ul style="list-style-type: none"> • A VIRUS DISEASE TRANSMITTED BY MEALY BUGS - NO TREATMENT 	<ul style="list-style-type: none"> • REASONS OTHER THAN CORRECT REASONS
3. TURNING FERMENTING COCOA	
<ul style="list-style-type: none"> • EVEN FERMENTATION WHICH PREVENTS SLATY AND DEEP PURPLE BEANS 	<ul style="list-style-type: none"> • REASONS OTHER THAN CORRECT REASONS
4. SPRAYING	
<ul style="list-style-type: none"> • PREVENTS OR KILLS CAPSIDS WHICH KILL COCOA TREES 	<ul style="list-style-type: none"> • REASONS OTHER THAN CORRECT REASONS
5. HARVESTING	
<ul style="list-style-type: none"> • PREVENTS GERMINATED BEANS AND SPREAD OF DISEASES 	<ul style="list-style-type: none"> • REASONS OTHER THAN CORRECT REASONS

induces the grower to adopt more recommended practices and thus the cycle continues.

HYPOTHESES

On the basis of the foregoing discussion, it is possible to state a number of directional hypotheses, concerning the relationship between the adoption of recommended cocoa practices, correctness of growers' knowledge of principles underlying the recommended practices, formality of the source of the information and selected personal and economic status indicators:

Hypothesis 1. The adoption score for cocoa growers in Ghana on selected recommended cocoa practices is positively associated with the correctness of grower's knowledge of the principles underlying the recommended practices.

This hypothesis was established upon the logical assumption that the average cocoa grower would be more likely to adopt a recommended cocoa practice if he understands why it is advisable or necessary for him to follow the recommended practice.

Hypothesis 2. The adoption score for cocoa growers in Ghana on selected recommended cocoa practices is positively associated with the formality of the source of the information on the recommended cocoa practices.

It is reasonable to assume that the formality of the information

source should be positively associated with adoption score because the formal instructional setting source provides an educational environment for the growers to learn about the recommended practice, and this encourages behavioural change.

Hypothesis 3. The adoption score for cocoa growers in Ghana on selected recommended cocoa practices is more significantly correlated with the correctness of growers' knowledge of the principles underlying the recommended practices than it is with the formality of the source of the information.

This hypothesis was established upon the assumption that cocoa growers will tend more strongly to adopt an innovation if they understand why it is necessary to follow the practice than merely obtaining information from formal sources.

Hypothesis 4. The adoption score for cocoa growers in Ghana on selected recommended cocoa practices is positively associated with each of the following personal and economic status indicators:

- Age.
- Sex.
- Number of wives.
- Number of children in household.
- Literacy.
- Number of years in cocoa growing.

- Cocoa production (income).
- Advisory role.

This hypothesis was established upon the assumption that certain personal and economic characteristics affect the adoption behaviour of growers.

DATA ANALYSIS

After the interviews were completed and the schedules edited, the data were punched onto data processing cards for computer application. The hypothesized relationships were explored by correlating each predictor variable with adoption score to assess the strength and direction of the relationship (see Table 15 [p. 65]). The adoption score was computed on the basis of the actual number of innovations adopted. In the correlation and regression analysis, the ordinal scales and the dichotomous nominal variables were treated as interval scales in accordance with the rationale advanced by Hays (1963), Labovitz (1970), and Bjerring (1972). In test of significance, the .05 level was accepted but the .01 level of significance is indicated where it occurs.

Since Pearsonian correlation compares pairs of variables taken singly, it is necessary to investigate the distinctness of these independent variables when combined severally and also to determine the amount of variance the combined variables explain.

With a large sample as the case is in this study, the meaningfulness of significance becomes a problem since small values of correlation

may be significant. The data were therefore further explored by stepwise regression analysis. The routine calculated a stepwise regression using all the independent variables in the predictor equation. Variables which did not make significant contribution to the total variance explained were eliminated until a 'core' of best predictors of cocoa production and adoption of recommended cocoa practices was obtained in the solution.

The single criterion used to enter a variable into the regression equation was that its correlation with the dependent variable had to be significant at the .05 level.

CHAPTER III

CHARACTERISTICS OF THE SAMPLE

Previous research has indicated that certain personal and economic characteristics as well as adoption behaviour of a population are related to the adoption of innovations. These data about each respondent in the sample were collected and have been discussed under three major descriptive categories; personal and economic characteristics, as well as adoption behaviour.

PERSONAL CHARACTERISTICS

Age

Data in Table 4 indicate the age distribution of respondents in this study.

Table 4

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY AGE

Age Category	Number	Per Cent
20 - 30	175	15%
31 - 40	260	22
41 - 50	271	23
Over 50	468	40
Total	1,174 ^a	100%

^a Seventeen of the respondents did not know their ages.

The age distribution of growers in Ghana is similar to most farm population patterns: the distribution was skewed towards the upper age. The age groups from twenty to thirty years contained 15 per cent of the

sample, thirty-one to forty had 22 per cent, while forty-one to fifty had 23 per cent. On the other hand, the fifty-one years or older group was 40 per cent of the respondents.

The average age of a grower was forty-eight years. This is consistent with the findings of Boateng (1974) who indicated that the average age of a Ghana grower was fifty years.

Age correlated positively with numbers of years respondents had been engaged in cocoa growing ($r = .62$, $df = 1,152$, $p < .01$), number of wives ($r = .15$, $df = 845$, $p < .01$), sex ($r = .11$, $df = 1,162$, $p < .01$), number of children in the household ($r = .46$, $df = 1,023$, $p < .01$) and cocoa production ($r = .19$, $df = 1,047$, $p < .05$) but negatively correlated with literacy ($r = -.38$, $df = 1,154$, $p < .01$).

Sex of Grower

The average Ghanaian woman is very enterprising. Some sectors of the economy are almost completely dominated by women; such as the marketing of textiles and foodstuffs. Two out of ten growers were women (Table 5).

TABLE 5
PERCENTAGE DISTRIBUTION OF RESPONDENTS BY SEX

Sex of Grower	Number	Per Cent
Male	976	83%
Female	201	17
Total	1,177 ^a	100%

^a Responses were not ascertained from 14 respondents.

There were significant correlations for sex with advisory role of

the respondents ($r = -.26$, $df = 1,161$, $p < .01$), literacy ($r = -.26$, $df = 1,156$, $p < .01$) and cocoa production ($r = -.22$, $df = 1,049$, $p < .01$). Thus, male growers were more likely to advise others, to be literate and to have higher cocoa production.

Number of Wives

As shown by Table 6, most of the respondents in the sample (72 per cent) were married while a smaller number was either single, widowed, divorced or separated (28 per cent).

TABLE 6

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY MARITAL STATUS

Marital Status	Number	Per Cent
Married	852	72%
Single	339	28
Total	1,191	100%

About three quarters of the married men respondents were monogamous while one-quarter were polygamous. The average grower had 1.4 wives. The breakdown of the number of wives is shown in Table 7.

