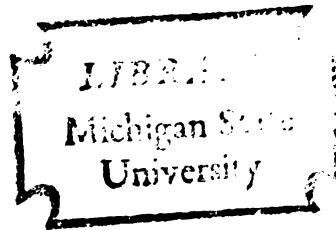


IMPACT OF SELECTED AGRICULTURAL
SCHEMES ON THE INNOVATION PATTERNS
AMONG TRADITIONAL FARMERS IN
THE SOUTHERN SAVANNA OF GHANA

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
ROSS EDGAR BIGELOW
1973



This is to certify that the

thesis entitled

IMPACT OF SELECTED AGRICULTURAL SCHEMES ON THE
INNOVATION PATTERNS AMONG TRADITIONAL FARMERS
IN THE SOUTHERN SAVANNA OF GHANA

presented by

Ross Edgar Bigelow

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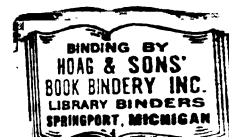
PhD degree in Geography

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ABSTRACT

IMPACT OF SELECTED AGRICULTURAL SCHEMES ON THE INNOVATION PATTERNS AMONG TRADITIONAL FARMERS IN THE SOUTHERN SAVANNA OF GHANA

By

Ross Edgar Bigelow

Agricultural development in Ghana during the early 1960's did not keep pace with the demand for food products. President Kwame Nkrumah attempted to accelerate agricultural development by establishing state-run, large-scale agricultural development schemes. Some 123 Soviet-style State Farms and forty Israeli, Nahal-type Workers' Brigade Farms were primary among the schemes formed by 1965.

Implicit in Nkrumah's agricultural revolution was the assumption still common in the 1970's that illiterate food farmers are too unproductive and too traditional in farming methods to provide the basis for national agricultural development. Schemes were viewed as an alternative to increase production and demonstrate modern farming to local farmers.

The purposes of this research have been (a) to measure the differential impact of four schemes on small-acreage farmers, (b) to define the traditional farmer in terms of domestic and productivity factors, (c) to determine what factors influence the most innovative and productive farmers, and (d) to assess whether illiteracy inhibits innovation and

production. Four hypotheses based on these purposes are tested in each case study and are collectively analyzed.

This study is based on extensive field interviews of a sample of 192 food farmers in the Southern Savanna of Ghana located on and around four different types of agricultural development schemes: (a) the Afife-Weta State Farm, (b) the Somanya Workers' Brigade Farm, (c) the Nungua Agricultural Research Station of the University of Ghana, and (d) the Ada Cooperative Food Farmers Union. Correlation matrices and factor analyses were generated based on 82 variables. Of these ten variables were selected for multiple-regression analysis.

Tentative conclusions derived from the survey are:

1. There is no inverse relationship between scheme impact and distance between farmer and scheme, i.e. the schemes had limited neighborhood effect. Schemes with the most active extension programs had the greatest impact, viz. the Research Station and the Cooperative. Schemes had unexploited potentialities to act as vehicles of extension.
2. Factor analysis revealed the communality of the following factors: advanced farmer age, large households, long farming experience and residential occupance in a single locale, and strong advantages of land tenure. These elements define the traditional farmer. So defined, he also had high scores for productivity (acres farmed) and innovativeness (innovations adopted).
3. Reasonably strong positive correlations were found between innovation and productivity, in terms of acres planted ($r = .377$), and susceptibility to scheme influences ($r = .444$). He also tended to have more travel experience, greater access to radio communication and a

higher rate of extension service contact. In regression analysis, acreage, scheme impact, travel and radio factors explain only 33 per cent of variance. There appears to be a functional rather than causal relationship between innovation and production. They covary.

4. From case to case farmer domestic characteristics, crops and perceived problems varied little, but adoption rates and per farmer acreages showed significant variations. Innovation and acreage were lowest around the Workers' Brigade and State Farm and highest in the Research Station and Cooperative study areas. Major perceived problems were rainfall irregularity/water supply and lack of credit.

5. Labor bottlenecks were overcome by surprisingly high farmer rates of utilization of the tractor for land preparation (67 per cent) and hired labor for weeding (83 per cent).

6. Formal education does not appear to be a necessary condition for agricultural innovation and production. Since a majority of the farming population are mature and illiterate, agricultural development programs should not skew emphasis to the younger, educated farmers.

7. The major difficulty facing agricultural development in Ghana does not appear to be getting farmers to produce and innovate, but providing the proper inputs, credit and infrastructural support. Further research is needed on these elements. Research should be integrated into decision-making and government should play an active part in this.

**IMPACT OF SELECTED AGRICULTURAL SCHEMES ON THE
INNOVATION PATTERNS AMONG TRADITIONAL FARMERS
IN THE SOUTHERN SAVANNA OF GHANA**

By

Ross Edgar Bigelow

A THESIS

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

DOCTOR OF PHILOSOPHY

Department of Geography

1973

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1972

TO MY WIFE ELAINE

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I wish to express my sincere appreciation to my Major Adviser, Professor John M. Hunter who chaired my Thesis Committee and has contributed significantly to my development as a geographer and social scientist. Professor Hunter's personal example and professional advice have guided my graduate program since his arrival at Michigan State University in 1967.

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EQUIVALENTS

Value of one Ghanaian New Cedi (N¢) in 1969:

$$\text{N¢}1.00 = \$0.98$$

$$\text{N¢}1.02 = \$1.00$$

There were 100 New Pence (NP) in one New Cedi (N¢)

CHAPTER I

AGRICULTURAL DEVELOPMENT AND RESEARCH IN GHANA

Ghana attempted a number of interesting agricultural experiments during the early 1960's to overcome sluggish agricultural development. Under President Kwame Nkrumah this little West African country established large-scale development scheme in an attempt to solve this problem which is recognized as critical in many developing nations today. The traditional farmer was substantially ignored in this program though he continued to produce nearly all Ghana's food.

Agriculture is the backbone of the Ghanaian economy. It has been the world's leading cocoa producing country since 1911, with production almost entirely in the hands of peasant farmers. Over sixty per cent of the labor force is in the agricultural sector which accounts for just under fifty per cent of the gross domestic product and over seventy per cent of the country's exports.¹ However, during the 1960's agricultural production did not match population growth.² With a population of 8.5 million in 1970 spread over 92,000 square miles Ghana's population grew at a rate of about three per cent per year, a doubling over the period of a generation.³ Food production in the agricultural sector was nearly stagnant.

Development of agriculture was sought through large-scale schemes with aid from Soviet, Israeli and other foreign sources. Some 123

Soviet-style State Farms and forth Israeli-inspired workers' Brigade Farms were primary among schemes formed by 1965. Less attention was paid to the traditional, small-acreage farmer despite his success in producing a profitable external cash crop such as cocoa.⁴ Ghanaian planners and agriculturalists often contended that the illiterate farmer was too preoccupied with subsistence to provide adequate internal food supplies or form the basis of agricultural development. Though by no means substantiated, this view is still commonly held by African planners.⁵

This research has four basic purposes. First, it is to measure the differential impact on Ghanaian, small-acreage farmers, of four agricultural schemes. Related to this an attempt is made to determine whether scheme impact is more closely related to farmer perception of and participation in scheme activities, or to a spatial variable, viz. the distance between farmer and scheme. Index techniques and correlation analysis are used.

Second, the study aims to define the so-called "traditional farmer" in terms of domestic and productivity characteristics. Can the traditional farmer be distinguished by age, household size, years of farming experience and residential occupance in a local, family composition, and land tenure? Are "traditional farmers" unproductive and uninnovative? Factor analysis is employed to determine the major variables accounting for the variation.

Third, the research tries to determine what factors influence the most innovative and productive farmers. What is the effect of travel experience, access to radio communication and extension service contact? Is the most innovative farmer the most productive? Is he the most influenced by scheme impact? How are production and innovation related?

Correlation and regression analyses are utilized to answer these questions.

Fourth, the study attempts to establish whether illiteracy, measured in terms of years of formal education, inhibits innovation and production. Is formal education a necessary condition for agricultural innovation and production? Correlation analysis is used to test this.

This study is based on extensive field interviews of a sample of 192 food farmers. In the Southern Savanna region of Ghana (Figure 1) located on and around four different types of agricultural development schemes: a State Farm, a Workers' Brigade Farm, a University Agricultural Research Station, and an indigenous cooperative. Four hypotheses are tested individually and collectively, based on data collected in the four case study areas.

A review of agricultural development and research in Ghana and a description of the study area are found in the first two chapters. These are followed by chapter case studies of each of the four schemes testing each hypothesis. A comparative analysis of the hypotheses and of spatial variations from scheme area to scheme area is then presented, followed by a concluding chapter.

Review of the Literature

Over the past quarter century there has been a massive increase in the research and literature on the subject of economic development in Africa. Many roads to development have been explored by social scientists. Students of economics, anthropology, rural sociology, political science and administration, rural development and geography have engaged

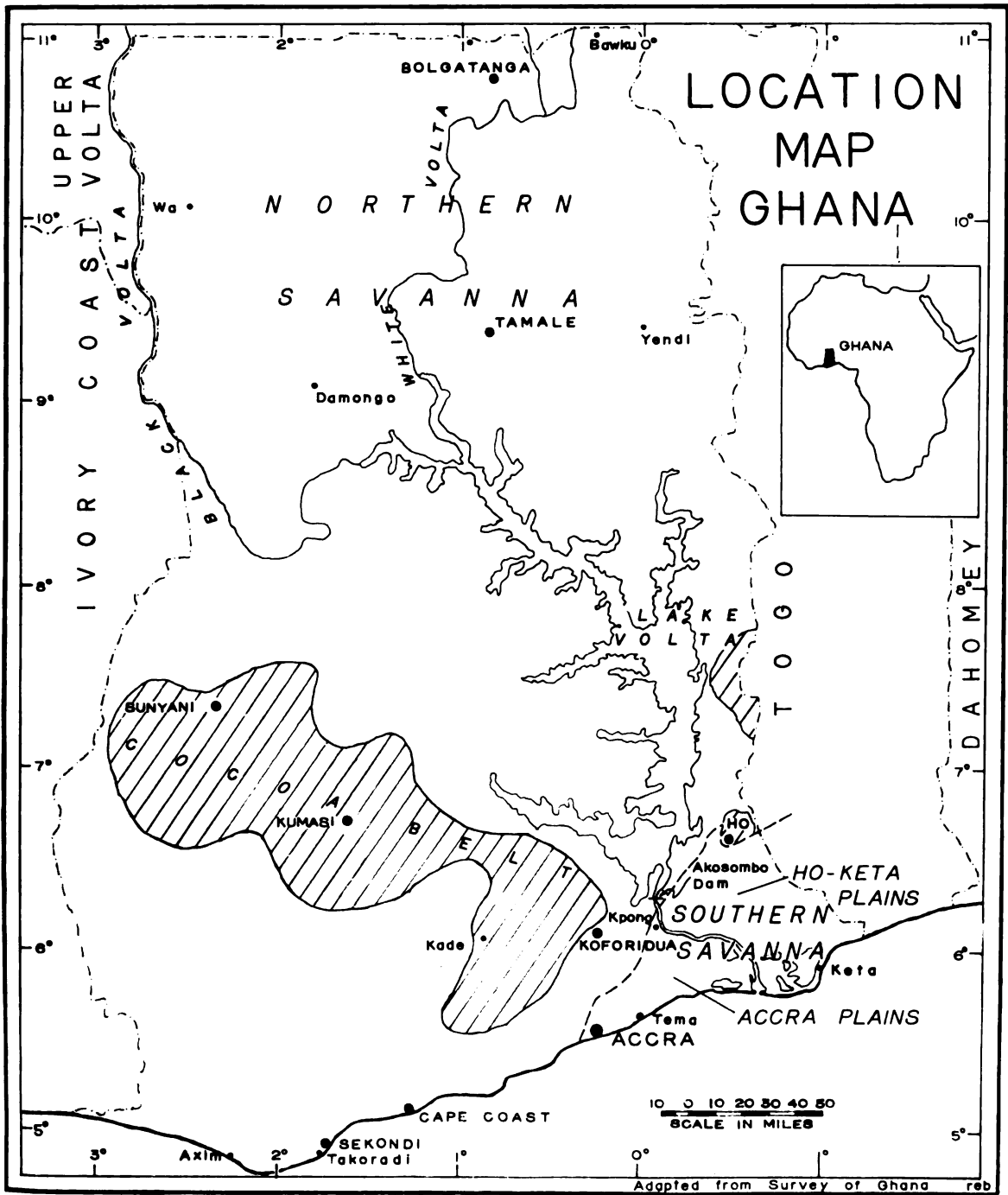


FIGURE 1

in an effort to detail the elements of development and formulate theories of advancement.

Much of the relevant literature and current research on West Africa are reviewed in bibliographical works by Carl K. Eicher,⁶ James Gordon,⁷ and Norman N. Miller.⁸ Eicher's work is the most recent of these and has useful introductory chapters on research environments and priorities. It focuses on the five anglophone West African countries with special emphasis on Nigeria where he did much of his own field work in agricultural economics. Gordon lists a wide range of social research particularly on Ghana and Nigeria. Miller's edition nominally covers all of rural Africa and includes signed articles by major North American researchers from a broad spectrum of social sciences. The three publications include most of the standard works applicable to rural agricultural development in Ghana. A Selected Bibliography of items related to the current research is presented at the end of the thesis. Also recorded are a number of other reports, official documents and unpublished materials.

Despite the wide variety of published materials there is no generally accepted theory of economic development.⁹ This is not surprising given the complexity of the task and the varied perspectives of researchers. However, considerable headway has been made toward zeroing in on the key elements in development and in discarding myths. Eicher suggests that the following hypotheses are among those which have been rejected during the 1960's: the noneconomic behavior of African farmers, industrialization as the sole means of increasing productivity, the

intractability of rural value systems vis-a-vis innovation, land tenure and family planning, and the large-scale production of plantation crops as the basis for all agricultural development in West Africa.¹⁰

During the 1960's these "myths" were challenged by the work of social scientists including especially significant studies by agricultural economists.¹¹ Evidence was uncovered which demonstrated that the behavior of West African farmers could be understood within the framework of general economic principles.¹² Studies also revealed that the productivity of peasant farmers could be stimulated under given economic conditions,¹³ and that employment generation and "labor bottlenecks" during key periods in the growing season were the primary obstacles to increased production in African agriculture.¹⁴ Institutional and infrastructural factors, such as agricultural extension and training, credit, marketing and cooperatives, were also discovered to be important development factors and became the foci of serious attention by researchers.¹⁵ Other authors raised the vitally important issues of socioeconomic growth, population, and the influence of cultural attitudes and value systems.¹⁶ A diverse array of agricultural and settlement schemes were analyzed and classified.¹⁷ Increased technical assistance in the Third World has resulted in a deluge of published and unpublished documents by bilateral and multilateral aid agencies and foundations.¹⁸

These and other works¹⁹ have brought us closer to an understanding of what development means in the contemporary African context. However, one must define "development" before attempting to consider means of achieving it. Herein development is defined as raising the socioeconomic

levels of people over time and space. More stress is placed upon how development contributes to the socioeconomic advance of human beings than measurement of growth in gross national product or increases in per capita income. In the view of this writer all useful studies of development must of necessity relate in one way or another to the economic realm, and one must define development in economic terms. Furthermore, if a general theory of development is someday evolved, it would certainly be dependent on economic factors.

Aside from theory-building, there are other more immediate and practical means of dealing with the problems of general and rural, agricultural development in Africa. Johnson asserts, "The alternative to creating general theories of development is interdisciplinary attacks on the particular problems one finds in the real world."²⁰ The problem-solving approach allows the development context to structure the research and integrate the efforts and talents of different social scientists. Eicher, in discussing the priority problem of research on food crops in West Africa, stresses, ". . . agricultural economists need to be joined by geographers, sociologists, communication experts, etc., in problem-solving research on food production."²¹ This accords with the view of this researcher.

Agricultural Development Schemes

As noted earlier one of the purposes of this research is to measure the impact on small holders of different agricultural development schemes. Schemes form the foci of four case study areas. Discussions of study areas, the selection of cases and the sampling of farmers are

presented in Chapter II. In this section we will review the Ghanaian experience with schemes, suggest an hypothesis for analysis, and consider a means for measuring impact.

The Ghanaian Experience

Ever since the ^{Gezira} Geriza Scheme was successfully implemented by the British in the Sudan in the 1920's, African countries have been using it as a prototype for other agricultural experiments.²² In Ghana the ^{Gezira} Geriza model was used in 1950 by the Agricultural Development Corporation's Gonja Development Company to establish the Gonja project near Damongo in the northern savanna (Figure 1). The objective was to raise groundnuts and other crops and to resettle peasant farmers on large-scale, mechanized farms in unoccupied savanna. Largely because of poor feasibility studies at the outset, the project encountered numerous organizational, climatic, and edaphic difficulties and was liquidated in 1957, as was the Agricultural Development Corporation in 1962.²³ The failure was in part attributed to the backwardness of the farmers who were settled. The Gonja failure was proof for some planners that the peasant farmer was able to contribute little to the general economic development of the country.

During the Presidency of Dr. Kwame Nkrumah (1957-66) Ghana attempted to expand commercial agriculture with large-scale, mechanized, state-run schemes to improve foreign exchange conditions, increase domestic consumption and encourage import-substituting industries based on Ghanaian farm products. In the early 1960's Nkrumah's iconoclastic experimentation aroused much enthusiasm and his ideas seem to have contained at least some seeds for success.

After Nkrumah's visit to the Soviet Union in 1960 his government sought to revamp the entire organization of agriculture. The Ministry of Agriculture was abolished and replaced by the State Farms Corporation in 1962. Some 123 large-scale, mechanized State Farms were formed by 1965 to produce everything from cocoa and rubber to yams, casava, fruit and vegetables. However, despite huge capital expenditures, the combined output of the State Farms did not exceed one per cent of the country's agricultural production.

Other experiments in large-scale agriculture that were tried included: forty Workers' Brigade farms patterned on Israeli systems, fifty-two resettlement farms developed around Lake Volta, three Agricultural Research Stations of the University of Ghana, and many cooperatives developed by the United Ghana Farmers Council Cooperatives primarily in the cocoa belt. Efforts to effect change in agricultural productivity were directed at revolutionary "great leaps forward" rather than evolutionary first steps or adaptations of existing systems of food production.

During the latter half of the Nkrumah regime, 1961-1966, approximately 7 - 10 per cent of the total annual government budget was allocated to agriculture of which 62 per cent on the average went in support of the State Farms Corporation and Cocoa Division.²⁴ In 1965, the investment in State Farms reached a peak of nearly N£11,000,000 and for the first and only time in the 1960's exceeded that for cocoa production (about N£5,500,000). This was in spite of the fact that very few State Farms had never shown a penny of profit while cocoa continued to provide over three-fifths of the country's export income. Such economic nonsense

resulted in internal financial difficulties and external debts which Ghana is still facing in the 1970's.

With the fall of the Nkrumah government in 1966, the National Liberation Council military government immediately began a program of curtailment of State Farm Corporation activities. By 1969 the number of State Farms was pared to 40 and each was put on a "self-accounting" basis whereby the farm was to generate its own profits or be closed down. Total investment in agriculture declined to about five to six per cent of the total annual budgets in 1967-68 through 1969-70.²⁵ Unfortunately, the de-emphasis on State Farms was not counter-balanced by greater investments in other agricultural programs. During the brief return to civilian government from October, 1969 to January, 1972, the Progress Party of Prime Minister Busia made agriculture and rural development first priorities.²⁶ Total investment in agriculture was expected to grow during the 1970's because of increased commitment to it among Ghanaian decision makers.

The Ghanaian experience with the Russian-style State Farms and the Israeli-type Workers' Brigade and their impacts on surrounding farmers are studied in Chapters III and IV, respectively. Specific case studies focus on the Afife-Weta State Farm and the Somanya Workers' Brigade found in the Southern Savanna. These are contrasted with the impacts of two other types of schemes found in the same region: the Agricultural Research Station of the University of Ghana, at Nungua, and the Ada Food Farmers Cooperative Union, in Ada. These cases are reviewed in Chapters V and VI, respectively.

Hypothesis and Measurement of Scheme Impact

A number of interesting questions are raised by the contrast between large-scale, capital-intensive, mechanized agricultural development schemes and surrounding small-scale, minimally-capitalized peasant farmers. Do these small and large-scale agricultural systems operate independently? Do the schemes have impact on local farming practices or the adoption of innovation? Are scheme influences the most significant factors in changing local farming methods? At the micro-level is spatial distance between farmer and scheme a factor? How can scheme impact be measured?

Calculation of the influence of a large-scale scheme on local farmers might be accomplished in at least the following two ways: (1) by studying changes in agricultural practices of surrounding farmers over a period of time and determining the sources of impact in retrospect, or (2) by determining at one point in time the sources of impact as perceived by surrounding farmers. The second of these approaches was employed in this research, though much of the literature on diffusion deals with the dynamics of information flow over time.²⁷ Divorcing the examination of the hypothesis from the time element means that this is primarily a perceptual rather than a diffusional study.²⁸

The first hypothesis to be tested is:

Scheme impact on small-acreage farmers is not inversely related to micro-spatial distance between farmer and scheme.

To measure scheme impact an impact Index has been developed. It is based on sample farmer responses to an arbitrarily selected set of questions concerning: (a) contact experience with the scheme through food purchases,

visits, or direct participation in scheme work, demonstration farming, training or extension programs, and (b) farmer perception of scheme benefit and scheme impact on his agricultural innovation patterns.

The Impact Index is expressed by the following equation:

$$\text{Impact Index} = \frac{FE_r + FP_r}{NQ} \times 100$$

where:

FE_r = number of sample farmers' positive responses to given questions concerning farmer experience with scheme

FP_r = number of sample farmers' positive responses to given questions concerning farmer perception of scheme

NQ = number of farmers sampled times the number of questions asked

Though the Impact Index could be employed as a tool in a variety of situations by substituting and/or weighting questions, this is beyond the concern of the present research. Here the Index represents a mean percentage of positive scheme impact based on certain farmer responses about contact experience and perception of schemes.

Specific data and indices are presented in each case study. To provide a clearer picture of how the Index works, however, the following example is given. Supposing 40 farmers (N) were asked eight questions (Q) concerning their impact experience and perception. Let us assume that of the 320 possible responses (NQ) by the sample, 120 positive responses were given concerning scheme impact on farmer experience (FE_r) and 40 positive responses were given concerning farmer perception of scheme impact (FP_r). The Impact Index would be $160/320 \times 100$ or 50 per cent.

This would mean that of the farmers sampled on the average 50 per cent were positively influenced by the scheme.

The Impact Index has been employed as a factor in a factor analysis of the data and as both an independent and dependent variable in a series of multiple-regression analysis. These analyses were undertaken at both the case study and regional (Southern Savanna) levels.

The "Traditional Farmer"

Traditional, small-scale farmers are generally recognized as the principal operatives in the agricultural growth of developing countries because of their numbers and their potential. Paradoxically, the "traditional farmer" frequently has the unflattering image of a conservative, subsistence-orientated and unproductive individual who is uneducated and hews closely to the farming techniques of his forefathers. Deriving from this image it is often assumed that he is necessarily uninnovative or even uneconomic in his behavior. However, in point of fact the characteristics of the so called "traditional farmer" are seldom assessed or defined, nor is the image adequately challenged. A second purpose of this research is to define the term "traditional farmer" to give us a clearer picture of how he related to the development process in rural areas.

The Ghanaian Experience

During the colonial period, Gold Coast administrators often took a short-sighted view of the change process. Local farming practices were often looked on in absolute rather than relative terms. It was easy to assume that "traditional agriculture" meant unchanged or even unchangable

agriculture. In British West Africa plantations and large-scale agriculture were limited and there was a laissez faire stance with respect to the so-called "traditional farming" activities.²⁹ Restraint was exercised in altering existing customary practices, particularly when it came to land tenure.³⁰ Such benign colonialism probably had the effect of entrenching existing practices while at the same time reinforcing the notion that the indigenous farmer was resistant to change.

Following independence in 1957 low rural farmer incomes and inadequate investment in small-scale agriculture by Ghana did not allow the perception to be altered. Per capita agricultural income was only N¢135-140 per year.³¹ Since about three-fifths of the economically-active population were engaged in farming, this meant that the principal segment of the population had limited purchasing power and remained largely outside the commercial market for industrial and agricultural goods and services.

Over the period 1961-62 to 1969-70 the total annual budget of the Ministry of Agriculture averaged about N¢25,000,000. In the latter year investment represented less than 40 per cent of the recommended minimum budget for a country with the Gross National Product of Ghana's.³² Of this miniscule amount no more than half benefitted the small-scale food producer. Only N¢7 per capita farm population was spent by the government for higher-yielding seed, fertilizer, and technology to directly increase small-holder productivity. The balance was consumed in administration, support for cocoa and other export crops, and in certain regulatory functions such as produce inspection.

The inadequacy of past investment in rural agricultural environments is now recognized as a key limitation to overall economic progress.³³ A first step toward increasing rural incomes is through greater investment in the productivity of the local farmer.

Definition of the "Traditional Farmer"

Any generalizations made about the capacity for change among local farmers must recognize that innovation and development are structured by the satisfaction of a hierarchy of factors. Pre-conditions which must be met before any farmer is in a position to break new earth, so to speak, include: environmental, institutional, manpower and socio-cultural factors. Table 1 demonstrates the relationships among these. Those at the lower end are most basic and least alterable. Higher pre-conditions can only be met by satisfaction of the lower ones first. Innovation is, therefore, possible when all the pre-conditions have been met.

An agricultural environment must possess the potential in agronomic and technical terms for development. Inadequate edaphic and climatic conditions can prelude the evolution of viable agriculture. These factors are least easily altered. It is uncertain even with major long-term investment, in, for example, irrigation/reclamation and agronomic research, whether change can be wrought. Institutional limitations such as inadequate budgets and infrastructure and inexperienced administration can be countered through increased budgets and investment in, for example, training, ministerial coordination and more rural credit.³⁴ Institutional problems are basically capital and planning problems. Manpower factors are also pre-conditions of innovation. The upgrading of skills,

TABLE 1.--The Pre-Conditions of Innovation

Alter-ability	Hierarchy of Pre-Conditions	Examples of Methods of Change
Most easily altered	Socio-Cultural, attitudes, perception	Innovation, personal contacts and exposure to new ideas
	Manpower: skills, abilities, experience	Skills training, adult education, extension
	Institutional: economic health of country, administrative competence, marketing/roads/infrastructural elements	Increase budget and investment in training leadership, promote coordination, increase rural credit, etc.
Least easily altered	Environmental: climate, soils, drainage, ecology	Uncertain; possibly major, long-term capital investment, e.g.; irrigation/reclamation, agronomic research over time

abilities and experiences through training, adult education, and effective extension services may rectify this.

Socio-cultural factors are the most easily altered of the pre-conditions in the hierarchy, if all lower pre-conditions have been satisfied. Attitudes and perceptions are influenced by personal contacts and exposure to new ideas. Unfortunately, it is these attitudes and perceptions which are so often maligned by the critics of the innovativeness of the so called "traditional farmer", quite probably because they are the last obstacles in the adoption process, rather than the most serious. To ask the farmer to innovate without the satisfaction of the pre-conditions

is to expect him unfairly to bear the burden and the risk for an inadequate support system.

The second hypothesis to be tested is:

The "Traditional Farmer" can be defined in terms of domestic characteristics (age, residence, years of farming, land tenure, household/family size and formal education) but not in terms of low productivity or lack of innovativeness.

The hypothesis will be tested at the case study and regional levels by use of factor analysis. This technique is frequently used for classification and definition of data.³⁵

The Innovative Productive Farmer

The full innovative and productive capacities of Ghana's over 2,000,000 food farmers³⁶ must be tapped to meet the country's agricultural demands. The past program of agricultural development, through large-scale schemes, and the provision of extension and other agricultural services, has failed to yield adequate foodstuffs. Statistics of the Ministry of Agriculture for the 1960's demonstrate wide fluctuations in the production of food crops such as cassava, maize, groundnuts, cowpeas, and other legumes.³⁷ Over the period 1966-1968 there were absolute decreased in the outputs of individual crops. This pattern has been repeated elsewhere in Africa as well. The Food and Agriculture Organization reported that in 1969 there was an absolute decrease in agricultural output for Africa, despite the rising population estimated at 2.5 per cent to 3.0 per cent per year.³⁸

These failures may be attributed in part to an inadequate understanding of the characteristics of the successful farmer. A further

purpose of this research has been to study the qualities of and factors influencing the most innovative and productive farmers.

The third hypothesis to be tested is:

Innovation among farmers is directly related to farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience, and access to radios.

To measure the innovativeness against farmer characteristics a series of indices have been developed, including:

- (a) The Innovation Index: average number (ranging from 0 to 4) of innovations of a given farmer sample;
- (b) The Travel Index: arbitrarily assigned values (ranging from 1 to 7) corresponding to the travel experience of a given farmer sample; and
- (c) The Radio Index: arbitrarily assigned values (ranging from 1 to 9) corresponding to the accessibility of radio contact of a given farmer sample.

These indices have been employed as factors in factor analysis of the data and as both independent and dependent variables in a series of multiple-regression analyses. Coefficient of correlation matrices have also been generated using the data, including relationships with farmer productivity (measured in terms of planted acreage) and extension service contact/non-contact.

Education and the Farmer

Surprisingly little is known about the role of education in agricultural development. Few studies of the subject are based on field research designed to pinpoint elements or systems of education which have a maximum economic advantage for agricultural development.³⁹

Our limited evidence suggests that an agricultural revolution in Africa will not be channeled through the formal educational system,

though this notion is the basis for a number of educational experiments in Tanzania,⁴⁰ Ghana⁴¹ and elsewhere on the continent. One might assert that if there is to be change it is likely to be evolutionary and be generated from an amelioration of environmental, agronomic and infrastructural limitations which facilitate innovation by the individual farmer. When supported by non-formal and informal education programs including adult literacy, rural vocational training, and extension, agricultural development may be furthered.

It would appear that the number of years of formal education provides no index to innovativeness, productivity or the agricultural development potential of the local farmer.⁴² This is perhaps not so surprising. Firstly, formal education attempts to provide over the period of several years, the basic building blocks (reading, writing, arithmetic, etc.) and mental sets (creativity, problem-solving capability, intellectual freedom) for all forms of development, rather than impartation of skills through short-term training. Secondly, the quantity of formal education does not tell us anything about the quality of the teaching, the applicability of the curricula or the capability of the learner. Thirdly, formal education is commonly disjunct from the agricultural environment; past efforts to make rural education more practical and agricultural in character have failed using the formal educational framework where it has been unsupported by the realities of agriculture. Fourthly, formal education has been made available primarily to the younger generation not the older, agriculturally productive segment of the population, which has more land and capital and, generally, more commitment to the agricultural way of life.

Another purpose of this research has been to assess the role of education in agricultural development in the study area. This was a secondary objective but one designed to tap the data to uncover clues about the relationship between education and the farmer.

Specifically, the fourth hypothesis to be tested is:

Formal education among farmers is not related to agricultural production or innovation.

To assess the role of formal education an Education Index has been developed. This was based on the number of years of formal schooling. As with the other indices, relationships with farmer productivity and extension service contact/non-contact were studied using correlation matrices. The Education Index has also been employed in factor and multiple-regression analyses.

Summary

In this introductory chapter we have briefly looked at some of the problems faced in the development of agriculture in Ghana. The general literature has been surveyed to get a perspective on these problems. A review has also been made of the Ghanaian experience with agricultural development schemes and the role of the so-called "traditional farmer" in providing solutions.

The data generated by this research are to be analyzed in the following chapters through the testing of the following four hypotheses:

- (1) Scheme impact on small-acreage farmers is not inversely related to the micro-spatial distance between farmer and scheme.
- (2) The "traditional farmer" can be defined in terms of domestic characteristics (age, residence, years of farming, land tenure, household/family size and formal education) but not in terms of low productivity or lack of innovativeness.

- (3) Innovation among farmers is directly related to farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience and access to radios.
- (4) Formal education among farmers is not related to agricultural production and innovation.

Before moving to the case analyses, let us take a closer look at the study area, the selection of the cases and the sampling of the farmers.

CHAPTER I--FOOTNOTES

¹See Walter Birmingham, I. Neustadt, and E. N. Omaboe, A Study of Contemporary Ghana, I, The Economy of Ghana (London: George Allen and Unwin, 1966), p. 215.

²Ghana, Ministry of Agriculture, Division of Economics and Statistics, Crop Area, Yield and Production 1965-1967 (Accra: 1969).

³Population Reference Bureau, 1971 World Population Data Sheet (Washington, D. C.: April, 1971).

⁴Polly Hill, The Migrant Cocoa Farmers of Southern Ghana: A Study in Rural Capitalism (London: Cambridge University Press, 1963).

⁵See for example Dr. G. K. Asamoah and Dr. S. V. Adu, "Agricultural Scientists and Food Production in Ghana," Daily Graphic (Accra: May 5, 1970).

⁶Carl K. Eicher, Research on Agricultural Development in Five English-Speaking Countries in West Africa (New York: Agricultural Development Council, 1970), 153p.

⁷James Gordon, "Rural Sociology and Economics in Relation to Agricultural Development in West Africa: An Annotated Bibliography," Ghana Journal of Agricultural Science, Vol. I (1968), pp. 173-8.

⁸Norman N. Miller, ed., Research in Rural Africa (East Lansing: Michigan State University, 1969), 341 p.

⁹The lack of a general theory of economic development is reviewed by Marvin P. Miracle, "Agricultural Economics in Africa: Trends in Theory and Method," pp. 141-51, and Glenn L. Johnson, "Agricultural Economics: A Critical Review," pp. 178-83, in Norman N. Miller, ibid.

¹⁰Eicher, op. cit., pp. 11-7, Footnote 6.

¹¹Important among these were: Bruce F. Johnston and John W. Mellor, "The Role of Agriculture in Economic Development," American Economic Review, LI (September, 1961), pp. 571-81; Carl K. Eicher and Lawrence Witt, eds., Agriculture in Economic Development (New York: McGraw-Hill 1964); Herman M. Southworth and Bruce F. Johnston, eds., Agricultural Development and Economic Growth (Ithaca, New York: Cornell University Press, 1967); John W. Mellor, The Economics of Agricultural Development

(Ithaca, New York: Cornell University Press, 1966); and Max F. Millikan and David Hapgood, No Easy Harvest (Boston: Little, Brown and Co., 1967).

¹²The classic in this sphere is William Jones, Economic Man in Africa (Stanford: Food Research Institute Studies, May, 1960), pp. 107-34. Also important are Arnold Rivkin, "Economic Incentives in African Life," Journal of African Administration, XII, No. 4 (October, 1960), pp. 224-7; Marvin P. Miracle, "Subsistence Agriculture: Analytical Problems and Alternative Concepts," American Journal of Agricultural Economics (May, 1968), pp. 292-310; Hill, op. cit., Footnote 4.

¹³Stimulating the productivity of the peasant farmer has been the subject of several publications: Theodore W. Schultz, Transforming Traditional Agriculture (New Haven: Yale University Press, 1964); Ester Boserup, The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure (Chicago: Aldine, 1965); Arthur T. Mosher, Getting Agriculture Moving (New York: Praeger, 1966).

¹⁴See John C. deWilde, et. al., Experiences with Agricultural Development in Tropical Africa (2 Vols.; Baltimore: Johns Hopkins Press, 1967), I, pp. 71-94. More recently the problem and importance of employment generation in agriculture have been raised in an articulate article by Carl K. Eicher, "Tacking Africa's Employment Problems," Africa Report, XVI, No. 1 (January, 1971), pp. 30-3; and in Carl K. Eicher, et. al., Employment Generation in African Agriculture, Institute of International Agriculture Research Report No. 9 (East Lansing: Michigan State University, July, 1970).

¹⁵deWilde, ibid., pp. 157-219; and Kurt R. Anschel, Russel M. Brannon, and Eldon D. Smith, eds., Agricultural Cooperatives and Markets in Developing Countries (New York: Praeger, 1969).

¹⁶Socio-cultural factors are treated in Walter Birmingham, I. Newstact, and E. N. Omaboe, A Study of Contemporary Ghana, II, Some Aspects of Social Structure (London: George Allen and Unwin, 1966); Pierre Gourou, The Tropical World: Its Social and Economic Conditions and its Future Status, trans. by E. D. Laboroe (4th ed.; London: Longmans, Green and Co. Ltd., 1966); Rene Dumont, False Start in Africa, trans. by Phyllis Nautsott (New York: Praeger, 1966); Georg Borgstrom, The Hungry Planet (London: Collier-MacMillan Ltd., 1967); Everett M. Rogers, Modernization Among Peasants: The Impact of Communication (New York: Holt, Rinehart, Winston, 1969); Buy Hunter, Modernizing Peasant Societies: A Comparative Study of Asia and Africa (New York: Oxford University Press, 1969). Specific examples of studies of socio-cultural attitudes and value systems are cited in the individual case studies in Chapters III-VI.

¹⁷For discussions of scheme in Ghana and other parts of Africa see John deWilde, op. cit., I, p. 129, Footnote 14; Robert Chambers,

[illegible]

Settlement Schemes in Tropical Africa: A Study of Organizations and Development (New York: Praeger, 1969), especially Part IV; Albert O. Hirschman, Development Projects Observed (Washington, D. C.: The Brookings Institute, 1967).

¹⁸Partners in Development: Report of the Commission on International Development (The Pearson Report), Report for the International Bank for Reconstruction and Development, Lester Pearson, chairman (New York: Praeger, 1969).

¹⁹Also refer to the Selected Bibliography for additional works.

²⁰Johnson, op. cit., p. 180, Footnote 9.

²¹Eicher, op. cit., p. 44, Footnote 6.

²²See William A. Hance, "The Gezira Scheme: A Study in Agricultural Development," African Economic Development, ed. by William A. Hance (2nd edition; London: Pall Mall, 1967), pp. 31-53.

²³See discussions of Gonja in Marvin P. Miracle and Ann Seidman, State Farms in Ghana (No. 3 Publication; Madison: Land Tenure Center, 1968), pp. 31-53. (Mimeographed); T. E. Hilton, "Land Planning and Resettlement in Northern Ghana," Geography, "Agricultural Migration and Land-Use in Central Ghana," Tidzschrift voor Economisch en Social Geografie, LII (September, 1961), pp. 225-30.

²⁴See Ghana, The Annual Estimates, Agriculture 1961-62, 1962-63, 1963-64, 1965, and 1966-67 (Accra: 1970-71). The Food and Agriculture Organization recommends that 13-15 per cent of budgets be devoted to agriculture. See United Nations, Food and Agriculture Organization, and Economic Commission for Africa, Fourth Inter-Regional Seminar on Development Planning, Development Prospects and Planning for the Coming Decade (With Special Reference to Africa), I.S.D.R. 4/A/R, 1 and 2, Meeting in Accra, Ghana, 4-13 December, 1968 (Addis Ababa: F.A.O./E.C.A., 1968).

²⁵Ghana, The Annual Estimates, Agriculture (Accra: 1957-68, 1969-70).

²⁶See Progress Party Manifesto (Accra: August 2, 1969); and "Sessional Address of Brigadier A. A. Afrifa, State Opening of the First Session of the First Parliament of the Second Republic," (Accra: October 2, 1969). A second military coup in January, 1972 placed the National Redemption Council in power.

²⁷See for example Everett M. Rogers' Diffusion of Innovations (New York: Glencoe, Free Press, 1962); and Torsten Hagerstrand's "Quantitative Techniques for Analysis of the Spread of Information and Technology," Education and Economic Development, comp. by Arnold C. Anderson and Mary Jean Bowman (Chicago: Aldine, 1965), pp. 244-80;

and Torsten Hagerstrand's Innovation Diffusion as a Spatial Process (Chicago: University of Chicago Press, 1967). A three-phase Innovation in Eastern Nigeria research project, financed by U.S.A.I.D., and directed by Everett M. Rogers of Michigan State University, was conducted in 1965-67 and resulted in the following publications: Gerald D. Hursh, Neils G. Roling, and Graham B. Kerr, Success and Failure of Agricultural Programs in 71 Villages of Eastern Nigeria (East Lansing: Michigan State University, September, 1968); Joseph R. Ascroft, et. al., Patterns of Diffusion in Rural Eastern Nigeria (East Lansing: Michigan State University, February, 1969); and Gerald D. Hursh, et. al., Communication in Eastern Nigeria: An Experiment in Introducing Change (East Lansing: Michigan State University, July, 1968). The last experimental phase was disrupted by the Nigerian Civil War.

²⁸Compare the two approaches in the Association of American Geographers' Spatial Diffusion, Commission on College Geography Resource Paper No. 4 (Washington: A.A.U., 1969) and Perception of Environment, Commission on College Geography Resource Paper No. 5 (Washington: A.A.U., 1969).

²⁹See W. M. Macmillan, Africa Emergent (2nd ed.; Harmondsworth, Middlesex: Penguin, 1949).

³⁰C. F. Charter, "Estate Agriculture and the Integration of Peasant Farming," Miscellaneous Paper No. 1 (Kumasi: Gold Coast Department of Soil and Land Survey, 1954), p. 12.

³¹Ghana, Central Bureau of Statistics, Economic Survey, 1968 (Accra: 1969). It should be noted that despite Ghana's low per capita agricultural income, it stood higher in this regard than any other West African country.

³²See Ghana, The Annual Estimates, Agriculture, 1969-70 and 1970-71, op. cit., Footnote 26. The 1969-70 the budgetary provision for agriculture was N¢26.6 million of a total budget of N¢468.6 million of 5.8 per cent--the fifth largest expenditure sector behind Education, Defense, Construction, and Finance-Development. The Food and Agriculture Organization and Economic Commission for Africa, op. cit., Footnote 24, recommends a 13 per cent - 15 per cent investment in agriculture.

³³See Yuan H. Ojang, "Some Information on Farming by Small Holdings" (Accra: 15 November, 1968); (Mimeographed). (Ojang was a Food and Agriculture Organization expert attached to the Irrigation and Reclamation Division). Also see James Gordon, "Problems of 'Settled Farming' in the Humid Tropics" (Legon: Faculty of Agriculture, 1969). (Mimeographed.)

³⁴An excellent discussion of the problems of small-holder capital limitations in Ghana is contained in: Ghana, Report of the Committee on Agricultural Indebtedness (Accra: Ministry of Agriculture, 1967). Though the Report was written ten years before publication, it was still an accurate assessment of the situation in the late 1960's.

³⁵The classic article describing this and other uses of Factor Analysis is R. J. Rummel, "Understanding Factor Analysis," Journal of Conflict Resolution, XI, No. 4 (1967), pp. 444-80.

³⁶Ghana, Manpower Board, First Annual Report (Accra: 1969).

³⁷Ghana, Crop Area, Yield and Production (1965-67), op. cit., Footnote 2.

³⁸United Nations, Food and Agriculture Organization, The State of Food and Agriculture 1970 (Rome: F.A.O., 1970).

³⁹Studies based on field research on the role of education in agricultural development in Africa include: E. R. Watts, ed., New Hope for Rural Africa, Proceedings of Conference held in Kikuyu, Kenya, September, 1967 (Nairobi: East African Publishing House, 1969); James R. Sheffield, ed., Education, Employment and Rural Development, Proceedings of Conference held in Kericho, Kenya, September, 1966 (Nairobi: East African Publishing House, 1967); John C. Caldwell, "The Demographic Implications of the Extension of Education in a Developing Country: Ghana," Report by Regional Director for Africa, Demographic Division (New York: Population Council, 1967), (mimeographed.); Clifton R. Wharton, Jr., "Education and Agricultural Growth: The Role of Education in Early-Stage Agriculture," Education and Economic Development, C. Arnold Anderson and Mary Jean Bowman, eds. (Chicago: Aldine, 1965), pp. 202-28; Archibald C. Callaway, "School Leavers and the Developing Economy of Nigeria," The Nigerian Political Scene, Robert O. Tilman and Taylor Cole, eds. (Durham, N.C.: Duke University Press, 1962), pp. 191-212; Archibald C. Callaway, "Continueing Education for Africa's School Leavers: The Indigenous Apprentice System," Bulletin, Inter-African Labour Institute, XVIII, No. 1 (February, 1965), pp. 61-73; Phillip Foster, Education and Social Change in Ghana (London: Routledge and Kegan Paul, 1965); David B. Abernethy, The Political Dilemma of Popular Education: An African Case (Stanford: Stanford University Press, 1969); and Food and Agriculture Organization, Agricultural Education and Training in Africa, Report of a Seminar held at Ahmadu Bello University, Zaria, Nigeria, 28 June - 7 July, 1965 (Rome: F.A.O., 1966).

⁴⁰President Julius K. Nyerere has authored several official publications on the Tanzanian experiment including Education for Self-Reliance, The Arusha Declaration and Socialism and Rural Development (Dar es Salaam: Ministry of Information and Tourism, undated). See also the reaction of Philip Foster, "Education for Self-Reliance: A Critical Evaluation,"

Education in Africa: Research and Action, Richard Jolly, ed., (nairobi: East African Publishing House, 1969), pp. 81-102.

⁴¹Philip Foster, "The Vocational School Fallacy in Development Planning," in C. Arnold Anderson and Mary Jean Bowman, op. cit., pp. 142-66, Footnote 39.