The number of wives a grower had seems to portray his social status. Respondents who had many wives seem to be richer (higher cocoa production) ($r = .24$, $df = 764$, $p < .01$), had many children in the household ($r = .38$, $df = 925$, $p < .01$), and often advised other growers ($r = .12$, $df = 1,159$, $p < .01$). The age of the respondents was positively associated with the number of wives they had ($r = .15$, $df = 845$, $p < .01$).

TABLE 7

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY NUMBER OF WIVES

Number of Wives	Number	Per Cent
One	635	74%
Two	157	18
Three	39	5
Over Three	21	2
Total	852	99% ^a

^a Does not equal 100 per cent due to rounding errors.

Number of Children

The respondents had an average of 7.1 children. Some 13 per cent had no children, 42 per cent had between one and five children, while 30 per cent had between six and ten children. More than ten children were reported by 15 per cent of the sample (Table 8).

TABLE 8

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY NUMBER OF CHILDREN

Number of Children	Number	Per Cent
None	157	13%
1 - 5	501	42
6 - 10	353	30
Above 10	180	15
Total	1,191	100%

The number of children in the household was found to be positively related to age ($r = .46$, $df = 1,023$, $p < .01$), number of wives

($r = .38$, $df = 823$, $p < .01$), advisory role ($r = .12$, $df = 1,019$, $p < .01$), the number of years the respondent had been growing cocoa ($r = .38$, $df = 1,011$, $p < .01$) and cocoa production ($r = .29$, $df = 925$, $p < .01$). There was, however, a negative relationship between number of children in the respondents' household and their ability to read or write ($r = -.17$, $df = 1,016$, $p < .01$).

Literacy

The data indicate that three out of four respondents were illiterate on the basis of the self-defined ability of respondents to read any of the Ghana newspapers (Table 9)

TABLE 9

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY LITERACY

Self-defined Ability to read a newspaper	Number	Per Cent
Able (literate)	292	25%
Not Able (illiterate)	875	75
Total	1,167 ^a	100%

^a Twenty-four respondents did not respond.

The average respondents had 2.7 years of formal education (Table 10).

As might be expected, literacy was negatively related to years respondents had been growing cocoa ($r = -.29$, $df = 1,139$, $p < .01$), age ($r = -.23$, $df = 1,156$, $p < .01$), number of children in the household ($r = -.17$, $df = 1,016$, $p < .01$), but positively related to the advisory

role of respondents ($r = .12$, $df = 1,154$, $p < .01$).

TABLE 10

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY FORMAL EDUCATION

Formal Education	Number	Per Cent	
None	752	64%	70% Illiterate
Mass Education (1 yr.)	40	3	
Class 1-3 (1-3 yrs.)	33	3	
Standard 1-5 (4-8 yrs.)	88	8	30% ^b Functionally Literate
Standard 6-7 (9-10 yrs.)	210	18	
Post Standard 7 (above 10 yrs.)	47	4	
Total	1,170 ^a	100%	

^a Responses for twenty-one people were not ascertained.

^b UNESCO considers a minimum of four years of schooling (U.S. fourth-grade) as a requirement for the typical individual to reach and maintain functional literacy (Rogers and Svenning, 1969:76). This obviously differs from country to country.

ECONOMIC CHARACTERISTICS

Cocoa Growing Experience

Most of the respondents were experienced growers although within the past ten years, a new crop of growers had entered the cocoa growing industry. The average grower had 19.7 years (Table 11) of experience.

The number of years the respondents had been growing cocoa was found to be positively related to age ($r = .62$, $df = 1,151$, $p < .01$), number of wives ($r = .10$, $df = 837$, $p < .01$), number of children in the household ($r = .38$, $df = 1,011$, $p < .01$), and cocoa production ($r = .23$, $df = 1,038$, $p < .01$). There was a negative relationship between the

number of years the respondents had been growing cocoa and their ability to read or write ($r = -.29$, $df = 1,142$, $p < .01$).

TABLE 11

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY COCOA GROWING EXPERIENCE

Years of Experience	Number	Per Cent
Less than 5	139	12%
5 - 10	302	26
11 - 15	141	12
16 - 20	118	10
21 - 25	74	6
26 - 30	94	8
Over 30	299	26
Total	1,167 ^a	100%

^a There was no response from twenty-four people.

The more years of cocoa growing experience, the less likely the respondents were able to read or write. This is probably explained by the fact that farming, in a few years past, was looked upon as an industry for illiterates. The recent policies of the various Ghana Governments (e.g., "Go back to the land" and "Rural Development Programmes") have been in the direction of encouraging educated people to go into farming.

Cocoa Production

The average grower's production was found to be 42.6 loads (2,256 pounds dry cocoa) which brings in an income of ₵511 (\$452). This finding is supported by Boateng (1974) who found the average income of a Ghana

grower to be ₵500 (\$420.60). Respondents with production above fifty-one loads of cocoa made up the largest single category. This group included 26 per cent of the sample. At the other extreme is another category of respondents who made up 20 per cent of the respondents who harvested and sold one to ten loads of cocoa. Another 15 per cent harvested and sold between eleven and twenty loads of dry cocoa while 12 per cent sold between twenty-one and thirty loads of cocoa. Those with thirty-one to forty loads, made up 9 per cent while 7 per cent harvested and sold between forty-one and fifty loads. The cocoa trees of 11 per cent of the sample have not started bearing (Table 12).

TABLE 12

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY COCOA PRODUCTION

Loads ^a Harvested and Sold	Number	Approximate Mean Value (₵)	Per Cent
Not bearing	132	-	11%
1 - 10	233	₵ 66	20
11 - 20	180	₵ 186	15
21 - 30	144	₵ 306	12
31 - 40	111	₵ 426	9
41 - 50	78	₵ 546	7
Over 50	313	₵1,200	26
Total	1,191		100%

^a 1 load = 60 pounds = ₵12 (\$10.60).

The yields from respondents' cocoa farms were positively related to the number of years the respondents had been growing cocoa ($r = .23$, $df = 1,038$, $p < .01$), their advisory role ($r = .16$, $df = 1,045$, $p < .01$),

age ($r = .19$, $df = 1,047$, $p < .01$) and number of wives ($r = .24$, $df = 764$, $p < .01$). Although there was a negative relationship between cocoa production and literacy, the relationship was weak resulting in non-significant association ($r = -.04$, $df = 1,040$, $p = n.s.$).

ADOPTION BEHAVIOUR

Number of Practices Adopted

On the average, respondents have adopted about two out of the five recommended cocoa practices (Figure 5). A comparison of the proportions of respondents who have adopted each of the five recommended practices and their correct knowledge of the principles underlying the recommended cocoa practices shows that the mere possession of correct knowledge of the principles underlying a recommended cocoa practice does not necessarily motivate respondents to adopt the recommended cocoa practice (Figure 6). The largest gap is found between the possession of correct knowledge on swollen shoot disease and the adoption of its recommended control practice. This huge gap needs some comments.