⁴²Clifton R. Wharton, Jr., "A Case Study of the Economic Impact of Technical Assistance" (unpublished Ph.D. dissertation, Department of Economics, University of Chicago, 1958), pp. 63-76; and Gordon K. Pierson, "An Investigation of the Contribution of Education to Economic Growth" (unpublished Ph.D. Dissertation, University of Washington, 1962).

CHAPTER II

THE STUDY AREA

The study area in which the research was undertaken in 1968-69 is the Southern Savanna (Figure 1). It is one of two savanna regions in Ghana and lies along the coast of the Gulf of Guinea. The Southern Savanna forms a discrete region in terms of climate and vegetation.¹ This angular wedge of land, covering about 3,500 square miles in the southern corner of Ghana, is delimited on an annual precipitation map roughly by the 30 and 50 inch isohyets. The vegetation is Guinea savanna woodland with the predominance of grasslands over thicket.

The Southern Savanna supports a rural population of about half-a-million of whom the majority are farmers.² The distribution of population, however, varies greatly from one part of the region to another (Figure 2). Rural densities in 1960 ranged from an average of 80 people per square mile in the Accra Plains where vast areas remained totally unsettled to 220-300 in the Volta River Valley and in the plains north of Keta. Excluding urban centers,³ the average rural density in the entire study area was 143 people per square mile. This was two times greater than the rural density of Ghana as a whole.⁴

Selection of the Case Studies

A striking feature of the Southern Savanna is the wide range of agricultural development schemes that have been established there

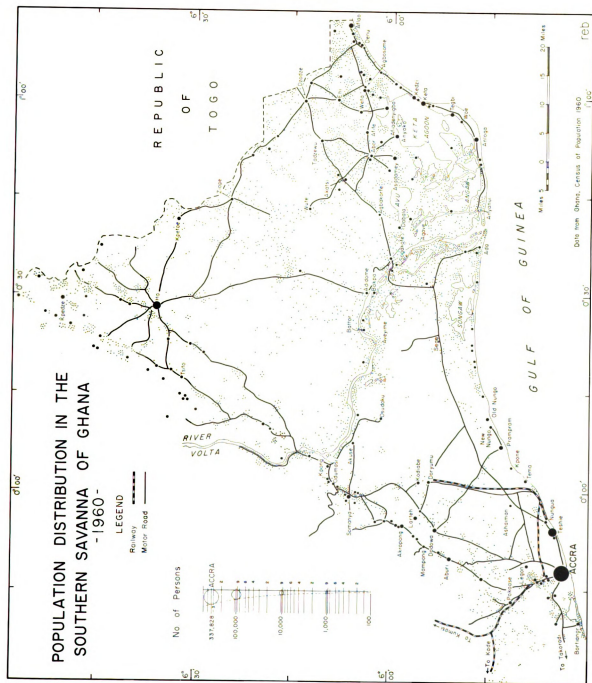


FIGURE 2

(Figure 3). In 1969 there were nine State Farms, four Workers' Brigade farms, two Agriculture Research Stations of the University of Ghana, three food farmers' cooperatives unions, plus numerous private commercial farms and various divisional stations of the Ministry of Agriculture. Some of the most interesting schemes were established with external assistance, such as the Adidome and Afife-Weta State Farms (Soviet Union), Somanya Workers' Brigade (Israel), the Asutsuare Sugar Scheme (Poland), and the Volta River Irrigation project (FAO). Others were undertaken largely with local resources, such as the University's Agricultural Research Station near Accra and the Ada Food Farmers Cooperative Union north of the Songaw Lagoon.

From these various possibilities four schemes were purposively selected as foci of research.⁵ Table 2 provides a listing of the case study areas and a summary of characteristics of each.⁶ These study areas and schemes typify the region's geographical, agricultural and ethnic variations and represent the different approaches to agricultural development in Ghana.

Selection of the Farmer Interviewees

In 1960 there were approximately 125,000 persons employed in farming in the Southern Savanna, or about 50 per cent of the rural employed population of the region.⁷ Of these 200 were interviewed of whom eight were dropped from the sample because they were not food farmers or were not able to provide adequate data. The sample of 192 thus represents only 0.15 per cent of the Southern Savanna's farmers.

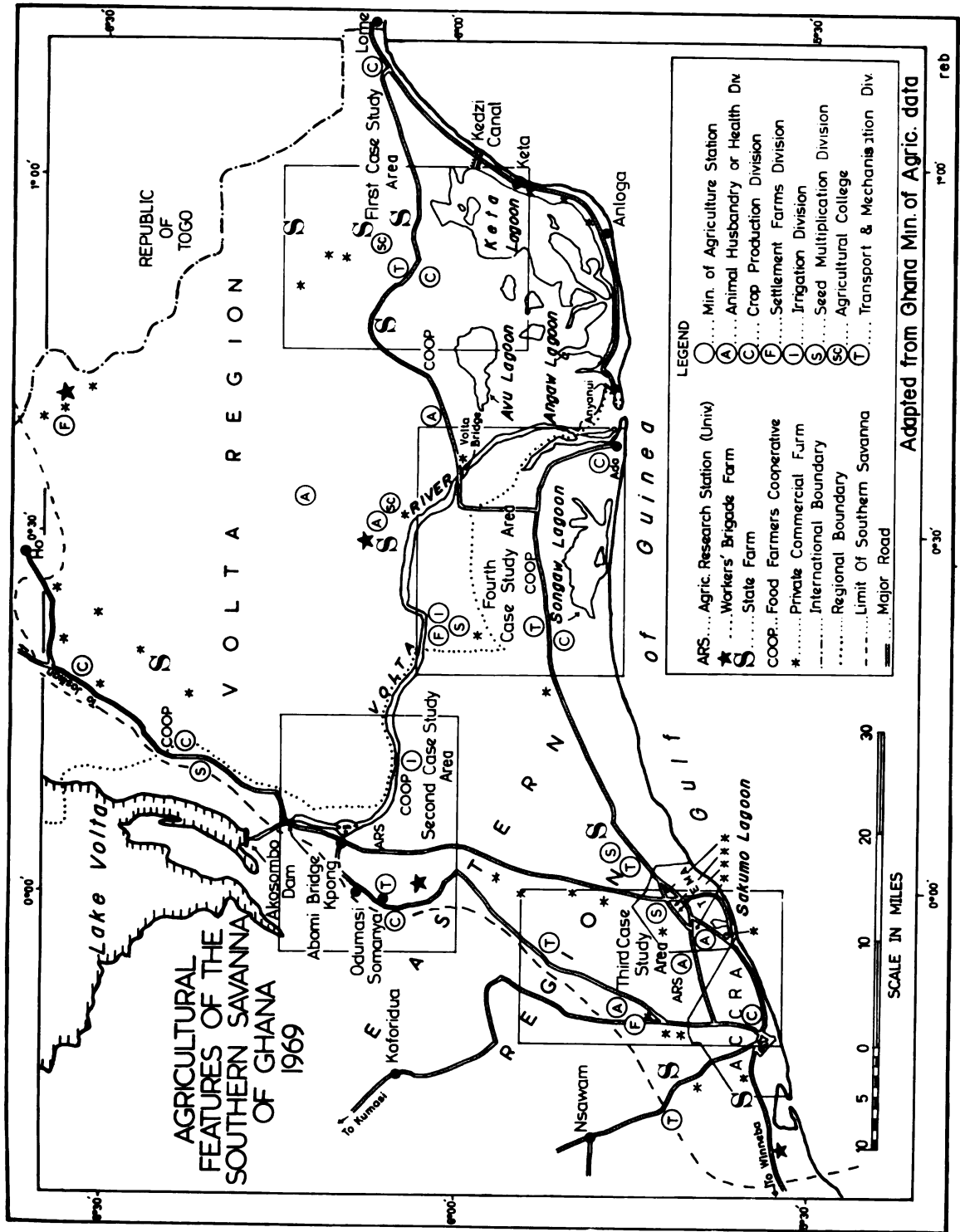


FIGURE 3

TABLE 2.-Summary of the Characteristics of the Four Case Study Foci in the Southern Savanna, Ghana

Case Studies:	Locations ^a	Major Cash Crop or Products	Dominant Ethnic Group	Assistance in Scheme Establishment	Date Scheme Established
Afife-Meta State Farm (Chapter III)	North of Keta Lagoon in Volta Region	Rice, other grains, vegetables	Ewe	Soviet Union	1962
Somanya Worker' Brigade Farm (Chapter IV)	about 12 miles south of Akosombo Dam near Somanya	<u>Sugar Cane</u> , food crops	Krobo (Adangbe)	Israel	1960
University Agricultural Research Station (Chapter IV)	North of Accra-Tema about 10 miles	<u>Cattle</u> , other livestock	Ga	University of Ghana	1952
Ada Food Farmers' Cooperative Union (Chapter VI)	North of Songaw Lagoon about 15 miles from Ada	<u>Food Crops</u> , especially cassava, tomatoes	Ada (Adangbe)	Local Farmers	1966

^aRefer to Figure 3 for locations

Around each of the four schemes a probability random sample of about 50 farmers was interviewed. Care was taken to include interviewees at random areal coordinates throughout the study areas, and on all sides of each scheme, where settlement patterns permitted. This assured that preference was not given to farmers living on major roads, i.e. in the more accessible areas.

Simple random sampling was employed in preference to other probabilistic selection procedures since so very little was known about the farming populations of Ghana, their numbers or economic characteristics.⁸ The paucity of data, it was felt, did not justify more elaborate sampling techniques.⁹ A micro-spatial approach was used. The sample was taken from farmers who lived and worked within a one-day walking distance of the schemes, or roughly a radius of seven miles.¹⁰ Sampling was, therefore, conducted within study areas covering about 150-175 square miles, which for the four case studies represented roughly a fifth of the total area of the Southern Savanna.

The data collection procedures of this research consisted of: (a) unstructured interviews (without questionnaires) of government officials, academics and scheme management personnel, and (b) structured interviews (with questionnaires) of farmers. The collection of the data was undertaken directly by this researcher throughout the survey. Interpreter-assistants were employed for the questioning of the farmers.¹¹ The farmer questionnaire was tested and revised in the field and is presented in Appendix A.

The Physical Environment

The physical environment of the Southern Savanna is relatively homogenous in terms of landscape, geology, soils, climate and water supply, and vegetation.

Landscape, Geology and Soils

The landscape features gently undulating relief. It ranges in elevation from sea level along the coast to about 400 feet at the base of the Akwapim Uplands which form the Western boundary of the region (Figure 7 in Chapter IV). To the West in the Workers' Brigade study area the landscape is punctuated by impressive crystalline outcroppings. The most prominent inselberg, Osuyongwoa, 1400 feet, near Osudoku, can be seen from the Gulf of Guinea. Ocean fishermen several miles from shore are said to use Osuyongwoa to get their bearings in stormy weather. Another inselberg, Yogaga, is the highest in the Southern Savanna at 1,441 feet and is virtually a part of the Akwapim Ridge. The most famous inselberg is Krobo "Mountain", 1,108 feet, for it is the ancestral home of the Krobo Adangbe people of the area.

Below Akosombo Dam the Volta River flows along a 50 mile course east and southward to the sea (Figure 3). It is a mature stream of low gradient lying only 50 feet above sea level near Kpong. In its lower course are found cut-off meanders and abandoned distributaries, such as the prominent Angaw which is used as a regional boundary. Numerous aggraded sandy islands dot the River estuary. The Volta incises the Southern Savanna and divides it into two plains: the Ho-Keta Plains to the north and east and the Accra Plains to the south and west.

Along the coast are found a series of brackish lagoons cut-off from the sea by the sand spits and dunes laid down by the Guinea Equatorial Counter Current. The largest and most impressive of these is Keta Lagoon, a body of water which area pulsates from more than 125 square miles in wet years to less than half that size, with desiccated salt flats, in dry years (Figure 5). It is fed by runoff from a series of streams to the north. In 1968, with record rains, Keta Lagoon was particularly expansive. The road links through this area are fragile. During the 1968-69 period the Accra-Lome and Anloga-Lome roads were broken by flooding lagoonal waters.

Geologically the area is composed of Dahomeyan (lower pre-Cambrian) schists and gneisses except at the Akwapim pediment where the Togo series of quartzite, shale, and phyllite are found.¹² The geology of the State Farm Study Area in Volta Region is Tertiary, made up of red continental deposits, mainly limonitic sands, sandy clays, and gravels. Related soil series consist of diverse profiles of clays, loams and sands, and on watersheds are suited to the cultivation of cassava, maize, tobacco, groundnuts, and vegetables. Along the coast are found unconsolidated sands, clays and gravels laid down by the river discharges in combination with the west-to-east coastwise current. Near the Songaw Lagoon red and gray acidic and alkaline clays in combination with occasional inundations of brackish waters, preclude significant agricultural activity.

The most fertile soils in the region are the clays called Tropical Black Earths (Akuse),¹³ and a sandier soil series known as the Tropical

Gray Earths (Simpa-Agawtaw),¹⁴ found over basic and acidic gneissic rock, respectively. These significant natural resources are found in the Accra Plains covering an area radiating southward in a wedge from Kpong (Figure 3). It is striking that virtually no farms or settlements are found over the Tropical Black Earths. The reason for this is that more sophisticated agronomic technology would be required to cultivate the poorly-drained, sticky-brick clays than presently exists in the region.¹⁵ Local farmers have preferred to settle and farm land more easily tilled.

Climate and Water Supply

For the farming population precipitation is the critical variable in the climate of the Southern Savanna. Lack of regularity in rainfall patterns from one year to the next creates uncertainty about the agricultural and domestic water supplies. Figure 4 presents monthly rainfall and water balance data for stations in each of the four case study areas. Table 3 shows basic precipitation data for 19 stations in the Southern Savanna.

The region lies approximately six degrees north of the equator and has a double rainfall maxima pattern. The major rainy season peaks in June, and as demonstrated in Figures 4b and 4f, it is the only time of year for some stations when rainfall exceeds potential evapotranspiration and thus provides a water surplus. The period of greatest farming activity in the Southern Savanna corresponds to the months which enjoy this water surplus. The minor rainy season peaks in October.

MONTHLY RAINFALL AND WATER BALANCE DATA FOR SOUTHERN SAVANNA STATIONS, GHANA

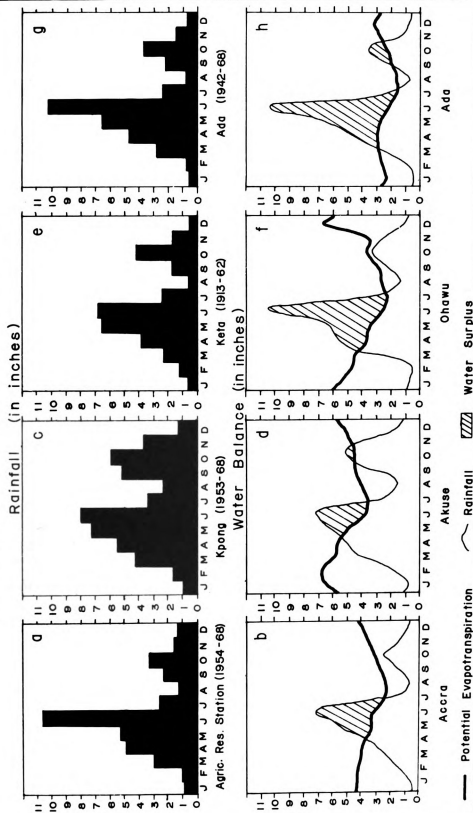


FIGURE 4

TABLE 3.--Precipitation Data for the Case Study Areas^a

Station	Contin- uous Years of Record	Height Above Sea Level (feet)	Highest Value (year)		Lowest Value (year)		Annual Aver- age
Inches							
First Study Area							
Keta State Farm (Afife-Weta)	50	4	57.27	(1934)	13.88	(1920)	32.69
Abor	3	25	57.63	(1968)	21.31	(1966)	35.93
Akatsi	12	50	46.78	(1957)	20.78	(1958)	40.61
Ohawu	4	150	48.92	(1957)	25.82	(1964)	41.18
Tadzewu	11	50	52.56	(1963)	23.29	(1964)	41.81
	15	70	56.72	(1960)	29.16	(1964)	43.78
Second Study Area							
Workers' Brigade Farm	1	250	51.02	(1966)			
Somanya (Mount Mary School)	5	400	60.99	(1960)	43.79	(1961)	52.11
Kpong	16	71	80.41	(1968)	33.96	(1964)	49.55
Akuse	54	57	77.21	(1968)	24.69	(1932)	44.01
Third Study Area							
Accra (Airport)	68	194	55.68	(1968)	10.84	(1926)	29.82
Tema	14	46	67.74	(1968)	19.53	(1966)	33.38
Pokoase	16	165	65.81	(1965)	28.90	(1953)	43.85
Nungua (Station)	15	100	55.00	(1968)	19.38	(1966)	37.14
Fourth Study Area							
Ada	27	17	66.76	(1968)	18.18	(1946)	36.79
Sogakope	15	35	55.23	(1965)	19.93	(1964)	35.89
Adidome	11	29	50.07	(1959)	23.86	(1964)	37.52
Aveyime	10	20	47.56	(1962)	26.86	(1964)	37.74
Sege	1	50	40.38	(1961)			

^aGhana Meterological Services, Accra

Generally it is utilized for farming only in the wettest areas of the region at the base of the Akwapim Uplands near Kpong and Akuse (Figures 4c and 4d). Among stations listed in Table 3 for which have at least 15 continuous years of record, Kpong has the highest annual average rainfall, 49.55 inches. Contrast this with the driest station, Accra, which has an annual average of 29.82 inches. This range of roughly 30-50 inches obtains throughout the Southern Savanna.

It is interesting to note that commencement of the planting of crops coincides with the beginning of the period of water surplus, around late March or early April (Figure 4). It was determined during the survey that both peasant farmers and professional agronomists at the Agricultural Research Station agreed that planting should begin after three to five inches of rain had fallen. Food farmers interviewed suggested that it was "best to plant after the third or fourth good rain". By implication, and in practice, this occurs in April and generally amounts to about four inches. Station management noted independently that a hygrometric reading of four inches within two or three weeks signaled the beginning of planting. The wisdom of these independently derived but concurring conclusions appears to be substantiated by the water balance data in Figure 4.

The lack of dependability of rainfall in the Southern Savanna, however, represents a considerable handicap to the development of agriculture. Even within limited areas variability is great.¹⁶ For example, though the Agricultural Research Station at Nungua and Accra (Kotoka International) Airport are located only seven miles apart, rainfall

totals differ by about 25 percent (Table 3). Both demonstrate different dependability patterns. Rainfall deviates considerably and frequently at both stations from means of 37.14 and 29.82 inches, respectively.

Unreliable rainfall patterns in the region have focused agronomists' attention upon irrigation techniques. A number of irrigation feasibility studies were conducted in Accra and Ho-Keta Plains during the 1960's. In 1965 following completion of the Akosombo Dam a comprehensive survey of irrigation in the Accra Plains was finished by Kaiser.¹⁷ The survey indicated that about half, 440,000 acres, of the Plains could be converted to irrigated agriculture (rice, sugar cane, cotton and vegetables) over a 31 to 53 year period with a capital investment of £28, 141,000 (\$359,000,000). However, the total and per acre (\$815) costs were considered far greater than Ghana could bear. As an outgrowth of this in 1969 a consortium of Italian companies supported a Ghana-Bonifica Joint Project to develop 25,000-40,000 hectares of prime irrigable land in the Accra Plains and to assist in reconditioning facilities for three State Farms producing irrigated rice, including the one at Afife-Weta.¹⁸

The potential for irrigated agriculture in the southern part of the Ho-Keta Plains has also been recognized.¹⁹ Surveys have been undertaken by WAKUTI of West Germany²⁰ on the reclamation of 40,000 acres around Keta and Avu Lagoons and by NADECO of Holland²¹ of 25,000 acres on Angaw Lagoon (Figure 3).

Considerable research has been carried out on the feasibility of irrigation in the Volta River flood plain. The first concentrated attention began with the establishment of the University of Ghana's

Agricultural Research Station at Nungua in 1952 and the Agricultural Irrigation Research Station at Kpong in 1954.²² Encouraging results were obtained from research conducted into the suitability of sugar cane, rice, and cotton for irrigated large-scale production. This was followed in 1963 by a Food and Agriculture Organization survey of 85,000 acres along the Lower Volta River (Kpong to Ada), in 1968 by a Commonwealth Development Corporation study of 25,000 acres at Aveyime, and in 1969 by 2,000 acre FAO experimental rice-sugar cane scheme at Asutsuare.²³ Ghana has indicated its desire to followup and coordinate these efforts.²⁴

One also finds a number of minor dams and small dugouts scattered about the Southern Savanna, especially in the Accra Plains. Numerous local cattle raisers have constructed dams and dugouts for water conservation using the example of the Agricultural Research Station at Nungua. These in turn, precipitated the building of Ashaiman Dam in 1968 in the same area by the Irrigation, Reclamation and Drainage Division of the Ministry of Agriculture which plans to irrigate 380 acres (Figure 9). To date the various feasibility studies, research stations, experimental schemes and local initiatives have had only a minor impact on the development of irrigated agriculture in the Southern Savanna.

Vegetation

The Accra and Ho-Keta Plains are derived savanna which have evolved biotically from a degraded woodland climax.²⁵ Forest today is confined to unsettled upland or riverine areas, such as the Akwapim Ridge and Krobo "Mountain" to the west, or along the tributaries of the Volta River. In the better watered area thickets predominate. Species

include the common Dichrostachys glomerata, found on sandy soils, Fagara zanthoxgloides, Millettia thonigii Malacantha ainifolia, and Lonchorarpus sericevus. On old termite-mounds over the gray earths are found small clumps of thicket including a candelabra-like tree, Elaeophorbia drupifera. Other common deciduous shrubs are Securinea virosa, Fluggea virosa, Grewia carpinifolia, Tephrosia elegans, and Anogeissus leicarpus. The occasional tree may be seen in the wettest thickets, especially the giant "silk cotton" (Ceiba pentandra). Thickets are normally wind-aligned with the prevailing Southwesterlies.