A diseased swollen shoot cocoa tree continues to produce pods until it finally dies. Despite the fact that the tree is diseased, the grower continues to get some income from the tree and finds it difficult to remove the diseased tree as well as healthy trees in contact with the diseased tree. The grower has also some emotional attachment to the trees which have been his main source of income for years. These have an effect on the grower's decision to adopt the control practice. Before about 1961, the Ghana Government had a compulsory cutting out

Figure 5
NUMBER OF RECOMMENDED COCOA PRACTICES WHICH WERE ADOPTED

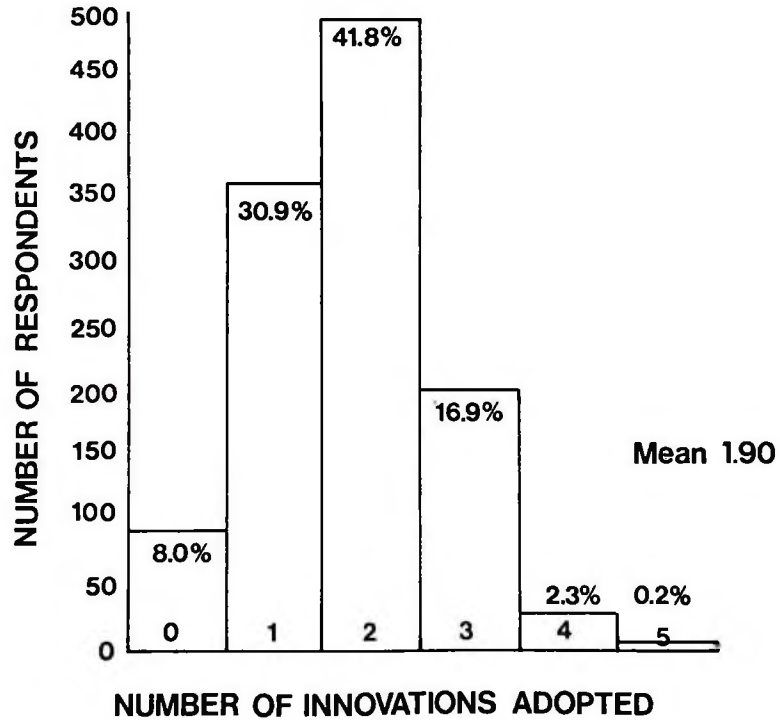
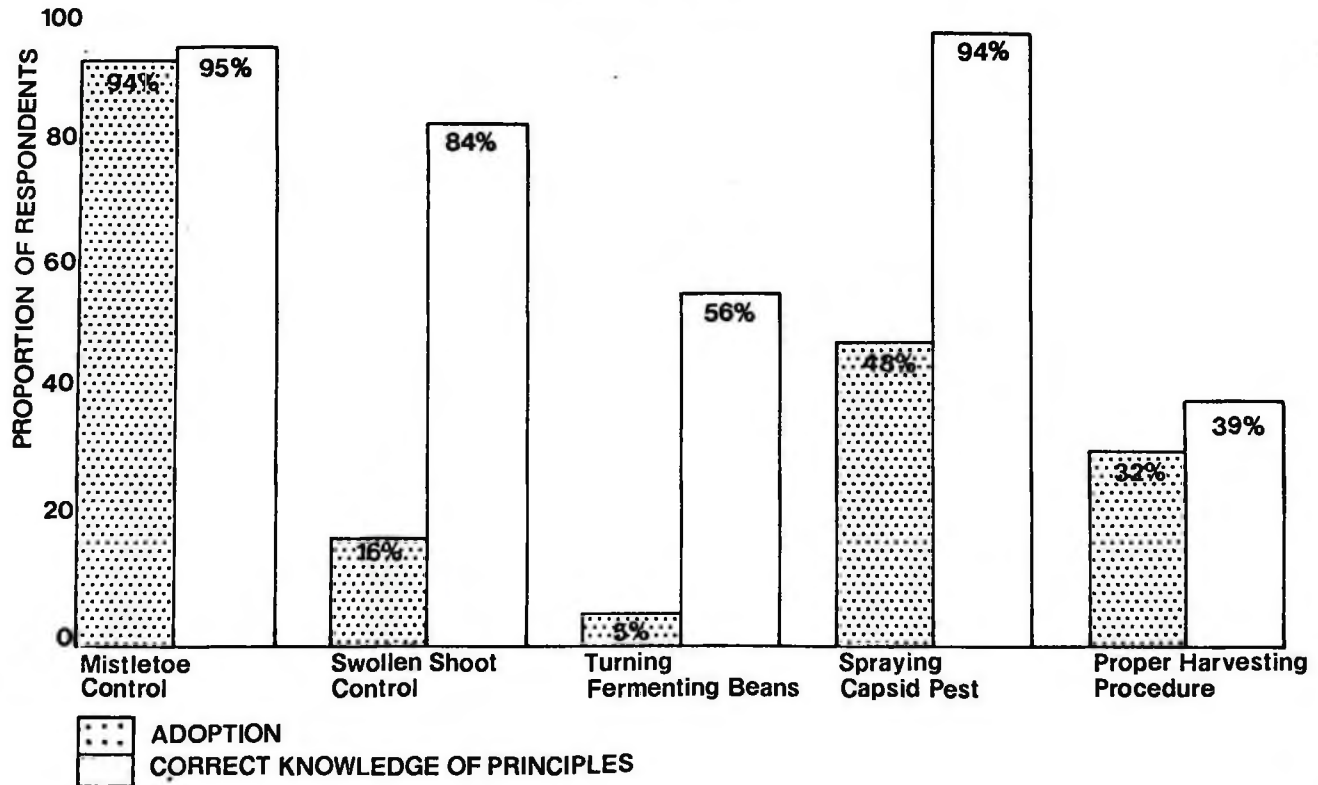


Figure 6

DISCREPANCIES BETWEEN CORRECT KNOWLEDGE AND ACTUAL ADOPTION FOR EACH OF FIVE RECOMMENDED COCOA PRACTICES



programme which circumvented this problem. Within the terms of the programme, the Government provided the labour to remove the diseased cocoa trees as well as healthy cocoa trees in contact and the growers were compensated for each cocoa tree removed. Through the compulsory cutting out programme, about 63 million cocoa trees were cut out between 1946 and 1957 and another 44.6 million between 1957 and 1961 (Asumaning, n.d.).

Since 1962, growers have been asked to remove diseased cocoa trees from their farms without any compensation except that the grower can ask the staff of the Cocoa Production Division to remove the trees for him. The growers have been reluctant to cut out the diseased cocoa plants as well as healthy cocoa trees in contact.