Moving eastward and away from the coast one finds medium-high grasses of three to four but sometimes over five feet. Vetiveria fulvibarbis is easily the most common and grows extensively over areas of poorly drained black earths.²⁶ Setaria sphacelata and Brachiaria falcifera are short steppe grasses found over sandy soils of acidic Dahomeyan gneiss in areas with more than 30 inches of precipitation.²⁷ Scattered trees here tend to be thick-barked and fire-resistant. The impressive Borassus aethiopum palms, used for house beams, are found in poorly drained areas. Other trees include Lophira lanceolata, Daniellia oliveri, and dwarf oil palms. The latter are of significant economic value as sources of palm oil for cooking, leaves for weaving mats and palm wine for enjoying one's leisure. In the lagoonal areas near the coast there are low mangroves and other saline vegetation.²⁸

Vegetation patterns in the Southern Savanna have been dictated not only by edaphic and water-supply factors, but also by the presence of man. Patterns of vegetation have been influenced by past human settlement. Foreign species of trees, such as the mango and the neem, and various

thicket shrubs populate hill-top locations where villages were once established. These provide useful clues to one seeking the location of former settlements. Much of the savanna is burned annually.²⁹ Burnings are of two types: (a) uncontrolled, dry-season fires set by hunters to scare up game such as grass cutters and other rodents, and (b) controlled fires by peasant farmers, approximately between February and the beginning of the major rainy season for the purposes of clearing brush and generating a natural source of potash.³⁰ The net result is a pyrogenetic grassland which is floristically distinct from the Guinea and Sudan savannas that cover much of West Africa.

The People

Unlike the physical environment the people of the Southern Savanna of Ghana are relatively heterogenous in terms of history, language and culture. Major ethnic groups include the Ewe of the Volta Region, the Adangbe peoples of the Accra Plains area of the Eastern Region, and the Ga near Accra (refer to Figure 3 and Table 4). In this section historical background and population characteristics of the major ethnic groups in the region are noted.

Historical Background

Though the historical record on the peoples of the Southern Savanna has not been varified, it appears that they originally migrated westward along the coast from the Niger Delta area during the Sixteen and Seventeenth Centuries.³¹ These migrations probably did not pre-date the establishment of the first slave fort by the Portuguese at Elimina

TABLE 4--Ethnic Distribution Among Peoples of Southeastern Ghana, 1960^a and Study Area Sample, 1969

Ethnic Group	Accra Capital District 1960	Eastern Region 1960 ^b	Volta Region 1960 ^b	Total 1960	Total Sample 1969
Ewe	71,220	130,210	571,000	772,530	60
Adangbe					
Ada	2,000	49,540	590	52,130	53
Krobo	3,110	148,260	640	152,010	34
Ga	184,230	23,950	2,060	210,240	35
Adan	78,440	448,900	19,300	546,640	1
Northern ^c	55,920	79,610	45,320	180,850	6
Other ^d	96,900	213,730	138,270	448,900	3
Total	491,820	1,094,200	777,280	2,363,300 ^b	192

^aSource: Ghana, Census of Population, 1960, Special Report E -- Tribes in Ghana (Accra: Census Office, 1964).

^bAbout half of the areas and three-fifths of the populations of the Eastern and Volta Regions combined lie outside the Southern Savanna. The total population of the Southern Savanna was 953,000 in 1960.

^cIncludes: Gurma, Mole-Dagbani, Grusi, Lobi, Songhai, Mande, Hausa and Fulani.

^dIncludes: Central Togo groups, Nigerian groups, Kru and Tem.

in 1482. Among the four major ethnic groups under consideration here, the Ewe were the first to settle the Southern Savanna. They were followed in order by the Ada Adangbe, the Krobo Adangbe and the Ga.

The Ewe are said to have migrated from a place called Ketu east of the Niger River. Propelled by a series of politico-military defeats, the loosely-knit collection of kinship groups that constituted the Ewe, they moved to Ketou (Ketu) in Dahomey³² to Dogbo (Dahomey) to Tadjö (Togo) and eventually to a town known in Ewe tradition as Notsie, most likely the present-day Nouatya (Nuatja) in the Republic of Togo.³³ They reached this place in the early 1600's and by the end of the century initiated a further trifurcated migration into what is today the Volta Region of Ghana. The first party of Ewe moved west to Palime (Togo) where they spread in both directions along the northeast-southwest oriented Togo Range. A second group, the Peki (Krepi) people, moved south to form a state near Ho with the Guan speaking Kyerepon people.

The third party, with which we are most concerned here, marched in two divisions under the leadership of Amega Wenya and his nephew Sri. The former appears to have reached Atsiteti (Figure 5) about 1720 where his party crossed Keta Lagoon to the isthmus of sand where his sons later founded the town of Keta. The Sri party moved west to the Volta River before eventually circling back through Anyanui to the same sand spit where the strong maritime capital of the state of Anlo (Awuna) was established at Anloga. This historic event is today recalled with pride by the Anlo Ewe who have come to think of themselves as distinct from the rest of Eweland.

Over the nineteenth century the Krepi and the Anlo Ewe developed largely independently of one another. They even joined opposing sides in the Ashanti wars. The British cooperated with the Krepi in 1874 to defeat the Ashanti and the Anlo and establish control of the area. In the years that followed the Ewe were caught in a series of political disruptions. The Germans controlled Togoland territory from 1885 to 1914, to be followed by British occupation during World War I (1914-1919), and then British-French subdivision in 1919 under mandates of the League of Nations. In 1957, following a plebiscite, British Togoland was integrated into Ghana. In effect this divided the Ewe nation between the Republic of Togo and Ghana.³⁴

The Adangbe Ada followed the Ewe to the region around the beginning of the Sixteenth Century. Because the Ada seem to have been rather peripheral to the wars of the Ashanti, they are virtually untreated in historical literature.³⁵ The origin of the Adangbe is thought to be Benin in contemporary Nigeria, from which migrants moved westward along the coast. The Ada settled on the right bank of the estuary of the Volta and founded Ada (now Big Ada). See Figure 3. Here they came into contact with Anlo and Tongu Ewe to the east and north, resulting in territorial feuding, especially with the Anlo.³⁶ Ewe proximity also meant a greater degree of linguistic borrowing from them than was true among other Adangbe peoples.

The Ada, Krobo, Accra and Akwapim helped the governor of the Danes in Christiansborg (Accra) to suppress the Anlo Ewe in 1794. This was followed by the establishment of the Danish forts of Prinzenstein in Keta and Konigstein in Ada. In 1792 the Danish government prohibited

the slave trade. But the Anlo and their neighbors collaborated with the Portuguese to defy the Danes through 1850 when the British took power. An ex-Brazilian's slave named Geraldo de Lema operated slaving activities in both Ada and Keta until the Ada joined the British in suppressing the trade with a victory at Datsutagba, near Adidome in 1865. The Ada area still retains the multivarious influences of the Anlo, Brazilians, Danish and British.

The Krobo and Shai Adangbe moved to the Southern Savanna from about the end of the sixteenth to the mid-seventeenth centuries.³⁷ They settled further inland than the Ada. Since the Guan people already occupied the plains, the Krobo and Shai established themselves on the inselbergs. In the eighteenth and nineteenth centuries the Krobo came under the successive hegemony of the Danes, the Dutch and the British, who ruled out of coastal forts rather than in the hinterland. Swiss Basel (Presbyterian) missionary activities began in the 1830's.³⁸ During the period of slave raiding and Ashanti warfare the inselbergs afforded protection. With the coming of the Pax Britannica in the latter half of the nineteenth century, the Krobo established agricultural settlements in the savanna at Sra (Yilo Krobo).³⁹ See Figure 7. Also in this period the Manya formed companies of cocoa farmers who undertook their famous and lucrative exploits of the western forests. This took place under the divided leadership of Konor (King) Ologo Patu of the Yilo Krobo and Konor (King) Odonkor Azu of the Manya Krobo.⁴⁰ Political and religious rivalry between the two chiefs divided Krobo agricultural thrusts and reduced military effectiveness against the Ashanti, and at the same time

forged the image of the Krobo as a fearsome people. The British enforced total evacuation of Krobo Mountain in the 1890's. The hill still remains uninhabited.

Like the Ewe, Ada and Krobo, the Ga first migrated to the Southern Savanna from the west. Unlike the others the Ga followed a maritime route along the Guinea Coast. They first established settlements a few miles inland near the Akwapim Uplands, but later they moved to the coast for fishing and to optimize trading opportunities with the Portuguese.⁴¹ Accra was well established by the 1600, spurred by European traders and slavers. From about 1680 to 1730 the Ga were largely displaced by the Akwamu (Akan) people. During this period the Ga returned to Anecho along the coast of Dahomey which resulted in contact and conflict with the Ewe as well as other peoples.⁴²

The re-immigration of the Ga to the Accra Plains occurred in the mid-eighteenth century. In 1826 they joined with the Akwamu troops to defend themselves against the Ashanti penetration from the west and north. A series of military camps were established by the Ga on the frontier with the advancing Ashanti. Two of these were Katamanso and Dodowa (Figure 9).⁴³ The Ashanti invasion was effectively repulsed, and Ga-British hegemony was established along the coast.

In the nineteenth century Ga economic activity was concentrated along the coast. Fishing and trading, the latter especially with Europeans, became particularly profitable.⁴⁴ Coastal villages such as Labadi, Teshie, Nungua, Tema and Kpone, separated by a series of small tidal lagoons, were established for these purposes by different Ga lineages. Accra

emerged as a central place and the major international port in the region, following its selection as the colonial capital. The lineages gradually brought stool lands under cultivation with migration inland and a shift to an agricultural basis for the economy was underway.⁴⁵

Population Characteristics

The major characteristics of the rural population of the Southern Savanna are the degree of agricultural dependence and the significance of migration (Table 5). Of the approximately 245,000 persons employed in the region in 1960, 50 per cent were in farming. Among males alone 56 per cent were farmers. This underlines the significance of agriculture in the economy of the Southern Savanna. The only local authorities in which less than half of the labor force was in farming were Ada and Anlo South, where fishing was of equal importance to farming.

Over the intercensal period 1948-1960 the rural population of the Southern Savanna increased only 20 per cent whereas that of the country as a whole increased 63 per cent. In the Ada and Tongu Local Authorities the populations showed absolute decreases. Farming and other occupations were not sufficiently profitable to restrain a considerable degree of out-migration. Males tended to be the most common migrants leaving their families at home in search of economic opportunities in the cocoa belt and cities to the west.⁴⁶ As a result the sex ratio, i.e. males per 100 females, for the region was only 85 while that for the country as a whole was 98. Out-migration was particularly severe in the Ewe Local Authorities of Anlo South, Anlo North and Tongu which had sex ratios of

TABLE 5.--Characteristics of the Rural Population of the Southern Savanna^a

Rural Local Authority Areas of the Southern Savanna	Number Persons All Occupations	Number Persons in Farming	Percent in Farming	Percent Males in Farming	Sex Ratio ^b	Percent Population Change 1948-1960 ^c
Ga-Dangbe-Shai	35,181	12,592	36	52	99	+ 3
Ada	22,338	7,131	32	37	89	- 2
Manyasi-Yilo-						
Osudokud	36,101	21,346	59	72	96	+ 39
Anlo South	29,485	5,943	20	34	77	+ 21
Anlo North	61,605	33,660	55	62	73	+ 52
Tongu	36,742	26,025	71	67	74	- 17
Hod	23,156	15,373	66	61	89	+ 70
Total	244,608	122,070				
Percent			50	56	85	+ 20

^aSource: Ghana, Census of Population, 1960, Economic Characteristics of Local Authorities, Regions and Total Country (Accra: Census Office 1964), Vol. IV. Farmers include managers, farm workers and laborers, but exclude those in fishing, hunting and forestry as defined in the Census.

^bSex Ratio: males per 100 females. In 1960 the Sex Ratio for Ghana as a whole was 98.

^cThe percent population change between 1948 and 1960 for Ghana as a whole was +63 percent.

^dData presented here are for only that part of the population in these local authorities living within the Southern Savanna.

77, 73 and 74, respectively. This was probably indicative of the relatively limited economic opportunities in the region.

CHAPTER II--FOOTNOTES

¹Refer to H. Brammer, Soils of the Accra Plains, Memoir No. 3 (Kwadaso, Kumasi: Soil Research Institute, 1967), p. 12.

²The rural population of the region, excluding Accra, Tema, and Keta, was 510,000 in 1960. The total including urban areas was 953,000 for the same year. See Ghana, Census of Population 1960 (6 volumes; Accra: Census Office, 1964), I. The 1970 detailed census data were not available at the time of writing, but heavy rural-urban migration is known to have continued during the 1960's and the rural population was not likely to be appreciably larger than it was a decade earlier.

³Urban centers in the Southern Savanna are: Accra, with a 1960 population of 388,369; Tema, with 27,127; and Keta, with 29,711, ibid.

⁴There were 73 people per square mile in Ghana in 1960. See John M. Hunter, "Regional Patterns of Population Growth in Ghana 1948-60," Essays in Geography for Austin Miller, J. B. Whittow and P. O. Wood (eds.), Reading: 1965), p. 277.

⁵Useful discussions of purposive and micro-geographic sampling are found in David Harvey's Explanation in Geography (New York: St. Martin's Press, 1969), pp. 358-61; and J. M. Blaut, "Microgeographic Sampling," Economic Geography, XXXV (1959), pp. 79-88.

⁶Reconnaissance visits to the four schemes and study areas consisted of five to seven seaparate contacts each and included at least one extended stay of a week or more in the study areas on or near the schemes. The researcher spent 18 working days in the ARS study area, 13 1/2 in the Sòmanya Workers' Brigade study area, ten in the Afife-Weta State Farm study area, and 12 1/2 in the Ada Cooperative study area. Working days consisted of at least ten and often as much as 14 hours per day of interviewing, traveling and observation. The researcher's wife frequently accompanied him to the field.

⁷Ghana, Census of Population 1960, op. cit., IV, pp. 18-4, Footnote 2.

⁸The major source of information on rural Ghana is the Ghana, Census of Population 1960, op. cit., Footnote 2. However, for purposes of the surveys conducted here the Census was inadequate, because: (1) the data were nearly a decade old at the time of sampling, and (2) no economic characteristics were available on villages under 100 population, which represented the size of settlements for about half of the sample of farmers interviewed.

⁹Peter Haggett, Locational Analysis in Human Geography (New York: St. Martin's Press, 1966), pp. 191-5.

¹⁰See the use of a similar technique in R. O. Adegboye, A. C. Basu, and Dupe Olatunbosun, "Impact of Western Nigerian Farm Settlements on Surrounding Farmers," The Nigerian Journal of Economic and Social Studies, XI (July, 1969), No. 2, p. 230.

¹¹I wish to gratefully acknowledge the help of my interpreter-assistants: (a) P. K. Torsu in the Afife-Weta State Farm study area (Ewe), (b) Samuel Odjao in the Somanya Workers' Brigade study area (Krobe Adangbe), (c) Ben Ashale, Raynal Kally, Ayi Hammond, and E. D. Hammond in the Agricultural Research Station study area (ga), and (d) Webel Kabutey in the Ada Cooperative study area (Ada Adangbe).

¹²"Geological Map," Ghana Atlas (Accra: Survey of Ghana, 1958).

¹³H. Brammer and A. S. deEndredy, "The Tropical Black Earths of the Gold Coast and their Associated Vlei Soils," paper presented to the Fifth International Congress of Soil Sciences, Leopoldville, August, 1954, and in Transactions, Fifth ICSS, IV (1954), pp. 70-6.

¹⁴H. Brammer and A. S. deEndredy, "The Tropical Grey Earths of the Accra Plain, Gold Coast," paper presented to the Sixth International Congress of Soil Science, Paris, 1956.

¹⁵Brammer, op. cit., p. 12, Footnote 1.

¹⁶See M. W. Walter, "Dependability of Rainfall in Ghana," Departmental Note No. 14 (Accra: Ghana Meteorological Department, 1959), pp. 2-3.

¹⁷Kaiser Engineers and Constructors, Accra Plains Irrigation Feasibility Study, Report for the Volta River Authority, Government of Ghana (2 volumes; Accra: 1965).

¹⁸Ghana, Contract between the Government of the Republic of Ghana and the Ghana Agricultural Development Joint Venture (Borifica, Condotte D'Acqua, Impresit, Borini Prono) for Agricultural Development of the Accra Plain and Other Areas (Accra: April, 1969).

¹⁹See C. E. Tagoe and Y. H. Kjang, "Irrigation Policy for Accra-Mo-Keta Area" (Accra: Ministry of Agriculture, May, 1967). (Mimeographed), 10 p.; and F. Penkava, "Irrigation in Ghana--Trends of Development and Investment Policy" (Legon: Faculty of Agriculture, 1968). (Mimeographed), 10 p.

²⁰Ghana, Feasibility Study for the Avu-Keta Project, Volta Region, Ghana (six volumes; Western Germany: Karl Gall RG, WAKUTI, December, 1968).

²¹Ghana, Ministry of Agriculture, Annual Report of the Irrigation, Reclamation and Drainage Division, 1968 (Accra: 1969), pp. 10 and 16. Also refer to J. T. Kowu-Tari, "The Effects of the Volta River Project on the Tongus of the Lower Volta Flood Plains" (unpublished B.A. dissertation, Department of Geography, University of Ghana, Legon, 1968).

²²University of Ghana, Annual Report 1966-67 (Kpong: Agricultural Research Station, 1968); and University of Ghana, "History of the Agricultural Irrigation Research Station," (Kpong: Agricultural Irrigation Research Station, 1965). (Mimeographed).

²³United Nations, Food and Agriculture Organization, Report on Survey of the Lower Volta River Flood Plain (5 volumes; Rome: F.A.O. and U.N. (Special Fund) Project, 1963); and Commonwealth Development Corporation, The Aveyime Rice and Sugar Cane Project, Ghana (2 volumes; London: 1968).

²⁴Interviews with I. Shah, Irrigation, Reclamation and Drainage Division, Accra, 5 May, 1969; K. Poku, same division, 9 May, 1969; and B. A. Sackey and C. T. Nelson, State Farms Corporation, Accra, 9 May, 1969.

²⁵See G. W. Lawson, Plant Life in West Africa (London: Oxford University Press, 1966), pp. 41-4; and H. Brammer, *op. cit.*, p. 15, Footnote 1.

²⁶University of the Gold Coast, Guide to the Agricultural Research Station, Nungua (Legon: 1955), p. 3.

²⁷See J. B. Hall and J. Jeník, "Contribution Towards the Classification of Savanna in Ghana," Bulletin de l'IFAN, T. 30, Sér A. No. 1 (1968), especially tables 1 and 2, p. 94f.; and G. W. Lawson and J. Jeník, "Observations on Microclimate and Vegetation Interrelationships on the Accra Plains (Ghana)," Journal of Ecology, LV (November, 1967), pp. 773-85.

²⁸A thorough study of the coastal area is found in G. W. Lawson, The Littoral Ecology of West Africa, "Oceanography and Marine Biology Annual Review (No. 4; London: Allen and Unwin, 1966), pp. 405-48; and see a general review in G. W. Lawson, "Ghana," Acta Phytogeographica Suecica 54 (Proceedings of a symposium held on Conservation of Vegetation in Africa South of the Sahara; Uppsala: September, 1966, 1968), p. 35.

²⁹The impact of man on vegetation patterns in the savanna are treated in Brian Hopkins, Forest and Savanna: An Introduction to Tropical Plant Ecology with Special Reference to West Africa (Ibadan: Meinemann, 1965), pp. 54-7.

³⁰P. H. Nye and D. J. Greenland, The Soil under Shifting Cultivation (Farnham Royal: Commonwealth Agricultural Bureaux, 1960), pp. 66-7.

³¹See W. E. F. Ward, A History of Ghana (4th ed.; London: Allen and Unwin, 1967), p. 57.

³²See Madeline Manoukian, The Ewe-Speaking People of Togoland and the Gold Coast, Daryll Forde, ed. (Ethnographic Survey of West Africa, Part VI; London: International African Institute, 1952), p. 13. It may be that the Kingdom of Dahomey was established by a small group of Ewe from Notsie, in the early seventeenth century.

³³Albert deSurgy, La Pêche Traditionnelle sur le Littoral Evhé et Mina (de l'Embouchure de la Volta au Dahomey) (Paris: Centre National de la Recherche Scientifique, 1966), p. 8 and map facing. This and other research on the Ewe was discussed with deSurgy in January, 1969, at Legon, Ghana. See also E. A. Boateng, A Geography of Ghana (2nd ed.; London: Cambridge University Press, 1967), pp. 109, 159-61.

³⁴W. C. Fiati, "Ghana-Togo Border: A Study in Political Geography" (unpublished B. A. dissertation, Department of Geography, University of Ghana, Legon, 1966).

³⁵The history of the Ada Branch of the Adangbe is given little coverage by Ward and Azu and none by Manoukian. Refer to Ward, op. cit., Footnote 31; N. A. A. Azu, "Adangbe History," The Gold Coast Review, II, No. 2 (1926), and III, No. 1 (1927); and Madeline Manoukian, Akan and Ga-Adangme Peoples, Daryll Forde, (ed.) (Ethnographic Survey of West Africa, Part I; London: International African Institute, 1950). A brief review of Adangbe historical literature is found in R. J. H. Pogucki, Gold Coast (Ghana) Land Tenure, Vol. II: Report on Land Tenure in Adangme Customary Law (2nd ed.; Accra: 1968), pp. 46-7.

³⁶See J. E. A. Adjakio, "Population and Settlement in Tongu" (unpublished B. A. dissertation, Department of Geography, University of Ghana, Legon, 1966); and Ward, op. cit., pp. 200, 223-8, Footnote 31.

³⁷The first known reference to the Ga-Adangbe was a word-list of the language recorded by Pieter De Marees in a book published in Amsterdam in 1601 (no title given); see note in R. J. H. Pogucki, op. cit., p. 47, Footnote 35. However, Azu says that they may have come as early as 1150-1250 A.D. in Azu, op. cit., p. 242, Footnote 35. Sutherland believes that the Krobo crossed the Volta about 1670; D. A. Sutherland, "The Manya-Krobo State" (unpublished manuscript, 1931), p. 10. The migration might well have occurred in phases over an extended period of time.

³⁸Rev. H. W. Durbunner, "Extracts from Yilo Krobo Church History," letter to the pastor and catechists of the Presbyterian Church at Somanya, 4 August, 1961.

³⁹See Hugo Huber, The Krobo: Traditional, Social, and Religious Life of a West African People, Vol. XVI, translation (St. Augustin near Bonn: The Anthropos Institute, 1963).

⁴⁰The Krobo consist of two major lineages: the Yilo and the Manya. They differ little in terms of culture or language. The Yilo (Yi in Krobo means "head" and lo, "governor") were formerly the privileged aristocracy who occupied the ancestral palace near the highest point at the south end of Krobo "Mountain;" the Manya (mang is "town" and yang, "edge") were the working plebian class who formed the bulk of the population and lived on the periphery and particularly at the north end of the hill. To my knowledge the Yilo-Manya dichotomy has never been previously explained in print. I am indebted to the Konor Yilo Krobo, Nene Padi Akrobetoh, for conveying this information to me, in ceremony, and for the opportunity for my wife and me to ascend the hill to the ancestral palace, for which he supplied the laborers and hunters, and I only the gin libations; 14 March, 1969.

⁴¹Ward, op. cit., Footnote 31.

⁴²Ibid., pp. 106-7.

⁴³I discussed the Battle of Katamanso with the Chief of Katamanso, Seth Laryea Afotey Agbo, whose grandfather was an eye-witness. Though Ward attributed Ashanti aggressiveness to political motives, the Chief emphasized the desire for salt sources as the goal. Undoubtedly, both were involved. According to the Chief, Dodowa derives its name from the Twi dodo waha meaning "many are here," referring to the assembled Ashanti troops.

⁴⁴See Kwamina B. Dickson, A Historical Geography of Ghana (New York: Cambridge University Press, 1969).

⁴⁵See R. J. H. Pogucki, Report of Land Tenure in Customary Law of the Non-Akan Areas of the Gold Coast (Now Eastern Region of Ghana), Part II, Ga (2nd ed.; Accra: Lands Department, 1968), p. 3.

⁴⁶Hunter, op. cit., pp. 282-5, Footnote 4; and John M. Hunter, "Ascertaining Population Carrying Capacity under Traditional Systems of Agriculture in Developing Countries," The Professional Geographer, XVIII, No. 3 (1966), p. 152.

CHAPTER III

THE FIRST CASE STUDY: THE AFIFE-WETA STATE FARM AND LOCAL FARMERS

This case study focuses on the Afife-Weta State Farm and the farmers in the area surrounding it. The study area is located about 100 miles east of Accra, and is the most rural and geographically remote of the case studies. The Afife-Weta State Farm is found just north of Keta Lagoon (Figure 5). The Ewe are the dominant ethnic group.

The objectives of this study are: (a) to review the background and development of the scheme, (b) to examine its impact on local farmers in the context of other sources of influence, and (c) to look at some of the characteristics of these farmers in terms of agricultural innovation and production. The data will be used to test the hypotheses presented in the introductory chapter.

Background and Development of the Scheme

In 1962, with Soviet technical assistance, the Afife-Weta State Farm was established for the purpose of developing large-scale, mechanized and irrigated rice production. This was part of the general revamping of Ghanaian agriculture in the early 1960's noted previously. Efforts were directed at converting virtually unused swamplands into productive rice paddies so that Ghana might generate an import substitute for one of its increasingly significant grain staples.

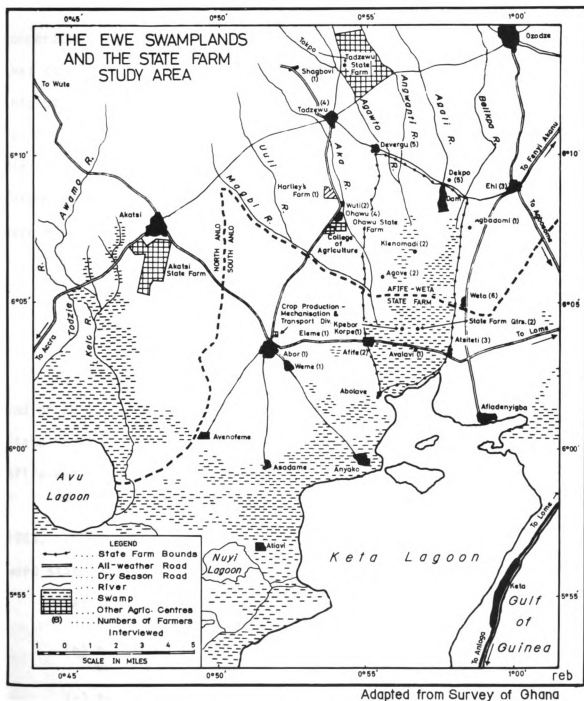


FIGURE 5

Background

Following a visit by Nkrumah to the Soviet Union in 1960, economic cooperation, protocol and technical assistance agreements were drawn up with that country.¹ In 1962 a Government-appointed committee under the chairmanship of Mrs. Amoako Atta was set up to determine the economic principles for the reorganization of state-assisted agriculture. As a result the Ministry of Agriculture was dissolved and replaced by the State Farms Corporation. The transfer to this new structure was not smooth. Officers were posted to the various State Farms, described thusly in one reference:

In 1962 about 17,000 agricultural workers in (the) cocoa field were deployed overnight without considering the consequences and there would have been chaos unprecedented in the annals of Ghana if the men had not been quickly absolved (sic.) into the State Farm which was then in the process of formation. That accounted for the poor foundation of such State enterprises.²

On 4 June, 1962 a contract was signed with the U.S.S.R. and by the end of that year efforts had begun to establish three Soviet-Assisted State Farms at Branam (maize) in Brong-Ahafo Region, Adidome (rice) and Afife-Weta (rice) in Volta Region.³

The State Farms Corporation was officially established in January, 1963. In the Instrument of Incorporation the objectives of the Corporation were stated as:

- (a) to establish and run large scale farms for the production of food and other agricultural products for sale;
- (b) to undertake any agricultural project other than those falling under subparagraph (a) of this paragraph;
- (c) to carry on, subject to the provisions of any other enactment, the business of marketing its farm produce.⁴

In addition it was tacitly accepted that a further goal was "to show the advantages of large-scale mechanized socialist farming over small-scale peasant farming."⁵

The State Farms Corporation began with 26 farms and up to £2,000,000 (\$5,600,000) authorized capital. The number of farms expanded rapidly until the coup of February, 1966 when Nkrumah tumbled from power. This was followed by a precipitous decrease in farms over the period 1966 to 1969:⁶

1962	26
1963	107
1964	111
1965	123
1966	112
1967	80
1968	49
1969	45

At its apogee in 1965 State Farms throughout Ghana had a labor force of about 18,800 and a wage bill of about \$6,000,000.⁷ The 123 State Farms listed in the Agricultural Census of 1965 covered an area of 63,892 acres of cropped land on a total acquired area of 345,080 acres.⁸ State Farms at their peak covered only 0.79 per cent of the total agricultural acreage in Ghana, while 98.58 per cent was in peasant farms.

State Farms grew virtually every variety of perennial and annual crop found in Ghana. Even cocoa was attempted, though it was quickly determined that experienced peasant cocoa farmers could produce more profitably than the State. More success was had with grain crops such as maize and rice and it was here that the Soviet Union was able to provide its expertise.

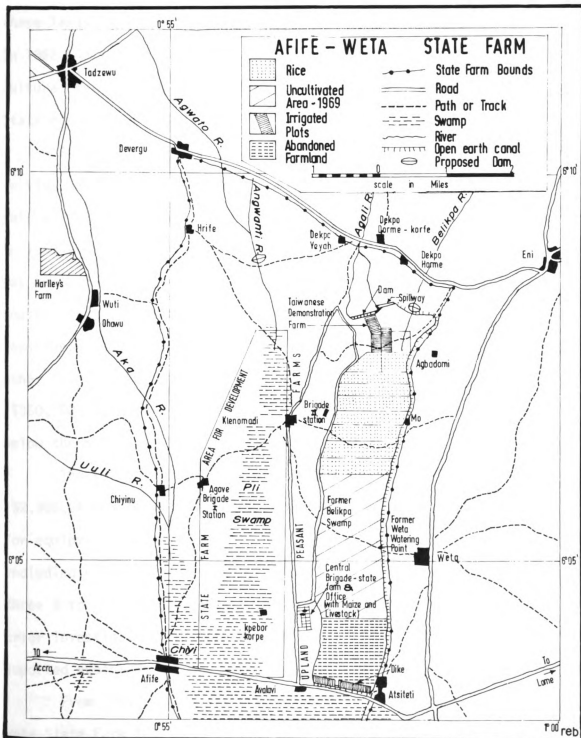
The Soviet-assisted State Farms were built to cover large areas, adaptations of the collective-style Kolkhoz farms found in the U.S.S.R.

The plans for the Ghana farms included diversified production units, central offices, machine and tractor repair stations, food processing units, housing for workers on site, water, sewage and electrical facilities, a school, post office and hospital, canteens and a cinema. In practice, only a small fraction of the local labor force agreed to live on the State Farms, and most of the non-production aspects of the grandiose plans never came to fruition.

Agricultural Census data reveal that at the time of the coup, the Soviet-assisted farm at Branam was producing crops on 1,657 acres, Adidome on 2,260 acres, and Afife-Weta on 2,773 acres. These figures were below original projections of about 5,000 acres each. The Soviet technical assistance contract, scheduled to run to June, 1966, was not renewed and virtually all Russian personnel left the country during 1966. In January, 1969 Ghanaian officials met with U.S.S.R. Embassy representatives to talk about reactivation of Soviet support for the Afife and Adidome projects. "The Ministry of Agriculture (did) not indicate its desire that the Soviet Union should continue with technical assistance on these projects."⁹

Development of the Afife-Weta State Farm

The Afife-Weta State Farm lies in a low-lying swampland just north of the Keta Lagoon and on the route from Accra to Lome (Figure 6). The Belikpa, Pli and Chiyi swamps converge to funnel the runoff of several rivers from the north into the Keta Lagoon to the south. In 1969 the land was virtually unoccupied and uncultivated. Aside from its value as a source of water and its use as a dry-season grazing area for cattle, the swampland played a limited role in the economy of the local Ewe people. Prior



Adapted from State Farms Corp. maps

FIGURE 6

to the 1960's no efforts had been made to develop large-scale farming on these lands, though observers had noted the feasibility of rice production.¹⁰ In 1962 the Nkrumah Government expropriated the land and the Russian agricultural team drew up maps and plans for the development of the Afife-Weta State Farm.¹¹

Soviet specialists laid plans for the developments of three farm sections or brigades (Figure 6).¹² At the Central Brigade a tractor repair workshop was built by the Ghana National Construction Corporation and in 1963 an East German Rice hulling machine (capacity: 50 tons paddy/day) was installed. Management housing, roads, offices, an 800-ton rice storehouse, a granary, sheds, a bore hole, and five blocks of staff hostels were constructed and sited on high ground. Repair units were also built at the other brigade stations. Reclamation and irrigation work valued at £G125,000 (\$350,000) was completed resulting in a dam, spillway and irrigated acreage below the dam.

The total capital investment through 1965 was estimated at £G823,800 (\$2,306,240) by Soviet technical personnel. About half (\$1,250,480) was for equipment, machinery and spare parts. Virtually all of this was Russian including nine rice combines, eleven C-100 tractors, 23 DT54's, 15 MTZ's, three 3-ton lorries, and one 5-ton lorry. Apparently because of the lack of prior investigation of local edaphic and climatic constraints, much of the imported equipment was found to be unsuitable.¹³

From 1966 to 1968 the production of rice and other crops on Afife-Weta State Farm fell well below initial expectations. Political problems brought about by the coup disrupted production in the first year of planting,

1966. Only miniscule tonnages of rice were produced off of 2,600 planted acres in 1967 and 1968 (Table 6). Original targets of 5,000 acres and two cropping seasons were abandoned because of organizational problems and lack of irrigation facilities. The State Farm therefore had little impact on Ghana's rice production which averaged 37,900 long tons per year over the 1965-67 period.¹⁴ This was about 30 per cent of the country's rice demand. In 1966/1967 Ghana spent N¢6,000,000 for imported rice which represented 16 per cent of Ghana's total food imports.¹⁵

Other agricultural efforts of the State Farm included modest acreages of maize and cowpeas planted on the upland near the Central Brigade, the raising of some 22,000 imported fowls (Highlands, Light Sussex, Rhode Island Reds), and the grazing of livestock from nearby Tadzewu State Farm on the post-harvest rice stubble. Local and Accra marketing of eggs and birds met with moderate success.

A number of factors precipitated a turnabout in the Afife-Weta State Farm's operations in 1969. Major among these were the heavy rains of 1968 which demonstrated the need for better irrigation facilities, the inefficiency of operations, the unmet targets, and excessive numbers of staff. To rectify these difficulties targets were reduced and preparations were made to increase irrigable land. The farm was given greater decentralized decision making capacity and was put on a self-accounting basis to pay its own way. Almost 25 per cent of the laborers were declared redundant, reducing the force from 163 to 123.

These reforms appeared to be achieving the desired ends in mid-1969. Rice acreage targets were being exceeded. Refer again to Table 6. Knowledgeable observers felt that Afife-Weta State Farm had the greatest

TABLE 6.--Crop Production on the Afife-Weta State Farm, 1967-1969--Major and Minor Season Totals^a

Crop	Target Acreage	Acres Planted	Acres Harvested	Total Production in Tons
1967				
Rice	4,000	2,600	964	120.5
Maize	800	350	280	42.7
Cowpeas	100	36	36	3.0
1968				
Rice ^b	4,500	2,486	767	308.7
Maize	500	324	250	7.0 ^c
Cowpeas	50	46	46	3.5
1969 ^d				
Rice ^b	1,500	2,000 ^e	. .	. .
Maize	200	200 ^e	. .	. .
Cowpeas	50	50 ^e	. .	. .

^aSource: Interview, Manager, G. K. Ocloo, Afife-Weta State Farm, 13 May, 1969.

^bpaddies; only raised in the major season.

^cFloods destroyed some acres of maize and excessive rain reduced yields.

^dTarget acreages were reduced in 1969 to increase efficiency of production. These targets were actually exceeded.

^eEstimates of acres planted made in May, 1969, by State Farm Manager, G. K. Ocloo.

potential of any large-scale farm in Ghana.¹⁶ In addition, in May, 1968 an experimental scheme was initiated with Taiwanese technical assistance to demonstrate improved techniques of rice and vegetable cultivation and to undertake a pilot settlement program for a dozen or so local farming families.¹⁷ This was the first time that the Afife-Weta State Farm turned part of its attention from the production to the extension side of agricultural development.

Impact on Local Farmers

We shall look at the impact of the Afife-Weta State Farm in the context of the several change agents in the study area. The other agents included the Pioneer Tobacco Company, the Ministry of Agriculture extension divisions, and the farmers themselves. Data on the perceived impact of these are presented in Table 7. Fifty local food farmers including part-time employees of the State Farm, were interviewed concerning agricultural innovations and perceived sources of influence in bringing about adoption. Innovations included use of the tractor, fertilizer, improved seeds or seedlings, and insecticides/weedicides.

Only 43 innovations had been adopted by the sample. The State Farm had minimal impact upon adoption patterns. Farmers attributed the major influence to the extension services (Crop Production and Mechanization and Transport Divisions) of the Ministry of Agriculture based near Abor (Figure 5). This impact was greatest in the area of tractor utilization with 36 per cent of the farmers adopting because of Ministry influence, and an additional ten per cent from other sources. The extension services had made some headway in establishing demonstration farms and farmers in

TABLE 7.--Perceived Major Sources of Influence in Adopting New Agricultural Practices by Fifty Farmers in the State Farm Study Area, 1969

	Use of Tractor	Use of Ferti- lizer	Use of Im- proved Seed	Use of In- secticide/ weedicide
Total interviewed	50	50	50	50
Number adopting	23	9	11	1
Percentages				
Major Source of Influence:				
Afife-Weta State Farm	2	0	2	0
Pioneer Tobacco Company	6	10	4	0
Ministry of Agriculture	36	6	10	0
Secondary Sources	2	2	6	2
Total Percentage Influenced	46 ^a	18	22	2
Percentage Not Influenced	54	82	78	98
Total Percentage	100	100	100	100

^aFive of 23 farmers who formerly adopted tractor use had temporarily abandoned cultivation of tobacco and use of the tractor during the 1969 season.

the study area. The lack of significant adoption of planting materials such as fertilizers, seeds and insecticides was considered by extension personnel to reflect inadequate supply.

The Pioneer Tobacco Company had an influence upon the adoption of planting materials and the use of the tractor. Company efforts to encourage peasant production of tobacco began in 1954 in the study area. Working in association with the extension services they set up demonstration farms, taught farmers procedures for the transplanting of delicate seedlings, introduced fertilizer and demonstrated the preparation of land using the tractor. The Company acted as a marketing board, providing credit on inputs, recording costs on cards held by the farmers, purchasing all produce with cash minus deductions for input costs. The system seems to have worked well and been well received by the farmers. But in 1969 government pricing policy did not provide adequate incentive to maintain farmer interests, and tobacco production declined in the study area.

At the time of writing there was no cultivation of rice by local farmers in the study area. In addition to the lack of State Farm impact, which was probably a minor factor, reasons for this appeared to be: (a) absence of local farmer experience in rice production, (b) lack of credit to underwrite production of this capital-intensive crop, (c) absence of hulling facilities for local farmers, (d) lack of irrigation facilities for higher yields, (e) inadequate storage facilities, and (f) presence of bird scavengers.

The impact of the State Farm was measured through interviews with 50 farmers of whom 11 were part-time employees of the State Farm and 39 non-employees. Data presented above indicate that the State Farm had

little impact on either group. Though the Farm had no explicit extension program until 1968, it is nonetheless surprising that only one innovation was perceived as scheme-influenced among part-time employees.

The impact upon local food farmers not employed by the State Farm was measured by use of the Impact Index, discussed in Chapter I. Table 8 shows that only 14.5 per cent of 39 farmers were positively influenced, using Index criteria. Slightly over a third of the sample had visited the scheme and bought its produce. None of the local farmers had visited the State Farm, observed demonstrations or been recipients of scheme extension activities. Only a third indicated that they believed the scheme had benefitted them in any way.

The Impact Index has been subjected to correlation analysis using variables listed in Appendix B. For the 50 farmers in this case notable correlations are found with only a handful of variables; however, these coincide with many of those which are particularly related to the hypotheses presented in this research.¹⁸ Specifically, the Impact Index is positively correlated with the Travel Index (.394), the Education Index (.296), and farmers whose major source of income comes from wages, especially State Farm part-time employees (.471). Negative correlations are found with farmer age (-.505), farmer years experience (-.522), and farmer years residence in study area (-.481). The State Farm's younger, wage-earning farmers are more influenced by the scheme than other farmers.

Of special interest is the relationship between scheme impact and the distance between farmer and scheme. The first hypothesis posits that in the micro-spatial context of the case studies that the "neighborhood effect" of the scheme would be limited, that is, the two factors would

TABLE 8.--Impact Index: Afife-Weta State Farm, 1969^a

Categories	Percentages
Farmer Experience	
1. Bought food products from scheme	36
2. Visited scheme at least once	36
3. Observed scheme "demonstration" ^b	0
4. Received training from scheme ^c	0
5. Received extension program of scheme ^d	0
6. Been paid employees of scheme in the past	8
Farmer Perception	
7. Perceived their innovation adoption as influenced by scheme	3
8. Perceived that they have benefitted from scheme	33
Mean Percentage	14.5

^aFarmer sample: N=39

^bIncludes passive observation of trial plots, scheme activities, "open day" (agricultural show), etc.

^cIncludes any type and length of active training at the scheme in agricultural practices, e.g. fertilizer application.

^dIncludes fertilizer, seeds, plant protectants, advice on particular farm problems, new techniques, credit, etc.

not be inversely related. The correlation coefficient for scheme impact and distance is $r = -.172$. Though inverse, this correlation is weak; therefore, data for this case study are inconclusive concerning the Scheme Impact hypothesis.

Local Food Farmer Characteristics, Production and Innovation

We shall now take a look at the local food farmers of the study area. Sections are presented on the characteristics of the sample, the nature and problems of food production, and an analysis of agricultural innovation.

Characteristics

One of the purposes of this research has been to determine what is meant by the "traditional farmer" by carefully examining his characteristics. The dominant ethnic group of the study area is the Ewe, consisting of the North Anlo and the South Anlo. Most live in small villages of a few hundred population (Figure 5). Table 10 presents the population characteristics of interviewees' villages in the study area.

The typical farmer in the sample was 45.8 years old, had lived in his village for 34.9 years, and had an average of 30.3 years of farming experience. The relative maturity of the sample was reflective of the out-migration of the younger males from this area, noted in Chapter II. Seventy-six per cent of the farmers owned and lived in their own compounds; eight per cent lived in houses, and 16 per cent occupied single rooms. Thirty-eight dwellings were constructed of swish (mud) and 12 were of cement blocks.

TABLE 9.--Factor Loadings Defining Traditional Farmers First Case Study
(N = 50)

Characteristics			Factor 1	Factor 2
Traditional Farmer				
(a) Domestic Characteristics				
(1)	Age	1	.7007	.2060
(2)	Years Resident	9	.6884	.4305
(3)	Years Farmer	10	.7591	.3078
(4)	Household Size	13	.6113	-.0116
(5)	Number Wives	14	.6832	-.0899
(6)	Number Children	16	.7048	-.2148
(7)	Formal Education	51	-.1453	-.6286
(8)	Stool Land Tenure	83	.1545	.4246
(b) Productivity Characteristics				
(1)	Acres Savanna Crops	31	.5502	.1113
(2)	Acres Cassava	32	.5338	.1325
(3)	Acres Tomatoes	36		
(4)	Acres Vegetables	37	.5188	.1325
(c) Innovation				
		50	.3464	-.7217

TABLE 10.--Population Characteristics of the Villages of the State Farm Study Area

Village or Other Location	Local Council	No. Inter- viewed	1960 Popu- lation ^a	1948 Popu- lation ^a
Ohawu	North Anlo	4	689	602
Agricultural College, Ohawu	. .	2	nd	0
Wuti	North Anlo	2	202	199
Harlley's Farm	. .	1	. .	. .
Tadzewu	North Anlo	4	1,654	1,146
Shagbobi- Tadzewu	North Anlo	1	201	94
Devergu	North Anlo	5	804	847
Agbadomi	North Anlo	1	66	0
Ehi	North Anlo	3	2,209	330
Dekpo-Horme	North Anlo	5	413	1,060
Weta	North Anlo	6)	378	540
Atsiteti	South Anlo	3)		
valavi	South Anlo	1	25	123
Agove	North Anlo	2	nd	nd
Afife	South Anlo	2	1,447	2,112
Kpebor-Korpe	South Anlo	1	36	0
State Farm Quarters	. .	2	0	0
Klendomadi	North Anlo	2	307	0
Weme	South Anlo	1	614	0
Abor	South Anlo	1	2,566	2,570
Eleme	South Anlo	1	nd	nd
Total		50		

^aSource: Ghana, Census of Population, 1960 (Accra: Census Office, 1964), Vols. I and II.

The typical household was composed of 9.4 members including the farmer, an average of 1.7 wives and 5.7 living children, of whom 3.5 lived at home. The average number of school age children (6 years and older) in these households was 3.4 of whom 64 per cent had received some formal education. Since this is a lower percentage than we shall find in the other study areas, it may be conjectured that an important reason for this has been the out-migration of the younger and better educated members of the community.