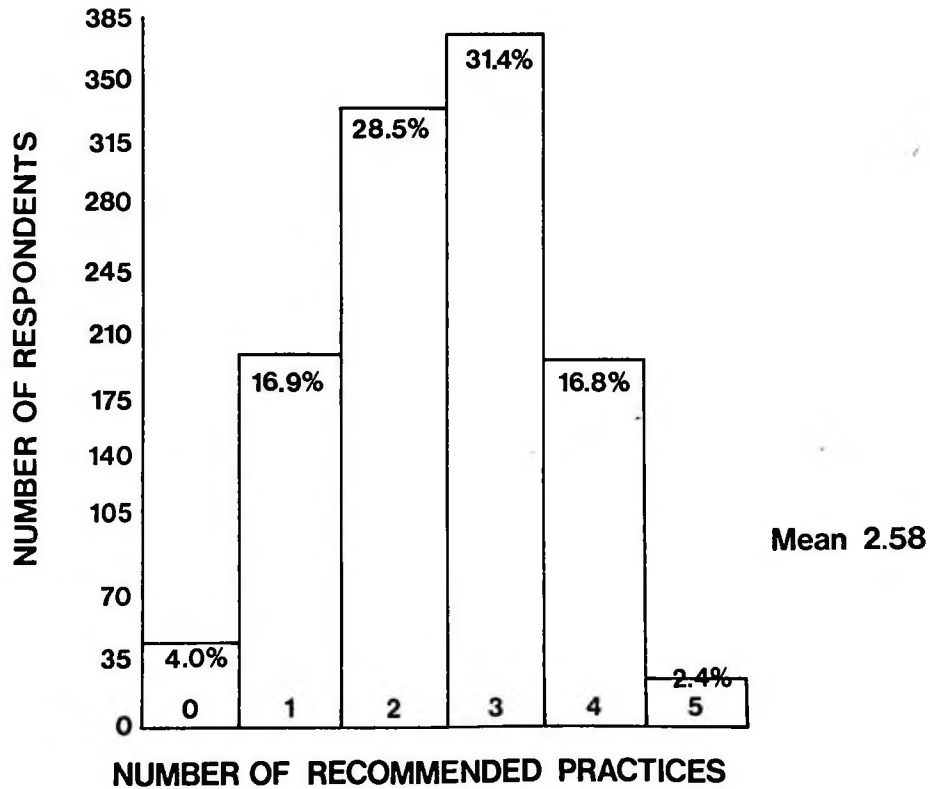
Asumaning (n.d.) indicated that between 1963 and 1964, out of the 1.5 million cocoa trees marked out for destruction by growers, only about 100,000 were actually removed.

It seems, the present policy of voluntary cutting out of diseased cocoa trees as well as healthy cocoa trees in contact by the growers themselves or by the staff of the Cocoa Production Division, on the invitation of the grower, without any financial compensation, has not met with any appreciable response from the growers.

Correct Knowledge of Principles on Recommended Practices

Figure 7 shows the number of practices and the proportions of respondents who have correct knowledge on them. On the average, respondents had correct knowledge on about three recommended practices.

Figure 7
**CORRECT KNOWLEDGE OF PRINCIPLES
UNDERLYING RECOMMENDED COCOA PRACTICES**



Instructional Source of Information

The respondents obtained information from instructional sources on about two innovations on the average (Figure 8). It appears that respondents use more instructional sources of information if the recommended practice is complex or technical. When this source is used, respondents appear to have a better understanding of the reasons why a recommended practice has to be adopted. Such is the case, as vividly shown by swollen shoot disease control and spraying against capsids (Figure 9).

Advisory Role

Fifty-eight per cent of the respondents indicated that they have advised other growers about matters concerning cocoa husbandry such as weeding, marketing, obtaining seeds, within the previous five years. The quality of the advice given was not measured (Table 13).

TABLE 13

PERCENTAGE DISTRIBUTION OF RESPONDENTS BY THEIR ADVISORY ROLE

Advisory Role	Number	Per Cent
Yes	490	42%
No	683	58
Total	1,173 ^a	100%

^a No responses were obtained from eighteen people.

Advisory role index was positively associated with number of children in the household ($r = .12$, $df = 1,019$, $p < .01$), number of wives