It was difficult to catalog the religious affiliation of the sample because many were syncretists, belonging to more than one religious group simultaneously. Twenty-eight farmers nominally followed animistic traditional religions (under local fetish priests), seven were followers of the local "Prophet" of the Apostolic Revolution Society church, seven were Roman Catholics, six were Presbyterian, one was Christian, and one, Moslem.¹⁹

Domestic characteristics, productivity characteristics and innovation have been factor analyzed to provide a definition of the so-called "traditional farmer". The data are presented in Table 9. The second hypothesis posited that the traditional farmer would be defined by domestic characteristics, but not necessarily by characteristics of low productivity or lack of innovation. If the hypothesis is correct factor analysis should reveal (a) a grouping together in a common factor of high factor scores for domestic characteristics such as age, household size, etc, and (b) a grouping together in a common factor of high factor loadings for domestic characteristics such as age, household size, etc., and (b) a grouping together in the same factor of high loadings for characteristics of

productivity and innovation. Factors 1 and 2 are shown in Table 9 for this case. In factor analysis Factor 1 generally has the highest factor scores appears as Factor 1 variance and Factor 2.²⁰

Table 9 shows that Factor 1 generally meets the above-stated conditions, and, therefore, the "traditional farmer" hypothesis is supported. Exceptions appear in subsets for formal education where a greater negative intensity might be anticipated and for stool land tenure where a greater positive intensity might be expected. Compare factor scores for these in Factor 2.

Production and Problems

There is a wealth of material available on the agricultural production²¹ and the economy²² of the study area. Brammer's work is the most comprehensive study of the agricultural environment in the Southern Savanna east of the Volta River.²³

The primary crops of the study area were cassava, maize, ground-nuts, tomatoes, peppers, and other vegetables. Table 11 presents data on the savanna crops and acreages of the study area sample. Ninety-four per cent of the farmers were raising cassava and maize. About three-quarters (76 per cent) interplanted these major staples with vegetables and other crops. A wide variety of interplanting patterns were observed in the study area: maize-cassava-vegetables, maize-vegetables, cassava-vegetables, and vegetable-vegetable. Tobacco and pineapples were not interplanted.

The total acreage of the 50 farmers was 188, a mean of 3.8 acres and median of 2.0 acres, ranging in size from 1/6 to 100 1/2 acres. The high degree of interplanting complicated the calculation of acreages.

TABLE 11.--Savanna Crops and Acreages for Fifty Farmers in the State Farm Study Area, 1969^a

Crop	No. of farmers	Acreage
Cassava	47 (35)	71
Maize	47 (36)	67
Vegetables ^b	25 (12)	38
Other ^c	6 (1)	12
Total	50 (38)	188

^aField data collected March, 1969. Numbers in parentheses represent farmers interplanting this crop with other crops.

^bVegetables include: pepper, okro, tomatoes, groundnuts, sweet potatoes, and cowpeas.

^cOther crops are: tobacco (6 farmers) and pineapples (2 farmers).

However, the Ewe farmer possess a reasonably accurate areal concept of acreage because of the use of the abo wo system of labor distribution. Labor assignments for breaking earth or weeding were assigned to family and hired workers on the basis of the linear abo wo (abo being the length of a man's outstretched arms, roughly equivalent to the English fathom of six feet, and wo meaning ten). The squared abo wo was employed using ropes and was reckoned to be the area that could reasonably be weeded by one man in one day. According to informants 11 or 12 square abo would be given to strong men, while eight or nine would go to children or weaker laborers. The per capita acreages planted were determined by converting abo wo to acres. There are approximately 12 square abo wo to the acre.²⁴

It appears that the pattern of labor utilization has altered considerably over the 1950's and 1960's. With higher percentages of children

going to school, there has been increasing dependence upon hired labor. The use of hired labor was probably uncommon before 1950.²⁵ Hired laborers were employed by 72 per cent of the sample in 1969. This was primarily to overcome the labor bottleneck during weeding periods. For example, about 50 man-days per acre were required for weeding an acre of maize over a three-month growing season. Laborers were paid N¢0.60 - N¢1.00 per day or per square abo wo. Eighty-seven per cent of the farmers used the spatial rather than the temporal allocation of labor. The fact that the pay rates were the same regardless supports the interviewee observations that a square abo wo is equivalent to the area one man can weed in one day. Labor bottlenecks at the planting season were overcome by use of the tractor, which as noted earlier had been adopted by 46 per cent of the sample. Unlike the situation we shall find in other study areas, the Ewe did not observe a land taboo. However, 95 per cent of the farmers not employed by the State Farm rested the land on Sunday, primarily to attend funeral ceremonies.²⁶

The Ewe are primarily a patrilineal people, and the patriarch of each lineage is responsible for its land.²⁷ Ewe land may be held either by the family or by the individual.²⁸ Among the sample 68 per cent were farming on family land and 32 per cent on individually-controlled land. Of the latter, ten per cent rented their land, eight per cent owned land through purchase, and 14 per cent had received farms as gifts. Those possessing allodial rights of individual ownership might pass land to a family member through labor, sale or mortgage, gift or testamentary disposition. Strangers could use or own land only by permission of the chief. Land tenure had not proven to be an obstacle to land purchases.

The major source of capital among the sample of farmers was income from job wages (48 per cent) followed by sale of crops (34 per cent). Table 12 displays the major sources of capital of the 50 informants, differentiating between food farmers working and not working for the State Farm. The difference between the employee and non-employee groups is striking, with a plurality of the latter much more dependent on crop sales. This is like the situation obtaining in other case study areas, where the sale of crops represents the major source of income among food farmers.

The major problems among farmers of the study area were inadequate rainfall and village water supply, scarcity of tractors, diseases and pests (white ants, insects, rodents), and the perennial worry of an inadequate source of credit. An inventory of the perceived problems of the sample is presented in Table 13. The pattern of complaints was very much the same for both the employee and non-employee groups. It is striking that the leading first-mentioned problem was tractor scarcity, which gives some indication of the significance of this factor to study area farmers.

Innovation

Among the sample of 50 food farmers the average number of adoptions was 0.86. Forty-three adoptions were made by 25 farmers, the balance adopted no innovations. In the following tables innovation is compared with indices of travel experience (Table 14), radio accessibility (Table 15), extension service contact (Table 16), and formal education (Table 17).

The third hypothesis posits that innovation among farmers is directly related to measures of farmer productivity, susceptibility to scheme impact,

TABLE 12.--Major Sources of Capital Among Fifty Farmers in the State Farm Study Area, 1969

Major Source of Capital	Food Farmers		Food Farmers Employed by State Farm		Total	
	No.	%	No.	%	No.	%
Sale of Crops/ Savings	16	41	1	9	17	34
Personal Loans	6	15	0	0	6	12
Bank Loans	0	0	0	0	0	0
Job Wages/Other Income ^a	14	36	10	91	24	48
Need No Money	3	8	0	0	3	6
Totals	39	100	11	100	50	100

^aOther income: from crafts, tailoring, weaving Kenta cloth, trading, and fishing.

TABLE 13.--Inventory of Perceived Problems of Food Farmers and State Farm Employees in the Study Area, 1969^a

Problem	Food Farmers	Food Farmers Employed by State Farm	Totals
1. Rainfall Irregularities/village water supply	18 (6)	5 (2)	23 (8)
2. Tractor scarcity	16 (9)	6 (3)	22 (12)
3. Diseases/White ants/insects/rodents	18 (4)	3 (1)	21 (5)
4. Credit/money	15 (8)	4 (2)	19 (10)
5. Labor supply	7 (3)	1 (0)	8 (3)
6. Fertilizer scarcity	6 (1)	1 (0)	7 (1)
7. Roads/transport/marketing	5 (0)	1 (0)	6 (0)
8. Others ^b	13 (1)	6 (1)	19 (2)

^aNumbers in parentheses represent people who indicated this was their most serious problem.

^bOthers include: sickness (6), soil infertility (3) weeding problems (3), scarcity of oil palm seedlings and other seeds (2), funerals taking up too much time (1), need of plant inspectors (1), animal disease (1), pasture shortage since establishment of State Farm (1), scarcity of land for outsiders (1).

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TABLE 14.--Travel Experience and Adoption of Innovations Among Study Area Food Farmers, 1969

Travel Experience ^a	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
1 (most experienced)	1	1	0	2	0	4	8	1.75
2	5	0	2	1	0	8	16	0.88
3	3	3	1	2	0	9	18	1.22
4	6	3	1	1	0	11	22	0.73
5	10	6	0	1	0	17	34	0.53
6 (least experienced)	0	1	0	0	0	1	2	1.00
Totals	25	14	4	7	0	50	100	0.86

^a1=travel to another region, Kumasi, Takoradi, Tamale, many other areas of Ghana and abroad; 2=to another region, Kumasi, Takoradi, Tamale and many other areas of Ghana; 3=to another region, Kumasi, Takoradi, and some other areas of Ghana; 4=to another region, Kumasi, and some other local places; 5=to another region and a few other local places; 6=only traveled in this region.

TABLE 15.--Radio Accessibility and Adoption of Innovations Among Study Area Food Farmers, 1969

Status	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Have radio	5	5	0	4	0	14	28	1.21
Have access	10	6	4	2	0	22	44	0.91
Have no radio and no access	10	3	0	1	0	14	28	0.43
Totals	25	14	4	7	0	50	100	0.86

TABLE 16.--Extension Services Contact and Adoption of Innovations Among Study Area Food Farmers, 1969

Extension service contact	Number of Inno- vations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Food Farmers								
Contact	7	4	3	6	0	20	40	1.40
No contact	14	4	0	1	0	19	38	0.37
Total Food Farmers	21	8	3	7	0	39	78	
State Farm Employees								
Contact	3	3	0	0	0	6	12	0.50
No contact	1	3	1	0	0	5	10	1.00
Total Food Farmers employed by State Farm	4	6	1	0	0	11	22	
Totals								
Contact	10	7	3	6	0	26	52	1.19
No contact	15	7	1	1	0	24	48	0.50
Totals	25	14	4	7	0	50	100	0.86

TABLE 17.--Formal Education and Adoption of Innovations Among Study Area Food Farmers, 1969

Formal Education	Number of Inno- vations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
None	13	12 ^a	1	3	0	29	58	0.79
Primary	6	0	2	0	0	8	16	0.50
Middle	6	2	1	2	0	11	22	0.91
Advanced ^b	0	0	0	2	0	2	4	3.00
Totals	25	14	4	7	0	50	100	0.86

^aThree of these farmers had no formal education but were doing private study on their own.

^bThese two farmers had advanced training in agriculture at the post secondary school level.

and extension service contact, travel experience and access to radios. In this case study the correlations between innovation and these variables are very weak. Thus, the data are inconclusive in support of the innovative farmer hypothesis.

The fourth hypothesis states that formal education is not related to agricultural productivity or innovation. This hypothesis is supported by the case study data. The Education Index bears no relationship to productivity measured in terms of savanna acres cropped (-.135). Its coefficient of correlation with innovation, though slightly higher than might be anticipated (.245), does not substantially weaken the hypothesis. However, there is a higher rate of innovation for the two farmers with advanced and specialized training in agriculture (Table 17).

Summary

The first case study has focused on the Afife-Weta State Farm in Volta Region which was assisted in its development by Soviet technical aid. Like other State Farms developed by the Nkrumah Government in Ghana in the early 1960's it was established to overcome food shortages. It improved utilization of the Ewe Swamplands north of Keta Lagoon for mechanized rice cultivation. Though at the time of writing profitable production had not been achieved, reforms in organization and operation appeared to be achieving greater success.

The impact of the State Farm on the local food farmers, either employed or not employed by the Farm, was minimal. The Impact Index was only 14.5 per cent. The influences of the Ministry of Agriculture extension services and the Pioneer Tobacco Company were much greater. A factor analysis of the domestic characteristics of the local farmer helped define the so-called "traditional farmer". A survey of his agricultural production showed that he grew a median of 2.0 acres of crops, primarily cassava, maize and vegetables. He overcame labor bottlenecks by use of hired labor for weeding and the tractor for land preparation. Major capital sources were income from job wages and sale of crops. The most pressing problems faced were inadequate rainfall, scarcity of tractors, diseases and pests, and inadequate sources of credit. An average of only 0.86 innovations has been adopted by the sample of 50 food farmers.

The traditional farmer and formal education hypotheses are supported by the case study data; but the scheme impact and innovative farmer hypotheses are only weakly supported and therefore inconclusive.

FOOTNOTES--CHAPTER III

¹Interview with C. T. Nelson, Chief Agricultural Officer, State Farms Corporation (and former Manager of the Afife-Weta State Farm), Accra, 13 March, 1969.

²Letter of B. A. Sackey, Assistant Commissioner, 30 June, 1966, Accra, Ministry of Agriculture files. Numerous conversations were had with Mr. Sackey in the early months of 1969 when he acted as the Deputy Director of the State Farms Corporation. The number of laborers is quoted as 10,000 in Ghana, State Farms Corporation First Biennial Annual Report (Accra: State Farms Corporation, 1964).

³Ghana, Technical and Economic Report on Afife-Weta State Farm (Accra: Ministry of Agriculture, State Farms Corporation, 1965), p. 1.

⁴Ghana, State Farms Corporation Instrument, 1965 (L. I. 398; Accra: March, 1965), p. 1.

⁵Ghana, State Farms Corporation First Biennial Report, op. cit., p. 2, Footnote 2.

⁶Gordon states that there were 135 State Farms at the time of the coup in February, 1966. J. Gordon, "State Farms in Ghana (The Political Deformation of Agricultural Development)," case study, 12h, Legon, 1968 (Mimeographed).

⁷See Miracle and Seidman, op. cit., p. 17, Footnote 24, Chapter I, for data which they found in the Ghana Planning Commission files, 1966.

⁸Ghana, Ministry of Agriculture, Division of Economics and Statistics, Statistics of Large Scale, Specialized, Institutional, Cooperative and Young Farmers' League Farming and Service Stations ("Agricultural Census"), 1965 (Accra: 1967).

⁹Ghana, Ministry of Agriculture files, "State Farm Corporation Irrigation Project," 27 January, 1969.

¹⁰See W. M. Clark and F. H. Hutchinson, British West African Rice Mission's Report on the Possibilities of Expanding the Production of Rice in the British West African Colonies (London: Secretary of State for Colonies, 1948); and references listed in Footnote No. 21 of this chapter.

¹¹The original area mapped by the Russians in January, 1962 is shown within the "State Farm Bounds" of Figure 3.1. The State Farm area which was laid out covered 19,259 acres and passed through or encompassed a number of small villages. Soviet Agricultural Team, "Afife State Farm Map," scale 1:18,750 (Afife: 1962).

¹²The leader of the Soviet Agricultural team was V. P. Karamyshev and the chief economist M. M. Trounov. They were key figures in the drawing up of the original farm plans. See Ghana, Technical and Economic Report on Afife-Weta State Farm, op. cit., Footnote 3.

¹³Interview with G. K. Delco, Manager of the State Farm, Afife, 5 April, 1969.

¹⁴Ghana, Ministry of Agriculture, Division of Economics and Statistics, Crop Area, Yield and Production, op. cit., p. 10, Footnote 2, Chapter I. About 87 per cent of the total was produced on peasant farms in 1967, largely in Northern Ghana.

¹⁵Eberhard Reusse, Ghana Food Industries, 1968 (Rome: F.A.O. and U.N.D.P., April, 1968), p. 62.

¹⁶Professor Seth LaAnyane, Dean of the Faculty of Agriculture, University of Ghana and Chairman of the former Agricultural Review Committee set up by the National Liberation Council after the 1966 coup, expressed this view; interviewed March, 1969. See also Miracle and Seidman, op. cit., kp. 38-9, Footnote 24, Chapter I.

¹⁷See Tu Pen-Yu, "The Outlines of Farming Work Programme--The Agricultural Mission from the Republic of China to Ghana--Afife-Volta Region," Afife, March, 1969, p. 1. (Mimeographed, 3 p.). This author benefitted from numerous conversations with the team members over meals and in the field while resident on the Farm during March, 1969.

¹⁸As noted in the introductory chapter, tests of statistical significance have not been and cannot appropriately be applied since the data have not been demonstrated to be normally distributed. Correlation coefficients are presented to supplement empirical data.

¹⁹Major among the works on Ewe religious practices are J. Spleth, Die Religion der Eweer in Sud-Togo (Seriin: 1911), reviewed in Manoukian, op. cit., pp. 45-53, Footnote 32, Chapter II; and Albert deSurgy, Ewe Fetish Shrines (Paris: Centre National de la Recherche Scientifique, in press); Kweku Nukunya, Kinship and Marriage among the Anlo Ewe, London School of Economics Monographs on Social Anthropology, No. 37 (London: The Athlone Press, 1969).

²⁰One should exercise caution in interpreting factor scores. These are not correlations but measures of communality and intensity. See again Rummel, op. cit., Footnote 35, Chapter I.

²¹These include S. J. Amegashital, "An Agricultural Geography of the Avenor District in the Volta Region" (Unpublished B. A. dissertation, Department of Geography: University of Ghana, Legon, 1966); H. T. Brash,

"Report on the Detailed Preliminary Soil Survey of the Mo-Keta Plains" (Kwadaso: Soil Research Institute, 1958), inter alia; S. LaAnyane, Report on a Survey of Ho-Keta Areas: Abutia, Pjelego-Warrya, Dodze and Abor, and Adidome (Accra: Department, 1954) (Mimeographed); J. A. Mensah-Ansah, "Soils of the Afife State Farm" (Kwadaso: Soils Research Institute, 1965), inter alia; A. D. T. Montague, "Agricultural Survey of the Keta-Ada District" (Accra: Department of Agriculture, 1941); (Typewritten); M. F. Purnell, "Detailed Soil Survey of Ohawu Agricultural Station, Babile" (Kwadaso: Soils Research Institute, 1956), (Mimeographed); S. T. Quansah, "Land Use in the Ho-Keta Plains (Accra: Department of Agriculture, 1957); (Typewritten); J. T. H. Stein, "Agriculture in the Keta-Ada District," Yearbook, Gold Coast Department of Agriculture (Accra: 1929), pp. 152-60; and H. Thompson, Agricultural Survey, Western Tongu Area, Trans-Volta, Togoland (Accra: Department of Agriculture, 1955). (Mimeographed).

²²George Benneh, "Land Tenure and Sabala Farming System in the Anlo Area of Ghana: A Case Study," Research Review, University of Ghana, VII, No. 2 (Lent Term, 1971), pp. 74-94; G. C. N. Cuojo, "A Study of the Internal Exchange Economy of Food Staples within the Anlo Area" (unpublished B. A. dissertation, Department of Geography, University of Ghana, Legon, 1958); and J. A. Obeng-Boampong, "Economic Geography of Afigya" (unpublished B. A. dissertation, Department of Geography, University of Ghana, Legon, 1963). See P. Y. Kuiui, "The Coconut Industry in Keta District" (unpublished B. A. dissertation, Department of Geography, University of Ghana, 1965). Another geographical study was carried out by J. M. Dotse on State Farms in South Anlo in 1969. I wish to acknowledge the assistance of Mr. Dotse who accompanied this writer to the Afife-Weta State Farm in November, 1968, to interview the manager.

²³H. Brammer, Soils of the Ho-Keta Plains (Kwadaao: Soils Research Institute, c. 1958). (Unpublished manuscript). The form of this work is similar to his Soils of the Accra Plains, op. cit., Footnote 1, Chapter II.

²⁴One abo wo, i.e. ten fathoms, equals about 60 feet. It seems likely that the ropes used in measuring, like men's arms, frequently vary in length. For example, one of the abo wo ropes measured by the author was 61 feet. However, in general one square abo wo equaled 3,600 square feet and 12 square abo wo equaled 43,200 square feet, virtually equivalent to an acre (43,560 square feet).

²⁵No reference is made to hired labor in early studies by Manoukian, 1952, op. cit., pp. 15-6, Footnote 32, Chapter II; nor Barbara E. Ward, "The Social Organization of the Ewe-speaking People" (unpublished M. A. thesis, University of London, London, 1949). On the other hand, Rowana M. Lawson has documented the significant rural transformation of the economy in this area in Progresses of Rural Economic Growth: A Case Study of the Change from Static to a Transitional Economy in the Lower Volta of Ghana, 1954-1967, Volta Basin Research Project Report No. 27 (Accra: December, 1968).

²⁶The considerable time spent at funerals by rural populations is indicated in Rowana M. Lawson, "Summary of a Study of Labour Input into Traditional Agriculture on the Lower Volta of Ghana," Journal of Agricultural Economics, XVIII, No. 3 (1967), 403-5.

²⁷See Benneh, op. cit., Footnote 22; and G. K. Nukunya, "Land Tenure and Agricultural Development in the Anioga Area of the Volta Region," a paper read at the Ford Foundation-sponsored Conference on Factors of Agricultural Growth, Legon, March, 1971.

²⁸See Manoukian, op. cit., p. 40, Footnote 32, Chapter II.

CHAPTER IV

THE SECOND CASE STUDY: THE WORKERS' BRIGADE AND LOCAL FARMERS

This case study focuses on the Somanya Workers' Brigade Farm and the farmers in the locale. The study area is located about 40 miles north of Accra at the foot of the Akwapim Uplands and just below the Akosombo Dam (Figure 7). The Somanya Workers' Brigade Farm is found between two motor routes connecting Accra with the north and astride the Prime Meridian. The Krobo Adangbe are the dominant ethnic group.

As in the other case studies, the objectives here are: (a) to review the background and development of the scheme, (b) to examine its impact on local farmers in the context of other sources of influence, and (c) to look at some of the characteristics of these farmers in terms of agricultural innovation and production. The data will be used to test the hypotheses presented in the introductory chapter.

Background and Development of the Scheme

The Workers' Brigade was originally conceived in 1957 as the Builders' Brigade. It was designed to overcome unemployment through provision of jobs in local development projects. President Nkrumah called on Brigaders for support at political rallies and public gatherings in addition to their work on farms and in villages. The Brigaders came largely from the ranks of the jobless and included men of a wide range of ages and backgrounds.