Figure 8
**FORMAL INSTRUCTIONAL SETTING SOURCES
OF INFORMATION ON RECOMMENDED COCOA PRACTICES**

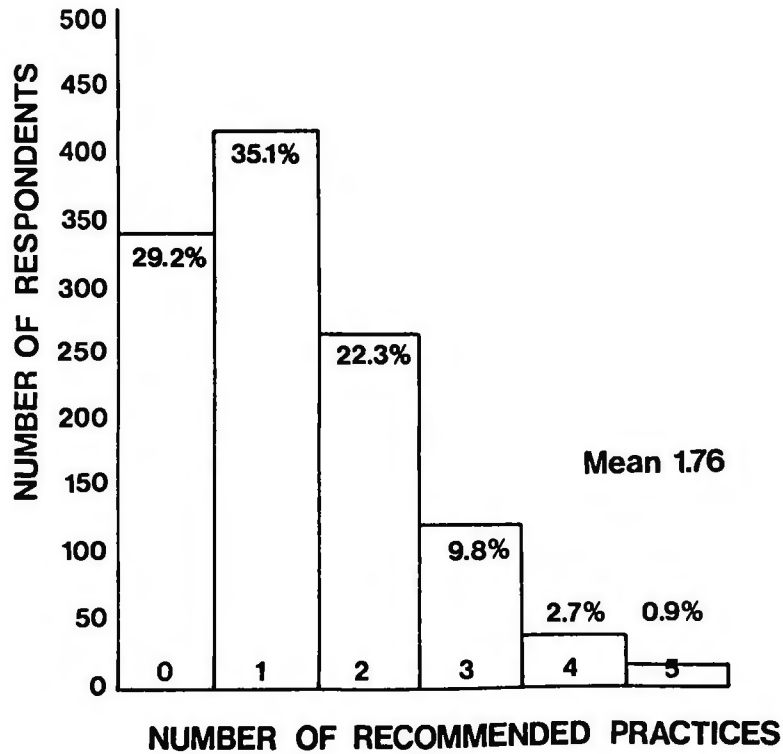
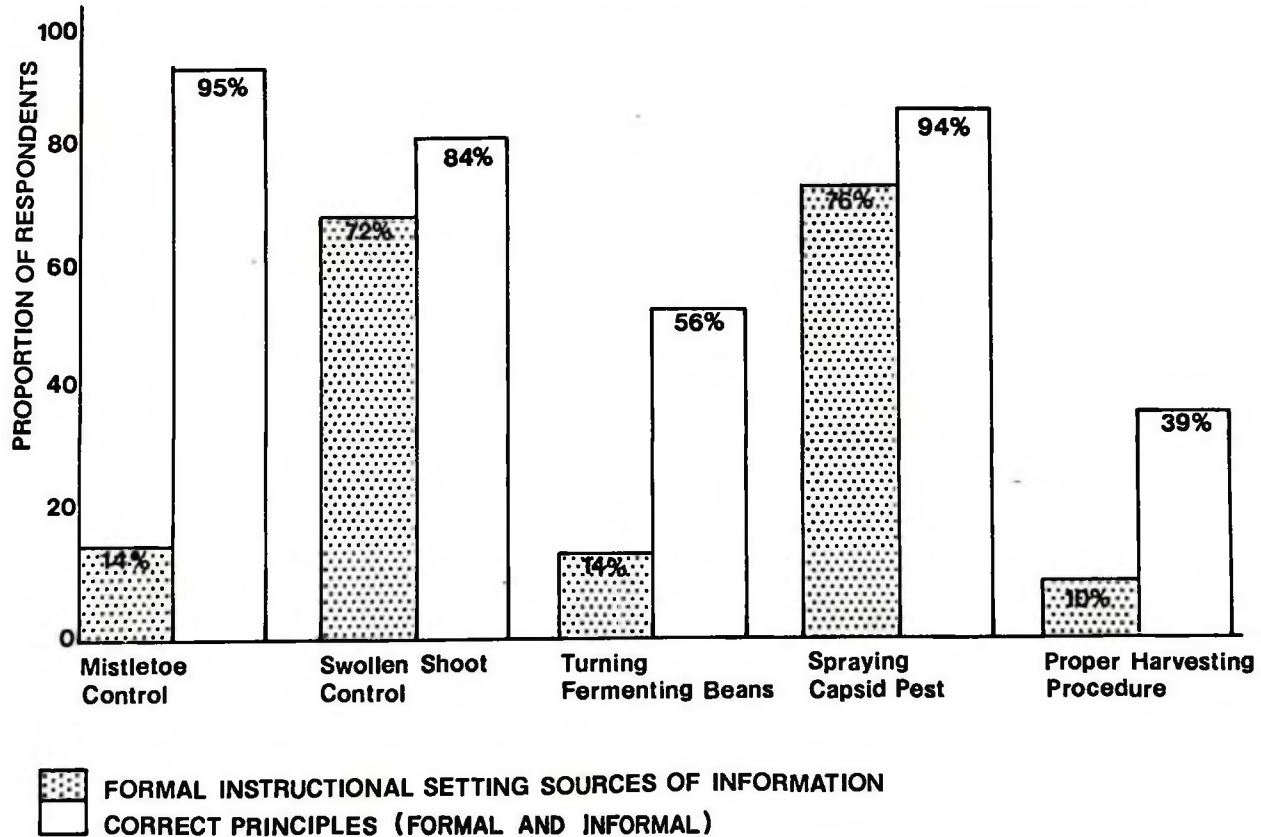


Figure 9

THE RELATIONSHIP BETWEEN CORRECT KNOWLEDGE AND FORMAL INSTRUCTIONAL SETTING SOURCES OF INFORMATION



($r = .12$, $df = 839$, $p < .01$), literacy ($r = .12$, $df = 1,154$, $p < .01$), cocoa production ($r = .16$, $df = 1,045$, $p < .01$), while negatively related to sex (males more likely to advise) ($r = -.26$, $df = 1,161$, $p < .01$). Age was not related to the advisory role of respondents.

SUMMARY OF CHARACTERISTICS OF THE SAMPLE

The eleven most critical variables on which the sample of Ghana cocoa growers were assessed are summarized in Tables 14, 15, and 16. The first five of these variables are personal characteristics measures, two economic characteristics measures, and the remaining four measures relate to adoption behaviour.

TABLE 14

MEANS, STANDARD DEVIATIONS AND POSSIBLE
RANGES FOR TEN PREDICTOR VARIABLES
(1,191 Respondents)

Variable	Mean	S.D.	Possible Range (observed)
Age (years)	48.07	15.06	20 - 80
Sex - Male	83%		
Female	17%		
Number of Wives	1.35	0.69	1 - 5
Number of Children	7.11	5.41	0 - 30
Literacy - Illiterate	75%		
Literate	25%		
(Formal Education in Years	2.69	4.08	0 - 12)
Cocoa Growing Experience	19.72	14.02	1 - 50
Cocoa Production (60 lbs.=1 load)	42.60 (¢511)	38.57	0 - 150
Adoption Score	1.90	0.79	0 - 5
Correctness of Knowledge Index	6.00	1.95	0 - 10
Formality of Information Source Index	5.25	1.75	0 - 10
Advising Other Cocoa Growers - Yes	58%		
No	42%		

TABLE 15

CORRELATION OF TEN VARIABLES WITH ADOPTION AND COCOA PRODUCTION

Variables	Correlation ^a With		N ^b
	Adoption Score	Cocoa Production	
Age	.04	.19	1,047
Sex	-.12	-.23	1,049
Number of Wives	.07	.24	764
Number of Children	.10	.29	925
Literacy	.08	-.04	1,040
Cocoa Growing Experience	.06	.23	1,048
Cocoa Production	.21	-	989
Adoption Score	-	.21	989
Correctness of Knowledge Index	.34	.21	1,051
Formality of Information Source Index	.31	.18	1,050
Advising Other Cocoa Growers	.10	.16	1,045

^a Correlations larger than .062 are significant at the .05 level.

^b N represents the number of observations. Where N for adoption differs from N for cocoa production, the more conservative figure is shown.

TABLE 16

INTERCORRELATIONS^a OF THREE PREDICTOR VARIABLES WITH COCOA PRODUCTION

Variable	Adoption Score	Correctness of Knowledge Index	Formality of Information Source Index	Cocoa Production
Adoption Score	1.00			
Correctness of Knowledge Index	.34	1.00		
Formality of Information Source Index	.31	.53	1.00	
Cocoa Production	.21	.20	.18	1.00

^a Correlations larger than .062 are significant at the .05 level.

ANALYSIS OF PREDICTORS OF ADOPTION

Testing of Hypotheses1. Adoption and Knowledge

The first hypothesis tested was that the adoption score is positively associated with the correctness of the growers' knowledge of the principles underlying the recommended practices. The hypothesis was confirmed ($r = .34$, $df = 1,092$, $p < .01$). One can therefore conclude that among growers in Ghana, those with a correct understanding of the principles underlying recommended practices would seem to adopt them.

2. Adoption and Source of Information

The second hypothesis was that the adoption score is positively associated with the formality of the source of the information on the recommended cocoa practices. A significant positive relationship was found ($r = .31$, $df = 1,086$, $p < .01$), therefore, one can conclude that growers in Ghana would seem to adopt recommended cocoa practices when they obtain information about them from adult education sources.

3. Adoption versus Knowledge and Sources

The third hypothesis was that the adoption score is significantly associated with the correctness of growers' knowledge of principles underlying the recommended practices rather than with the formality of the source of the information. The difference between the two correlation coefficient values, correctness of knowledge and formality of the

source of the information [$(r = .34) - (r = .31) = r .03$], was subjected to the Hotelling 't' test for correlated correlation coefficients (Gilford, 1956:190). The analysis showed no significant difference ($t = 1.18$, $df = 1,086$, $p = n.s.$).

This finding shows that there is no significant tendency for correctness of knowledge to be more closely linked with adoption than with adult education sources of the information.

4. Adoption versus Personal and Economic Characteristics

Since the actions of people may be partially explained by their personal and economic characteristics, the data was further analysed by testing for relationships between adoption behaviour, and personal and economic characteristics. Thus, the fourth hypothesis was that the adoption score is positively associated with selected personal and economic characteristics.

a) Age

The hypothesis predicting a positive significant relationship between age of growers and the adoption of recommended cocoa practices was not supported at the .05 level of significance ($r = .04$, $df = 1,081$, $p = n.s.$).

This finding is consistent with those of Verner and Millerd (1966), Verner and Gubbels (1967), Sawyer (1974), and Clark and Akinbode (1968). Rogers and Shoemaker (1971:186), however, indicated that probably the age at the time of adoption rather than the age at the time of the interview is related to adoption.

b) Sex Score

The relationship between adoption and sex indicated that males were more apt to adopt innovations than were female growers ($r = -.12$, $df = 1,082$, $p < .01$). This relationship may be due to the fact that the males have more physical strength to carry out innovations which require manual labour than do females. A typical example is that female growers find it difficult, if not impossible, to climb a cocoa tree to cut down mistletoes. In some of the control methods, the female has to depend on farm labourers. In the absence of farm labourers, most females may find it relatively difficult to adopt some of the control methods which require manual labour. Some females, sometimes, are expected to check with their husbands before adopting an innovation which requires some expenditure, while the males may choose to adopt an innovation without consulting the wife.

It is, therefore, not surprising that male growers adopt more recommended practices than females.

c) Number of Wives

The relationship between the number of wives and adoption of recommended cocoa practices was found associated ($r = .07$, $df = 805$, $p < .05$). Thus, an increase in the number of wives tends to increase adoption of recommended practices.

d) Number of Children

The sub-hypothesis predicting a positive relationship between

adoption of recommended cocoa practices and number of children was supported ($r = .10$, $df = 953$, $p < .01$).

This is consistent with the findings of South, Hansbrought and Betrand (1965), Clark and Akinbode (1968) and Alleyne and Verner (1969). Alleyne and Verner (1969) observed a low chi-square value even though the relationship was significant at the .01 level.

This relationship may be due to a number of factors, among which are that children are sometimes a source of labour to the farm enterprise. Also that young people tend to be receptive to new ideas and may encourage their parents to try new ideas. This relationship may also be due to the idea of parents adopting innovations as an insurance for their children. On the other hand, adopters may be more economically solvent, hence they can afford more children.

e) Literacy

The sub-hypothesis predicting a positive significant relationship between adoption of recommended cocoa practices and literacy was supported at the .01 level of significance ($r = .08$, $df = 1,073$, $p < .01$).

This finding is supported by Goldsen and Ralis (1957)¹ who found that literate villagers were more innovative than illiterates. Rahim (1961)¹ in his studies in Pakistan observed literacy to be positively related to adoption. Wright et al. (1967:17)¹

¹ Cited in Rogers and Svenning (1969).

indicated that Guatemalan literate peasants were more innovative than illiterates. This is, however, at variance with Graham (1954), Belcher (1958), and Clark and Akinbode (1968).

A positive relationship is to be expected since literacy widens ones experience beyond the traditional village level and this should accelerate the acceptance and adoption of recommended cocoa practices.

f) Advising Other Farmers

A positive and significant relationship was observed in the association between growers offering advice to other growers and the adoption of recommended cocoa practices ($r = .10$, $df = 1,079$, $p < .01$). This indicates that those growers who advise others are normally people practicing the innovation recommended.

Economic Characteristics

g) Number of Years in Cocoa Growing

The hypothesis predicting a positive significant relationship between cocoa growing experience and the adoption of recommended cocoa practices was supported at the .05 level of significance ($r = .06$, $df = 1,073$, $p < .05$). This is at variance with Verner and Millerd (1966), Verner and Gubbels (1967), Alleyne and Verner (1969), and Clark and Akinbode (1968).

The Cocoa Production Division is the principal source of information available to growers in Ghana. Those growers who have been growing cocoa for a longer period of time may have established

contact with the Division and therefore, take advantage of its educational programmes.

h) Cocoa Production

The variable, cocoa production, which is the ultimate aim in adopting recommended cocoa practices, showed a higher significant relationship with the adoption of recommended practices than did any other characteristics studied ($r = .21$, $df = 989$, $p < .01$). However, it cannot be determined whether the production per acre is greater among adopters since size of farm was not measured. This positive relationship results because adopters may have larger farms and therefore enjoy the advantages of economy of scale.

The positive significant relationship between adoption and farm production is consistent with the findings of Clark and Akinbode (1968), Alleyne and Verner (1969), and Sawyer (1974).

Joint Influence of Adoption and Other Independent Variables on Cocoa Production

The joint relationship of independent variables; sex, number of wives, number of children, literacy, number of years in cocoa growing, advisory role, adoption of recommended practices, formality of the source of information, and correctness of knowledge; to cocoa production was assessed in a separate regression analysis.

Of the original nine independent variables entered in the analysis, six predictors; number of children, sex, adoption score, years

engaged in cocoa growing, number of wives and correctness of knowledge; were retained in the final regression equation and jointly accounted for 19.3 per cent of the variance in 'explaining' cocoa production. It is evident that the number of children in the growers household was of significant value in predicting cocoa production (Table 17).

TABLE 17
SIX VARIABLES WHICH PREDICT COCOA PRODUCTION

Core Variables	Cumulative Proportion of Variation Explained	F. Prob.
Number of Children	.082	0.0000
Sex	.121	0.0000
Adoption Score	.142	0.0000
Years in Cocoa Growing	.167	0.0000
Number of Wives	.182	0.0001
Correctness of Knowledge	.193	0.0001
R^2	.193	

Joint Influence of Independent Variables and
the Adoption of Recommended Cocoa Practices

It was speculated that correctness of knowledge underlying a recommended cocoa practice, the formality of the source of the information, and certain personal and economic characteristics would jointly predict adoption since each of the variables contributes towards adoption in its own way. The relative contributions of these several independent variables to adoption was assessed in a stepwise regression analysis to determine the proportion of variance in adoption explained by the

independent variables considered jointly.