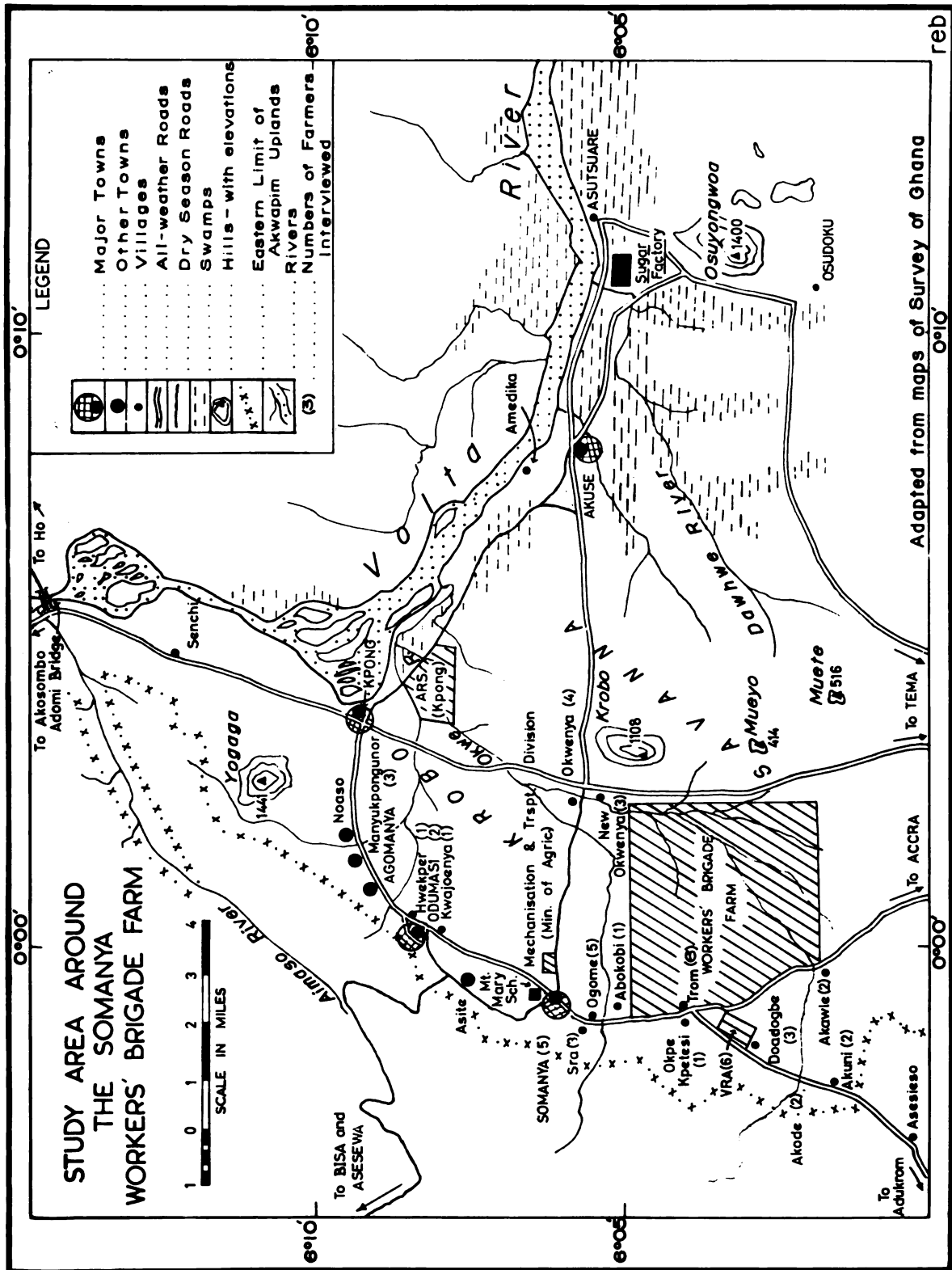


FIGURE 7

Background

The early activities of the Brigade were very much in contrast to its stated purposes. A 1957 White Paper presented these objectives:

The object of the Brigade, then will be to provide useful occupation to the unemployed who are unable to secure either formal apprenticeship or steady employment, to afford youth of the country an opportunity to give patriotic services in the development of the country and assist in the execution in the development projects, especially in the rural areas. . .¹

Activities were to include the building of schools, low cost housing, wells, dams, and feeder roads. In addition, provision was made to encourage some Brigaders to ". . . work on State Farms as well as frontier and agricultural settlements for production of commercial food crops. . ."² Agriculture became an increasingly important activity in subsequent years.

In September, 1959 a Ghanaian delegation paid a visit to Israel. There they were impressed by the philosophy and work of the Fighting Pioneering Youth groups called Nachal. They combined military preparedness with agricultural training and settlement. When the delegation returned to Ghana they recommended that the Brigade adopt a Nachal-type pattern.³ In 1960 a team of four Nachal officers from Israel was invited to come to Ghana to advise and guide the organization.⁴ Brigade camps at Ejura, Damongo, and Klukpo-Kpetoe were reorganized along Nachal lines. In addition a new camp was established at Somanya with Israeli technical assistance. Somanya was the only Workers' Brigade farm influenced from its inception by Israel.⁵ The Israelis were not integrated into the para-military structure at Somanya but acted as advisors.⁶ They were based in Accra not on the Farm.

The impact of the experts from Israel was largely in the technical rather than the ideological realm. From the perspective of the advisors

the Brigade lacked the sense of purpose and the spirit which marked collective farming in Israel.⁷ The reason for this may be that in Ghana the objective was to overcome unemployment and inadequate food supplies while in Israel the Nachal served real military and settlement functions.

In 1965 there were 47 Brigade Farms in Ghana with about 281,000 acres of land of which roughly only ten per cent was cleared and under cultivation.⁸ The total number of workers was 28,000. When the coup came in February, 1966, the Brigade was in debt to the tune of ₵200,000 (about \$280,000). The Kom Commission of Enquiry was constituted to investigate the malpractices of the Brigade and to make recommendations for its future.⁹ It was revealed that the debt resulted from (a) unauthorized payments to members of the Brigade, (b) unpaid for services rendered in cash and kind to politicians and other Brigaders, (c) inclusion of "ghost" Brigaders of fictitious names on payrolls, and (d) outright theft of Brigade cash and stores.¹⁰ Israeli personnel were gradually withdrawn, the last one leaving in July, 1966. The fate of the Brigade remained in limbo during the enquiry of the Kom Commission which eventually endorsed its reconstitution and resuscitation to conform to the original purposes.

To achieve a viable economic program the number of Brigaders was reduced to 5,000 by January, 1969.¹¹ The pay of another 2,000 workers was reduced. The continuance of the Brigade was made contingent upon the implementation of more effective accounting and auditing procedures, better marketing arrangements, upgraded recruitment methods, and elimination of all military elements in the Brigade. Emphasis was to be placed upon increased productivity.

Development of Somanya Workers' Brigade Farm

In 1969 the Somanya camp was the largest Workers' Brigade Farm in Ghana, encompassing an area of 7,936 acres (12.4 square miles). The land had been acquired in 1960 with the consent of the Konor Yilo Krobo and his Matse, the Chief of Trom (Figure 8). The area and the soils were surveyed in late 1961.¹² Unfortunately, the 1,000 acres chosen for mechanized cultivation prior to the soil survey publication bore little relationship to the area underlain by the fertile black clay Akuse series ideally suited to this purpose. See the contrast between the cleared/farmed area and Akuse soils in Figure 8.

Therefore, it is not suprising that Somanya found difficulty in producing high yeilds.¹³ In addition, soil mismanagement retarded development. In the process of demarcating plot boundaries, the humas topsoil, holding the most vital plant nutrients, were bulldozed up into high ridges edging each ten-acre section.

The mechanization of cultivation also progressed slowly. Eleven David Brown tractors plus implements were purchased from England to work the 1,000 cleared acres. But frequent breakdowns, partially due to mishandling by untrained tractor operators, scarcity of spare parts, and inadequate service facilities reduced efficiency.

In view of the Brigade employment objective, it is not surprising that in the first years the labor force at Somanya swelled to more than 200, or about one for every two acres actually brought under cultivation.¹⁴ Later the Regional Organizer working in cooperation with the Israelis pared the staff to 84. The highest level of operational efficiency at Somanya seems to have been reached around 1963.

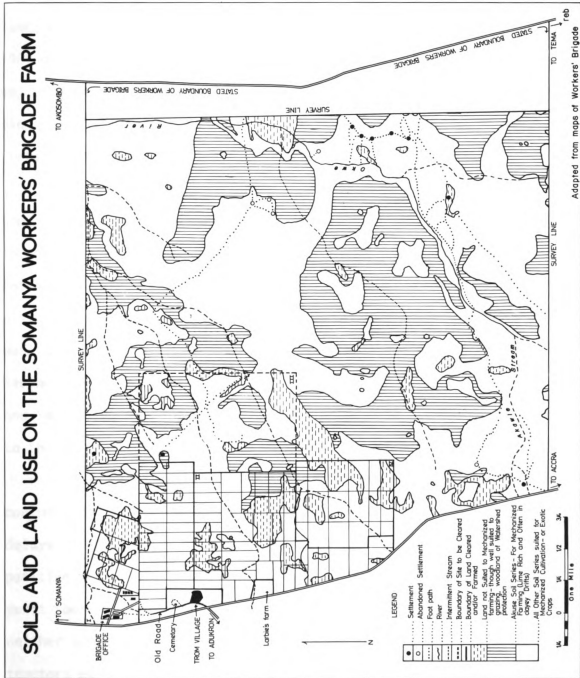


FIGURE 8

The Nachal philosophy did not encourage piece work. Workers were paid by the day. Incentives came only through the desire for promotion in rank, made conspicuous by the wearing of uniforms with insignia. From 1964 onward some 200 extra Brigaders were "dumped" on the Farm to provide employment for a reserve of political supporters.¹⁵ During the 1968 cropping seasons 322 employees were on the payroll, including 256 farmer-workers, 35 equipment operators, and 31 administrative staff.

By 1968 the accomplishments of the Somanya Brigade were modest. Some 428 acres were allocated to maize, cassava, sugar cane, groundnuts, tobacco, cowpeas and other vegetables. Yields during the 1968-1969 harvests were very low due to heavy rainfalls, poor drainage, and poor agronomic planning using existing resources (Table 18). Maize yields for example were three to five times less than other large-scale farms in the Southern Savanna. This pattern was slightly altered in 1969 by dropping tobacco and increasing sugar cane to over 100 acres. The latter was in response to the development of Asutsuare Sugar Factory to be discussed below.

Problems of management, mechanization and marketing continued to confound the efforts of the Somanya Brigade in 1969. Laborers experienced delays of up to three months in being paid. Others had wages halved as a punitive measure for past inefficiency. Management was unstable. In nine years there were nine different camp commanders, many apparently having neither administrative nor agricultural experience. Only a third of 12 tractors were operable in 1969. Spares were expensive and in short supply, and servicing took place in Accra rather than on the Farm. Brigade management considered mechanization problems to be the greatest hinderance to development. Very little Farm-produced maize and cassava was marketed

TABLE 18.--Crops, Acreages, and Yields on the Somanya Workers' Brigade Farm, 1968-1969a

Crops	Acreage	Yield/Acre	Problems
Maize	226	296 bags	Flooded plots and low potash
Cassava	80	Unharvested	Flooded plots
Groundnuts	53	62 bags (unshelled)	Flooded and destroyed plots
Sugar Cane	41	Unharvested	White ants and stemborers
Tobacco	18	171 lbs. (Grade 1) ^c	Flooded plots
Others ^b	10	Experimental and for seed multiplication	Cowpeas flooded

^aPlanting: February-April, 1968; record of harvests up to mid-March, 1969; Source: Workers' Brigade, Accra, 1969.

^bCowpeas (approximately 8.4 acres), yams, garden eggs, peppers.

^cGrade 2 yield: 267 lbs; grade 3 yeild: 356 lbs.

locally in Somanya and Agomanya. Since the demand for local food stuffs was considerable this was a source of irritation to many surrounding farmers. Originally the intention was to market locally, but thefts of produce forced Brigade Headquarters to control marketing directly in Accra. This meant limited integration of the Somanya Farm with the local community.

Impact on Local Farmers

The impact of the Somanya Workers' Brigade Farm will be reviewed in the context of the several change agents in the study area. Other change agents included: the State Sugar Products Corporation with its factory located near Asutsuare, the Ministry of Agriculture extension divisions, and the farmers themselves. Fifty local food farmers, including ten

part-time employees of the Workers' Brigade and ten sugar cooperative farmers, were interviewed concerning agricultural innovations and perceived sources of influence in adoption. Data on perceived sources of impact are presented in Table 19.

Only 36 innovations have been adopted by the sample. The average of 0.72 adoptions per farmer is the lowest innovation rate among the four case studies. No farmer credited the Workers' Brigade with major influence in adoption. Farmers attributed the primary influence to the extension services (Crop Production Division and Mechanization and Transport Division) of the Ministry of Agriculture based near Somanya (Figure 7). Tractor utilization was the area of greatest adoption with 16 per cent of the 50 farmers adopting because of Ministry influence, ten per cent because of sugar factory/cooperative influences, and four per cent because of secondary (other farmer) influences. Fertilizer use was adopted by 20 per cent of the sample, 14 per cent of which was again Ministry influenced. Adoption rates for improved seed and insecticide were low. Nineteen per cent of all adoptions were primarily influenced by the farmers themselves, 25 per cent by the sugar factory/cooperatives, and 56 per cent by the Ministry.

The Ministry's extension activities were having a relatively greater impact in the study area due in part to the introduction of a new program in mid-1968. With assistance from the United States Agency for International Development the Crop Production Division initiated an effort to "focus attention and concentrate available resources -- advisory manpower, seed, fertilizers, crop protectants and credit -- upon limited geographic areas with the greatest potential for growing maize, guinea corn, rice and

TABLE 19.--Perceived Major Sources of Influence in Adopting New Agricultural Practices by Fifty Farming in the Study Area, 1969

Item	Use of Tractor	Use of Fertilizer	Use of Improved seed	Use of Insecticide/weedicide
Total Interviewed	50	50	50	50
Number adopting	15	10	6	5
Percentages				
Major Source of Influence:				
Workers' Brigade	0	0	0	0
Sugar Factory/cooperatives	10	4	4	0
Ministry of Agriculture	16	14	4	6
Secondary Sources	4	2	4	4
Total Percentage Influenced	30	20	12	10
Percentage Not Influenced	70	80	88	90
Total Percentage	100	100	100	100

groundnuts."¹⁶ Somanya was one of six agricultural districts selected for the "Focus and Concentrate Programme". By April, 1969 41 farmers had been identified for special assistance in planning and production. Inputs were supposed to be made readily available on credit. Agricultural Assistants helped these demonstration farmers prepare farm plans based on current prices and market conditions. Two demonstration farmers were included in the sample. Farm plan data for the two are presented in Table 20. Actual acreage planted by the two farmers fell short of planned acreage which meant that the projected profits (net cash income) could not be achieved. Plan failures for these and other participating farmers were due to lack of credit sources, input inadequacy, and tractor scarcity.¹⁷ These problems were common to all farmers in the study area and put brakes on program development and general innovation adoption.

The State Sugar Products Corporation influenced the adoption of the use of the tractor, fertilizer and varieties of sugar cane (Table 19). The Corporation in 1969 was supplying its own extension services to some 500 members of 47 sugar cane cooperative societies roughly within a 20 mile radius of the sugar factory.¹⁸ Local farmers were particularly attracted to the sugar cooperatives because of credit opportunities. On rainfed land they were outproducing the Corporation's daily wage laborers who had irrigated plots.¹⁹

The Asutsuare factory was experiencing considerable difficulty in achieving the goals for which it was developed. Over the period 1964-1968 Ghana invested about N¢24,000,000 to reduce its dependence on foreign sugar. Sugar imports totaled 58,000 in 1966. The Asutsuare and Komenda²⁰ factories

TABLE 20.--Selected Farm Plan Data of Two Demonstration Farms in the Workers' Brigade Study Area, 1969

Farm	Planned Acre- age 1969		Actual Acreage 1969a	Estimates of Labor, Costs and In- come, Based on Farm Plan							
				Labor (Man/Days)	Costs (N¢)b			Total Cash Income	Net Cash Income		
	Family	Hired			Plant- ing Mater- ials	Equip- ment Labor	Totalb				
1	8.3	4.5	4.0	0	365	92.80	188.75	273.25	633.30	1499.00	865.70
2	9.1	3.5	2.0	124	33	76.24	113.75	135.50	360.49	1505.00	1144.51

^aField survey, March, 1969

^bCosts in "total" but not itemized are: capital depreciation, land rent, interest on loans, and transportation.

were constructed with Polish and Czechoslovakian assistance, respectively, to produce a combined annual total of 30,000 tons of sugar plus 500,000 gallons of akpeteshi, the popular Ghanaian alcoholic beverage. Managerial and operational difficulties during the 1966, 1967 and 1968 campaigns limited Asutsuare's production to less than 1,000 tons per annum.²¹ Production failures not only slowed down the development of the sugar industry but also reduced its impact upon surrounding farmers.

The impact of the Somanya Workers' Brigade upon local food farmers not employed by the Brigade was measured by use of the Impact Index, discussed in Chapter I. Table 21 shows that only 10.4 per cent of the 40 farmers were positively influenced, using Index criteria. Thirty-eight per cent of the sample had visited the scheme, 15 per cent had bought produce and ten per cent had observed a demonstration. No farmer had benefitted from scheme training or extension. Only 20 per cent indicated they believed that the scheme had had some benefit for them. The Somanya Workers' Brigade had the lowest Impact Index of the four case studies.²² Through 1969 the Brigade had initiated no extension program of its own among local farmers.

As described in the previous case study, the Impact Index has been subjected to correlation analysis using variables listed in Appendix B. For the 50 farmers in this case notable positive correlation coefficients were found between impact and the Education Index (.558), farmers whose major source of income came from wages (.658); and negative correlations

TABLE 21.--Impact Index: Somanya Workers' Brigade Farm, 1969^a

Categories	Percentages
Farmer Experience	
1. Bought food products from scheme	15
2. Visited scheme at least once	38
3. Observed scheme "demonstration" ^b	10
4. Received training from scheme ^c	0
5. Received extension program of scheme ^d	0
6. Been paid employees of scheme in the past	0
Farmer Perception	
7. Perceived their innovation adoption as influenced by scheme	0
8. Perceived that they had benefitted from scheme	20
Mean Percentage	10.4

^aFarmer sample: N=40

^bIncludes passive observation of trial plots, scheme activities, "open day" (agricultural show), etc.

^cIncludes any type and length of active training at the scheme in agricultural practices, e.g. fertilizer application.

^dIncludes fertilizer, seeds, plant protectants, advice on particular farm problems, new techniques, credits, etc.

were found with age (-.332), years as farmer (-.350), and years resident in study area (-.430).

The scheme impact hypothesis posits that in the micro-spatial context of the case studies there would be no "neighborhood effect", that is, no inverse relationship in distance between farmer and scheme. There is an unexpectedly high inverse correlation (-.362), and, thus, the hypothesis is not supported.

Local Food Farmer Characteristics, Production and Innovation

The patterns of personal and household characteristics of local food farmers, the nature and problems of production, and agricultural innovation will be examined in this section.

Characteristics

As in the other case studies we are testing the definition of the so-called "traditional farmer" by reviewing the characteristics of local food farmers. In the Workers' Brigade Study area the dominant ethnic group, the Krobo Adangbe, have a history of agricultural success. In the nineteenth century the Manya Krobo developed the huza company system to exploit cocoa production in the forests beyond the Akwapim Ridge (Figure 7).²³ Directed by the Konors of Odumasi they succeeded in increasing Krobo holdings in the rich Cocoa Belt by seeding out closely-knit companies of cocoa farmers. The Krobo contribution to the Ghanaian cocoa industry has been considerable. Therefore, in this area the traditional farmer has always been looked upon as a productive farmer.

TABLE 22.--Factor Loadings Defining Traditional Farmer, Second Case Study (N=50)

Characteristics			Factor 1	Factor 2
Traditional Farmer				
(a) Domestic Characteristics				
(1)	Age	1	.4488	-.4356
(2)	Years Resident	9	.2680	-.3515
(3)	Years Farmer	10	.4070	-.5351
(4)	Household Size	13	.2790	-.3808
(5)	Number Wives	14	.2461	-.2497
(6)	Number Children	16	.3596	-.4472
(7)	Formal Education	51	.0504	.6127
(8)	Stool Land Tenure	83	.3327	-.0355
(b) Productivity Characteristics				
(1)	Acres Savanna Crops	31	.4850	.2708
(2)	Acres Cassava	32	.5116	-.0666
(3)	Acres Tomatoes	36	.1454	.0075
(4)	Acres Vegetables	37	.2108	.0937
(c)	Innovation	50	.7931	.2568

The ethnicity of the study area is mixed reflective of the immigration of non-Krobo into the study area. Of the 50 farmers interviewed two-thirds (68 per cent) were Krobo, one-fifth (20 per cent) Ewe, and the balance (12 per cent) other. Twelve interviewee villages were Krobo, five were non-Krobo. Table 23 presents the population characteristics of interviewees' villages in the study area. See Figure 7. Most villages were over 300 and in 1960 had grown considerably over the intercensal period from 1948. Krobo and non-Krobo farmers manifested similar characteristics, with the expected exception that the Krobo had greater years of residence and farming experience in the study area. Population characteristics of the sample by ethnicity are shown in Table 24.

The typical farmer in the sample of 50 was 45.9 years old, had lived in his village for 27.7 years, and had 21.8 years of farming experience. Eighty-six per cent owned or lived in their own compounds; 14 per cent lived in houses. One-fifth (20 per cent) of the home buildings were constructed of cement blocks and the rest were of swish (mud). The typical household was composed of 10.2 persons including the farmer, an average of 1.3 wives and 6.8 living children, of whom 3.9 lived at home. The average number of school age children (6 years and older) in these households was 5.1 of whom 80 per cent had received some formal education. Among ten Ewe informants 100 per cent of their children had schooling. Syncretism was commonly practiced in the study area, however, 36 per cent of the sample were nominally animistic, 28 per cent Presbyterian, 12 per cent Methodist, and 24 per cent other religions.

TABLE 23.--Population Characteristics of the Villages of the Workers' Brigade Study Area

Village or Other Location	Stoola	No. Inter-viewed	1960 Population ^b	1948 Population ^b
Akawie ^c	(stranger)	2	37	41
Akuni	Ewe	2	nd	nd
Akode	Ewe	2	211	958 ^d
Doadagbe	Ewe	3	54	0
Volta Resettlement Authority ^c	(stranger)	6	0	0
Trom	Yilo Krobo	6	492	88
Okpe Kpetesi	Yilo Krobo	1	582	72
Abokobi	Yilo Krobo	1	926	179
Ogome	Yilo Krobo	5	919	156
Sra	Yilo Krobo	3	2,043	515
Somanya	Yilo Krobo	5	9,258	2,485
New Okwenya ^c	Yilo Krobo	3	0	0
Okwenya ^e	Manya Krobo	4	329	135
Odumasi	Manya Krobo	2	4,519)	3,354
Hwekper	Manya Krobo	1	)	213
Kwajoenya	Manya Krobo	1	)	nd
Manyukpongonor	Manya Krobo	3	1,131	1,218
Total		50		

^aSource: field data. Also refer to Figure 7.

^bSource: Ghana, Census of Population, 1960, I and II, op. cit., Footnote 4, Chapter III.

^cVolta Resettlement Authority stranger village is called "Somanya New Town;" constructed of cement blocks in the 1960's, it was to provide homes for Krobos displaced by the flooding of Lake Volta behind Akosombo Dam. However, few Krobos lived here. It was used by various peoples as temporary housing. Akwale's population consisted of Gurma and other northern tribes.

^dFour villages were encompassed in the 1948 count. Akode showed no appreciable change in population from 1948 to 1960.