The most important predictor was found to be correctness of knowledge which explained 11.7 per cent of the variance in adoption. The combination of correctness of knowledge and formality of the source of information accounted for 13.9 per cent of the variance in adoption. Cocoa production and literacy were also retained in the final prediction equation. These four predictors jointly accounted for 16.1 per cent of the variance in adoption leaving 83.9 per cent of the variance attributed to other factors (Table 18).

TABLE 18
FOUR VARIABLES WHICH PREDICT ADOPTION

Core Variables	Cumulative Proportion of Variation Explained	F. Prob.
Correctness of Knowledge	.117	0.0000
Formality of Information Source	.139	0.0000
Cocoa Production	.157	0.0000
Literacy	.161	0.0174
R^2	.161	

It is interesting to note that sex, number of wives, number of children, number of years engaged in cocoa growing, and advising role of the cocoa grower did not emerge as significant contributors toward explaining the variance in adoption and were therefore eliminated from the final predicting equation. Thus the personal and economic factors investigated, with the exception of cocoa production and literacy, appear to have had little bearing upon explaining the variance in adoption of recommended cocoa practices.

DISCUSSION OF THE FINDINGS

The results presented in the previous sections of this chapter highlighted interesting relationships.

The correctness of knowledge of the principles underlying recommended cocoa practices appears to be the best predictor of adoption of recommended practices. This indicates that those growers in Ghana who have a correct understanding of the principles underlying recommended cocoa practices are more likely to adopt them. Therefore, this suggests that to accelerate the adoption of recommended practices in Ghana, cocoa growers must be taught to understand the principles underlying the recommended practices being promoted. But the possession of correct knowledge alone is not always sufficient motivation to effect adoption of the recommended practices. In addition to providing correct knowledge, growers must also be motivated to adopt through educational programmes.

The adopters of recommended practices in Ghana are more likely to use adult education sources of information particularly when the practices are complex in nature as is the case with swollen shoot disease control and spraying against capsids.

There is no indication that the adoption of recommended practices is more closely linked with correctness of knowledge than with adult education sources of the information.

Among the personal and economic variables studied, number of wives, number of children, literacy, advisory role, number of years engaged in cocoa growing, and cocoa production, are positively associated with the adoption of recommended cocoa practices among Ghana growers.

Cocoa production (income) and literacy are the best predictors, among the personal and economic variables, of adoption of recommended cocoa practices. It was found that age neither encouraged nor hindered the adoption of recommended practices. Male growers are more apt to adopt the innovations than female growers.

The adoption of recommended practices per se by Ghana growers is of little benefit unless it results in increased cocoa production, which means more income for the grower and for the total economy of Ghana. This study shows clearly that adopters of recommended practices are more likely to have increased cocoa production. Government therefore, has sufficient reason to promote the adoption of recommended practices among growers.

CHAPTER IV

SUMMARY AND RECOMMENDATIONS

OVERVIEW OF THE STUDY

The general purpose of the study was to explore the relationship between the adoption of recommended cocoa practices by growers in Ghana, and the correctness of their knowledge of principles underlying the recommended cocoa practices, formality of the source of information used by growers, and selected personal and economic characteristics of the growers. Specifically examined were predictor variables hypothesized to be associated with the adoption of recommended cocoa practices.

Subjects for the study were a sample of 1,191 cocoa growers in Ghana. The survey was conducted during July, August, and September of 1973. The data were collected in personal interviews, and analysed using simple correlation coefficients and stepwise regression analysis. The .05 level of significance was used in the analysis of the data.

SUMMARY OF THE FINDINGS

Focusing on directional hypotheses, the statistical analysis yielded the following salient findings;

1. The correctness of knowledge of principles underlying a recommended cocoa practice was positively associated with the adoption of recommended practices by growers in Ghana.
2. Adult education sources of information used by growers in Ghana

were positively associated with the adoption of recommended cocoa practices.

3. The hypothesis that the adoption of recommended practices is more closely associated with correctness of knowledge underlying the practices than with the adult education source of information, was not supported.
4. Among the personal and economic variables, number of wives, number of children, advisory role, number of years engaged in cocoa farming and cocoa production were positively related to adoption of recommended practices.
5. Age was not related to the adoption of recommended practices.
6. Sex was found to be negatively related to adoption of recommended practices. Male growers were more apt to adopt the recommended practices than female growers.
7. Literacy and adoption of recommended practices were positively related.
8. The above related variables "statistically explained" a total of 16.1 per cent of the overall variance, leaving 83.9 per cent unaccounted for. Further studies are likely to reduce this.

RECOMMENDATIONS

The study shows that possession of correct knowledge of principles is crucial to adoption of recommended cocoa practices. Thus, access to formal instructional activities could contribute to the improved performance of cocoa growers in Ghana. An obvious mechanism for

improvement is adult education for the growers.

Some of the ways in making the formal instructional activities effective are:

1. Induction and Inservice Training Programme

The effectiveness of the Technical Officers responsible for providing the formal instructional activities depends, to a large extent, on their competencies in teaching adults as well as their technical knowledge of cocoa husbandry. The Technical Officers are very knowledgeable on the technical aspects of cocoa husbandry but lack training in adult education (Opare, 1973).

The Cocoa Production Division therefore needs to develop comprehensive induction and inservice training programmes for future and present extension workers. Such a training programme must be expected to provide the extension workers with competencies in planning, sequencing, implementing, and evaluating learning activities for growers based on sound principles of adult learning and instruction.

The Cocoa Production Division may utilize the existing facilities at the Universities, agricultural colleges, and farm institutes for the training programmes. Qualified instructors in adult education and cocoa husbandry are available at the Universities and other higher institutions.

2. Organizing Educational Activities for Growers

The major function of the extension workers should be in organizing educational activities for cocoa growers. The Cocoa Production

Division currently provides farmer training courses on sixteen Cocoa Agronomy Stations, each course lasting a fortnight. Each station organizes twenty courses annually and intake is limited to thirty-six growers. The participants are provided with free boarding and lodging as well as an allowance of 50 pesewas (45¢) per diem. Other extension services activities of the Division include farm visits, station visits by growers, agricultural shows, open days, radio, and posters.

It is suggested that all extension workers organize farmer training courses in the villages under their control utilizing the existing village classrooms and community centres.

Such educational programmes should be designed to ensure that the growers become interested in the recommended practices, to assist them in the evaluation of the new practice and to encourage them to actively try out the recommended practices. In order to aid learning, the material to be learnt should be near reality and active participation of the growers in the learning activity should be encouraged. The extension worker needs to aim at smaller groups of people for the learning activities since participation increases with smaller group size. Proper selection of techniques and devices should accelerate learning. The extension worker must therefore select the most suitable techniques and devices for specific behavioural objectives and learning tasks. For example, techniques such as the lecture, debate, a panel and field trips are mainly used for acquiring information, while buzz

groups, group discussion and role playing are techniques for applying knowledge. One of the important techniques for acquiring a skill in agriculture is the process demonstration followed by actual practice. In the process demonstration, the extension officer demonstrates how, for example, to spray cocoa trees against pests and explains the method used step-by-step while the growers watch and listen. The demonstration is usually followed by the growers practicing what has been demonstrated under the guidance of the extension officer. This approach helps the grower to understand the procedure before trying to follow it himself.

The educational activities should be planned for growers of mixed characteristics. For example, since the male growers tend to adopt more innovations than females, in a group situation the males may tend to influence the females to adopt the recommended innovations. Adoption is a socially based behavioural change and must therefore be directed to groups not individuals.

A mixed group of males and females would tend to correct the present situation at the farmer training courses where almost all participants are males despite the fact that 17 per cent of the growers are females.

3. Availability of Inputs

The Cocoa Production Division should make available the necessary inputs (seedlings, cutlasses, spraying machines, insecticides, etc.) growers need in order to adopt the recommended cocoa

practices. Such inputs should be made available in convenient sizes and locations so that growers can obtain them without much hustle. It will be frustrating for a grower to travel a long distance just to purchase, say one bag of fertilizer or one cutlass.

4. Provision of Transportation

One of the major problems facing an extension worker in Ghana is the lack of transportation (Opare, 1973). The Cocoa Production Division has to provide a means of transport if extension workers are to reach most growers in scattered and remote villages.

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APPENDIX

INTERVIEW SCHEDULE

THE ROLE OF ADULT EDUCATION IN THE ADOPTION OF
 INNOVATIONS BY COCOA GROWERS IN GHANA

INTERVIEWER.....		CODE:
		1 = WESTERN
		2 = CENTRAL
		3 = EASTERN
SAMPLE NO.	REGION	4 = VOLTA
		5 = ASHANTI
		6 = BRONG AHAFO
NAME OF VILLAGE.....		

Hello, I'm from the University of Ghana, Legon and I am one of the students the Chief announced will be asking questions about cocoa growing and yourself. As the Chief indicated, all the information that you give me will be strictly confidential, and will be used for statistical summaries only.

A. TO BEGIN, I WOULD LIKE TO ASK QUESTIONS DEALING WITH YOUR COCOA FARMS.

ALL QUESTIONS ON THE COCOA PRACTICES REFER TO THE PRECEDING FIVE YEARS.

1. For how many years have you been engaged in cocoa farming?

.....

MISTLETOE

2. When mistletoe and epiphytes appear on your cocoa trees do you

1. Remove them

2. Leave them on the trees

A. Why?.....

B. Which source of information provided you with the most influential

information leading you to remove or not to remove these parasites?.....

FREQUENCY OF HARVESTING

3. What is the interval between two harvests in the same season?
.....
- A. Why do you harvest in this way?.....
.....
- B. Which source of information provided you with the most influential information leading you to harvest this way?.....
.....

INTERVIEWER:

One harvest is when the whole farm has been harvested. It may take 5 days from start of harvesting to finish but this is considered as ONE harvesting.

SWOLLEN SHOOT

4. What do you do when you spot a swollen shoot diseased cocoa on your farm?
1. Remove the diseased tree only
 2. Remove diseased tree plus those trees in contact with the diseased tree
 3. Do not remove it
 4. Report to Cocoa Division Staff
 5. Other (specify)
- A. Why?.....
- B. Which source of information provided you with the most influential information leading you to adopt this practice?.....

TURNING

5. How many times do you turn your fermenting heap of cocoa?
1. None
 2. Once
 3. Twice
 4. Thrice
 5. Four or more
- A. Why?.....
- B. Which source of information provided you with the most influential information leading to those fermenting practices?.....
-

SPRAYING AGAINST CAPSIDS

6. Within the past five years, have you continuously been spraying your farm against cocoa capsid pests?
1. Yes
 2. No
- a) How many times in a year do you spray your cocoa trees against capsids? In which months?

<u>Number of Times</u>	<u>Months</u>
1. Once
2. Twice
3. Thrice
4. Four times
5. More than four
A. Why?.....

B. Which source of information provided you with the most influential information leading to this practice?.....
.....

7. How many loads of cocoa from your own farm did you actually sell last cocoa season? (1 load = 60 lbs.).

0. None

1. 1 - 10

2. 11 - 20

3. 21 - 30

4. 31 - 40

5. 41 - 50

6. 51 - 100

7. more than 100

8. Judging by your own experience, what do you think is the most important bottleneck in your cocoa farming?
.....

9. How can the bottleneck be improved?
.....

B. MY NEXT SET OF QUESTIONS ARE ABOUT YOURSELF AND YOUR FAMILY

10. Sex of Respondent?

1. Male

2. Female

11. What is your age?

1. 20 - 30 years

2. 31 - 40 years

3. 41 - 50 years
 4. Above 50 years
12. Are you
1. Married
 2. Single
 3. Divorced, separated, widower, etc.
13. If married, how many wives do you have?
1. One
 2. Two
 3. Three
 4. Four
 5. More than four
14. How many children do you (yourself) have?
0. None
 1. 1 - 2
 2. 3 - 5
 3. 6 - 10
 4. 11 - 20
 5. Over 20
15. Have you in the last five years constantly been advising other cocoa growers on cocoa husbandry?
1. Yes
 2. No
16. Can you read a newspaper (Graphic, Times, etc.)?
1. Yes
 2. No

17. What was the highest class you reached at school?
1. None
 2. Mass Education
 3. Class 1-3
 4. Standard 1-5
 5. Standard 6-7
 6. Above Standard 7.

E N D

T H A N K Y O U

SOURCES OF INFORMATION

CODE:	00.	Cocoa Division Technical Officers
	01.	Cocoa Division Visits-Demonstration Farm (Involving Extension Officer)
	02.	News Bulletin and Posters
	03.	Radio or Rediffusion
	04.	Farmers Training Courses
	05.	Family or Relatives
	06.	Farmers Organizations
	07.	Fellow Farmers
	08.	Commercial Salesmen
	09.	Own Experience
	10.	Purchasing Agents
	99.	N.A.

APR - 5 1976

April 2, 1976

Dean P. A. Larkin
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University of British Columbia
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Vancouver, B. C.
Canada V6T 1W5

Dear Dean Larkin:

My apologies for my tardiness in conveying my reactions to Dr. Opare's thesis; I told your secretary by phone last Thursday that the thesis was satisfactory, so that the defense could be held.

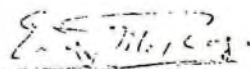
Let me expand on this evaluation. The thesis deals with an important problem, and is written in an admirably clear and straight forward way. The data are adequate, and are analyzed in a proper way. While the findings are not especially surprising, a number of important contributions are made to knowledge about the diffusion of innovations.

So in all, I find the thesis to be a fine piece of work, and a credit both to the candidate and to his thesis advisor.

Cordially,

Xc: Dr. D. McKie
Dr. C. Verrier

Sent


Everett M. Rogers
Professor