^eSince 1960 New Okwenya has been formed by a dissident element from Okwenya. Originally all were from Old Ningo on the coast. The New Okwenya faction sides with the Yilo Krobo on the land tenure issue, while Okwenya remains in the Manya Krobo camp.

TABLE 24.--Population Characteristics of the Sample by Ethnicity, in the Workers' Brigade Study Area, 1969

Ethnic Group	Years Resident	Years Farming Experience	No. in Household	No. of Wives	No. of Children	No. of School Age Children	Per cent Children Educated	No. of Farms
Krobo (34)	31.8	23.6	10.5	1.3	7.0	5.8	77.9	1.9
Non-Krobo (16)	19.7	18.3	9.6	1.4	6.4	4.2	88.6	1.6
Average for Total (50)	27.7	21.8	10.2	1.3	6.8	5.1	80.3	1.8

To obtain a definition of the "traditional farmer" data on the domestic, productivity and innovation characteristics of the 50 farmers have been subjected to factor analysis. See Table 22. The process of analysis was discussed in the preceeding case. The second hypothesis postulates that the traditional farmer can be defined by common domestic characteristics but not necessarily in terms of low productivity or lack of innovation. Factor 1 in Table 22 demonstrates a high degree of association among domestic characteristics, as well as reasonably strong measures of productivity (savanna and cassava acreages) and a high intensity score for innovation. Factor 2 is presented for purposes of contrast. Therefore, the case study data support the second hypothesis.

Production and Problems

The primary crops of the study area are cassava, maize, yams, peppers, tomatoes, okro and other vegetables. Table 25 presents data on the savanna food crops and acreages of the study area sample. Eighty-eight per cent of the farmers were raising cassava, 62 per cent maize, and 60 per cent vegetables. Twelve per cent were raising sugar cane. Nearly half (48 per cent) practiced interplantations of crops, especially with cassava.

The total acreage of the 50 farmers was 192, a mean of 4.8 acres and median of 3.1 acres, ranging in size from 1/2 to 100 1/2 acres. Calculation of acreages was based on interviews not chain and compass measurement though the acreages of two study area farms were satisfactorily varified by pacing off distances in the field. Farmer estimates were

TABLE 25.--Savanna Crops and Acreages for Fifty Farmers in the Workers' Brigade Study Area, 1969a

Crop	No. of farmers	Acreages
Cassava	44 (20)	75
Maize	31 (15)	56
Vegetables ^b	30 (6)	38
Yams	8 (2)	14
Other ^c	7 (3)	9
Total	50 (24)	192

^aField data collected February-March, 1969. Numbers in parentheses represent farmers interplanting this crop with other crops.

^bVegetables include: peppers (16), tomatoes (10), okro (9), garden eggs (3), onions (1), and sweet potatoes (1).

^cOther crops are: plantains, groundnuts, rice, pineapples, oil palm, cocoyams.

Probably suspect since the traditional huza system of the Krobo did not employ areal measures. On the other hand, the areal concept of acre was known to most informants. This was presumably because of the existence of telegraph poles spaced roughly 70 feet apart, which distance squared equals an acre. Several interviewees said they used 12-fathom ropes (about 70 feet in length) to lay out square "poles" for farming. The use of tractors in the study area also tended to reinforce thinking in terms of areal acre measurements.

As in other parts of the Southern Savanna the pattern of labor utilization was in the state of flux. Whereas the use of hired labor was uncommon before 1950,²⁴ 70 per cent of the sample were employing it

in 1969. This was primarily to overcome labor bottlenecks during weeding periods. Labor distribution was based both on the spatial (acres) and temporal (hours, days) measurements. Rates ranged from N¢4.00 to N¢10.00 per acre, or N¢0.50 to N¢0.80 per day, depending upon the difficulty of the work. Hired laborers were commonly Northerners living in nearby stranger villages. Labor bottlenecks during the planting season were also overcome by use of hired labor, but as noted earlier tractors were used by 30 per cent of sample for this same purpose, i.e. land preparation prior to cultivation.

The Krobo observed a land taboo. The Manya tended to rest the land (prohibit the use of machete or hoe for weeding or planting) on Thursday and Sundays while the Yilo observed Monday and Friday taboos. Ewe and other "strangers" living among the Yilo also followed the Yilo pattern. The taboo was observed by 76 per cent of the 50 farmers. In contrast, among the ten sugar cane cooperative members interviewed, none observed the local taboo for commercial cane production, though two did observe it for domestic food production.

Krobo land tenure patterns are evolving. In 1969 land sales and purchases were becoming more common but have existed for over a century according to Pogucki. Among the sample allodial rights in land were held by both kinship groups and individuals. Twenty-two Krobo (64 per cent) farmed family (kinship group) land, eight (24 per cent) had rented or leased land from other Krobo (excluding tree rights), and four (12 per cent) had purchased land. Thirteen non-Krobo had received permission from the Krobo divisional Matse (chiefs) to rent or buy Krobo land.

Three non-Krobo lived on Volta Resettlement Area land owned by the government. The Krobo social structure is patrilineal, patrilocal, patriarchal and theocratic in origin. The Konor Yilo Krobo and Konor Many Krobo control land tenure through their divisional Matse. The land tenure situation appeared to be quite fluid with increasing acceptability of land sale and ownership among the Krobo.

Major sources of capital among the sample of 50 farmers were sale of crops (32 per cent) and income from job wages (32 per cent). Table 26 displays the major sources of capital of food farmers, food farmers who were also members of sugar cooperatives, and food farmers employed by the Workers' Brigade. It is interesting to observe that the exclusively food farmers group was primarily dependent upon sale of crops (46 per cent) for capital, cooperative members upon bank loans from the Agricultural Development Bank (60 per cent), and Workers' Brigade farmers upon job wages (100 per cent).

The major problems among farmers of the study area were inadequate credit, diseases and pests (white ants, insects, rodents), and scarcity of labor. An inventory of the perceived problems of the sample is presented in Table 27. The patterns of problems of the food farmer, cooperative member, and Workers' Brigade groups were generally similar, with the exception that for cooperative members the major difficulty was considered to be inadequate management of the sugar factory and related bad handling of marketing and transport. The leading first-mentioned problem overall was lack of credit.

TABLE 26.--Major Sources of Capital for Fifty Farmers in the Workers' Brigade Study Area, 1969

Major Source	Food Farmers		Food Farmers, also Cooperative Members		Food Farmers Employed by Workers' Brigade		Total	
	No.	%	No.	%	No.	%	No.	%
Sale of Crops	14	46	2	20	0	0	16	32
Personal Loans	10	33	0	0	0	0	10	20
Bank Loans	2	7	6	60	0	0	8	16
Job Wages	4	14	2	20	10	100	16	32
Total	30	100	10	100	10	100	50	100

Innovation

Among the sample the average number of innovations was 0.72. Thirty-six adoptions were made by 24 farmers, the rest adopted no innovations. In the following tables innovations has been compared with indices of travel experience (Table 28), radio accessibility (Table 29), extension service contact (Table 30) and formal education (Table 31).

The third hypothesis assumes that innovation among farmers is directly related to measures of farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience, and access to radios. In this case study there are direct correlations between innovation and all the above variables except scheme impact. However, though productivity (.352) and travel (.305) correlations stand relatively higher, none of the coefficients is high. Therefore,

TABLE 27.--Inventory of Perceived Problems of Peasant Farmers, Cooperative Members and Workers' Brigade Employees in the Study Area, 1969^a

Problem	Food Farmers	Food Farmers, also Cooperative Members	Food Farmers Employed by Workers' Brigade	Totals
1. Credit/money	26 (20)	4 (2)	6 (3)	36 (25)
2. Diseases/ white ants/ insects/ rodents	16 (4)	3 (1)	5 (1)	24 (6)
3. Labor supply	7 (0)	1 (0)	5 (2)	13 (2)
4. Management of factory/mar- keting/ transport	1 (0)	7 (4)	1 (0)	9 (4)
5. Tractor avail- ability	2 (1)	2 (1)	4 (2)	8 (4)
6. Rainfall/vil- lage water supply	2 (0)	1 (0)	2 (1)	5 (1)
7. Fertilizer availability	1 (0)	0 (0)	3 (0)	4 (0)
8. Others ^b	5 (2)	1 (0)	1 (0)	7 (2)

^aNumbers in parentheses represent the number of people who said that this was their most serious problem. One or more answers were possible for each interviewee.

^bInclude: land no good (2), no seed (1), family too large (1), maize costs too much (1), fire (1), corrupt cooperative leaders (1).

TABLE 28.--Travel Experience and Adoption of Innovations Among Study Area Food Farmers, 1969

Travel Experience ^a	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
1 (most experienced)	0	0	1	0	0	1	2	2.00
2	0	1	1	0	0	2	4	1.50
3	2	5	0	1	0	8	16	1.00
4	8	3	0	1	0	12	24	0.50
5	9	4	6	0	0	19	38	0.84
6 (least experienced)	7	1	0	0	0	8	16	0.13
Totals	26	14	8	2	0	50	100	0.72

^a1=travel to another region, Kumasi, Takoradi, Tamale, many other areas of Ghana and abroad; 2=to another region, Kumasi, Takoradi, Tamale and many other areas of Ghana; 3=to another region, Kumasi, Takoradi, and some other areas of Ghana; 4=to another region, Kumasi, and some other local places; 5=to another region and a few other local places; 6=only traveled in this region.

TABLE 29.--Radio Accessibility and Adoption of Innovations Among Study Area Food Farmers, 1969

Status	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Have radio	6	4	5	1	0	16	32	1.06
Have access	11	5	2	1	0	19	38	0.63
Have no radio and no access	9	5	1	0	0	15	30	0.47
Totals	26	14	8	2	0	50	100	0.72

TABLE 30.--Extension Services Contact and Adoption of Innovations
Among Study Area Food Farmers, 1969

Extension Service Contact	Number of Inno- vations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Food Farmers								
Contact	7	9	2	0	0	18	36	0.72
No contact	9	2	1	0	0	12	24	0.25
Total Food Farmers	16	11	3	0	0	30	60	
Food Farmers, also Cooperative Members								
Contact	2	2	2	1	0	7	14	1.29
No contact	0	0	2	1	0	3	6	2.33
Total Co-op Members	2	2	4	2	0	10	20	
Food Farmers Employed by Workers' Brigade								
Contact	1	0	0	0	0	1	2	0.00
No contact	7	1	1	0	0	9	18	0.33
Total Brigade Employees	8	1	1	0	0	10	20	
Totals								
Contact	10	11	4	1	0	26	52	0.85
No contact	16	3	4	1	0	24	48	0.58
Totals	26	14	8	2	0	50	100	0.72

TABLE 31.--Formal Education and Adoption of Innovations Among Study Area Food Farmers, 1969

Formal Education Attempted	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
None	11	8	1	1	0	21	42	0.62
Primary	3	1	0	0	0	4	8	0.25
Middle	10	4	5	1	0	20	40	0.85
Advanced ^a	2	1	2	0	0	5	10	1.00
Totals	26	14	8	2	0	50	100	0.72

^aIncludes: one informant with special/commercial education and four with secondary school education.

the case study data are inconclusive in support of the innovative farmer hypothesis.

The fourth hypothesis postulates that formal education is not related to agricultural productivity or innovation.

The formal education hypothesis is supported by the case study data. The Education Index shows no strength of correlation with productivity (.092) or innovation (.149).

Summary

The second case study has focused on the Somanya Workers' Brigade Farm which was aided in its development by Israeli technical assistance. The Brigade was formed in 1957 under Nkrumah to overcome unemployment through provision of jobs in local development projects

as well as provide a body of supporters for political activities. Through mid-1969 the Somanya Farm had made only modest progress toward the economic production of local food crops, with a miniscule 428 acres producing low yields in its best year (1968). Problems of management, mechanization and marketing continued to plague the scheme at the time of writing.

The impact of the Brigade Farm on local food farmers was the lowest among the four case studies. The Impact Index was only 10.4 per cent. Greater influence in innovation adoption came from the extension services of the Ministry of Agriculture and the sugar factory and cooperatives of the State Sugar Products Corporation. A factor analysis of the domestic characteristics of the local farmer provided a definition of the so-called "traditional farmer". A survey of food production showed the typical study area farmer grew a median of 3.1 acres, primarily cassava, maize and vegetables. Seventy per cent of the sample employed hired labor, largely for weeding, and 30 per cent used the tractor, primarily for land preparation. The land tenure situation was fluid with an apparent increased frequency of land sale and purchase. Major sources of capital were sale of crops and job wages (32 per cent each). The greatest perceived problems were inadequate credit, diseases and pests, and scarcity of labor. An average of only 0.72 innovations had been adopted.

The traditional farmer and formal education hypotheses are supported by the case study data: the scheme impact hypothesis is not

supported by the data; and the innovative farmer hypothesis is only weakly supported and is, therefore, inconclusive.

FOOTNOTES--CHAPTER IV

¹Ghana, White Paper on the Builders' Brigade Act, 1957 (Accra: State Publishing Corporation for Ministry of Information, 1957), p. 1.

²Ibid.

³Mordechai Kreinin, Israel and Africa, A Study in Technical Cooperation (New York: Praeger, 1964), p. 100. It should be emphasized that the Nachal is distinct from the more famous Kibbutz and Moshav collective settlements which have no military function. In this connection see Ghana, Minority Report of the Commission Appointed to Enquire into the Functions, Operation and Administration of the Workers' Brigade (Accra: State Publishing Corporation for Ministry of Information, 1967), p. 3.

⁴Interview with Amos Ganor, First Secretary, Embassy of Israel, Accra, May 7, 1969. It seems likely that the Israeli example influenced the Brigade many years before actual Ghanaian-Israeli contact. See Ghana, White Paper on the Report of the Commission of Enquiry into the Functions, Operation and Administration of the Workers' Brigade, 1968 (No. 8; Accra: State Publishing Corporation, 1968), p. 3.

⁵Interviews with S. O. Adjin-Tettey, Acting Principal Agricultural Officer, Workers' Brigade National Headquarters, Accra, 25 January, 1969, and 9 May, 1969. I would like to extend my appreciation to Mr. Adjin-Tettey for his support and his permission to conduct research at Somanya and for the cooperation of the Farm Staff.

⁶Interview with William Baffo, former Regional Organizer for the Workers' Brigade from 1962 to 1964 and a key figure in the development of the Somanya camp, Accra, 7 May, 1969. At the time of the interview Mr. Baffo was an officer in the Cocoa Division of the Ministry of Agriculture.

⁷Kreinin, op. cit., p. 101, Footnote 3.

⁸Ghana, Ministry of Agriculture, Division of Economics and Statistics, Statistics of Large-Scale, Specialized, Institutional, Cooperative, and Young Farmers' League Farming and Service Stations, 1965 ("Agricultural Census"), II/C, op. cit., Footnote 8, Chapter III.

⁹Ghana, The Minority Report, op. cit., Footnote 3; and Ghana, The Majority Report of the Commission Appointed to Enquire into the Functions, Operation and Administration of the Workers' Brigade (Accra: State Publishing Corporation for Ministry of Information, 1957).

¹⁰Ghana, White Paper on the Report of the Commission of Enquiry into the Functions, Operations and Administration of the Workers' Brigade, op. cit., pp. 4-5, Footnote 4.

¹¹Sunday Mirror, Accra, 26 January, 1969.

¹²J. A. Mensah-Ansah, Report on the Soils of the Somanya Workers' Brigade Mechanized Farm, Technical Report 55 (Kumasi: Agricultural Research Institute, 1963). This survey was completed in December, 1961. Apparently, few copies were produced. At the time of this author's research in 1969 no copy was in the hands of farm management at Somanya.

¹³For example in its first years the Brigade got one bag of cowpeas per acre as compared with 25 bags per acre in other parts of Ghana. Interview, William Baffo, op. cit., Footnote 6.

¹⁴Interview with E. R. Baah, Camp Commander, Somanya Workers' Brigade, 1 March, 1969.

¹⁵Interview, William Baffo, op. cit., Footnote 6.

¹⁶Files of the Somanya Crop Production Division, dated September, 1968; expanded at interviews with Agricultural Officer J. K. Wiredu, Somanya, numerous times in March, 1969; see also Ray Johnson, "Focus and Concentrate Programme" (Accra: United States Agency for International Development, 1966). (Mimeographed, 10 p.)

¹⁷Interview with the U.S.A.I.D. Coordinator of the "Focus and Concentrate Programme," Dr. Fred Marti, who indicated major aspects of the project were subject to evaluation and revision, 28 May, 1969. See also United States Agency for International Development, "Procedures for Preparing a Farm Plan" (Accra: May, 1969). (Mimeographed).

¹⁸State Sugar Products Corporation, "Acreage in Respect of Each of the Sugar Cane Cooperative and Individual Farms," Asutsuare, 1969 (Mimeographed, 3 p); and interviews with C. Coussey, Manager, State Sugar Products Corporation Factory, Asutsuare, 28 and 29 January, 1969.

¹⁹According to the Principal Agriculturalist of the Corporation; also see Reusse, op. cit., p. 56, Footnote 15, Chapter III.

²⁰The Komenda mill is located on the Gulf of Guinea between Takoradi and Cape Coast. Visited 19 November, 1968, at which time representatives of both Pakistani and Nigerian management were interviewed.

²¹Reusse, op. cit., p. 51, Footnote 15, Chapter III.

²²This analysis of the Somanya Brigade's impact does not accord at all with that provided in Kreinin, op. cit., p. 102, Footnote 3. Kreinin, on the basis of no documented evidence, describes the scheme in the early 1960's as a "show place" with considerable "demonstration effect" upon local farmers.

²³Works on Krobo agriculture include: W. J. Field, "The Agricultural System of the Manya-Krobo of the Gold Coast," Africa, XIV, No. 2 (April, 1943), 54-65; Polly Hill, op. cit., Footnote 5, Chapter I; John M. Hunter, "Cocoa Migrations and Patterns of Land Ownership in the Densu Valley near Suhum, Ghana," Transactions, Institute of British Geographers, No. 33 (December, 1963), 61-87; W. Manshard, "Agrarische Organisationen foe Men fur den Binnenmarkt' bestimmter Kulturen im Waldgurtel Ghanas (Huza System of the Krobo)," Erdkunde, II, No. 3 (1957), 215-32; Seth LaAnyane, "A Strip System of Farming in Ghana," The Economic Bulletin of Ghana, IV, No. 1 (January, 1960), 6-12; and Nene Azzu Mate Kole, "The Historical Background of Krobo Customs," Transactions of the Gold Coast and Togoland Historical Society, I, Part 4 (1955), 133-40.

²⁴R. J. H. Pogucki, Gold Coast (Ghana) Land Tenure in Adangme Customary Law (2nd ed.; Accra: 1968), p. 8.

CHAPTER V

THE THIRD CASE STUDY; THE NUNGUA AGRICULTURAL RESEARCH STATION AND LOCAL FARMERS

The third case study focuses on the Agricultural Research Station of the University of Ghana, located at Nungua, and local food farmers. The scheme is situated about five miles from the Gulf of Guinea, and about the same distance from the outskirts of Accra and Tema (Figure 9). Despite its proximity to the most urbanized area of Ghana, the Agricultural Research Station itself is in sparsely-settled savanna. In the surrounds there are small villages without piped water, electricity or modern roads, where one can see the lights of Accra by night and hear the din by day. The dominant ethnic group here is the Ga.

Again the objectives of this study, as with the others, are: (a) to review the background and development of the scheme, (b) to examine its impact on local farmers in the context of other sources of influence, and (c) to look at some of the characteristics of these farmers in terms of agricultural innovation and production. The data will be used to test the hypotheses presented in the introductory chapter.

Background and Development of the Scheme

The Agricultural Research Station was established in 1952, earlier than any of the other case study schemes and five years

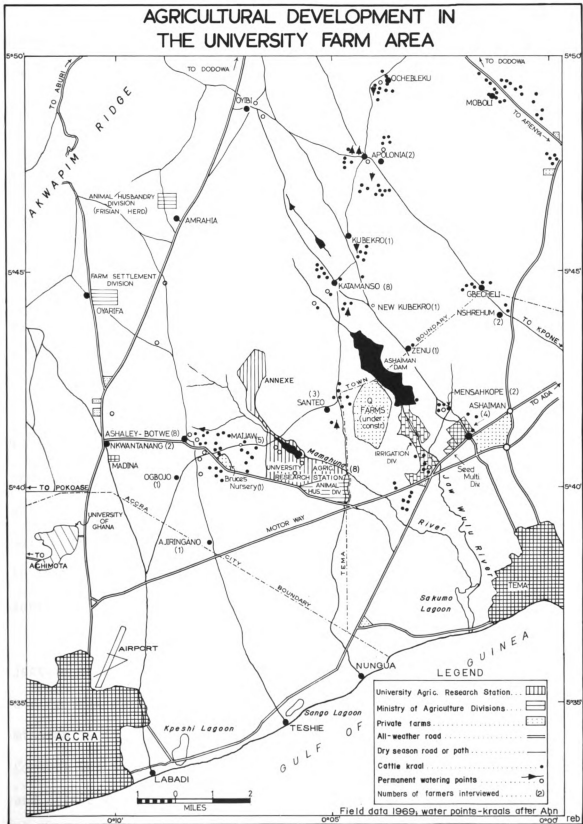


FIGURE 9

before Ghanaian independence. Its aims were to initiate research into the many unsolved mysteries of tropical agriculture and to provide professional training for Ghanaians in the agricultural sciences.¹

Background

The Station at Nungua was set up to tackle a myriad of research problems, since very little was known about the climate, vegetation, soils and general agronomic potential of the Accra Plains. Investigation was undertaken on these topics as well as irrigation potential, fertilizer responses, exotic crop and animal adaptability to the tropics, diseases, mechanized farming, and management practices for land and livestock.²

At its foundation in 1952 the Agricultural Research Station at Nungua received G £1,000,000 (\$2,800,000) ". . .for use on capital expenditure connected with the teaching of Agriculture and the associated sciences. . ." This grant was made to the University College of the Gold Coast from colonial government resources and allowed the Station to initiate a program ". . .for educational and experimental work in arable agriculture, pasture management and animal husbandry."³

In addition, extension work was identified as an important objective of the Station. The marriage of basic research to the local environment was recognized as important for ". . .the early transmission of new ideas and plant materials to the working farmer. . ."⁴ Contact was made by the first Station management with local food farmers and cattle rearers.⁵ This began with the purchase of about 992 acres of land from the Ga of the Nungua stool (lineage) in 1952 and continued

with the acquisition of livestock from local cattlement in Katamanso and Maijaw (Figure 9). This attempt to integrate scheme activities with the local environment stands in contrast to the approaches of the State Farm and Workers' Brigade.

At the outset the Station concentrated research on both crops and livestock. Even irrigation research was undertaken until 1954 when this work was largely transferred to the University's Agricultural Irrigation Research Station at Kpong. At Nungua experiments were started on irrigated bananas, oil palm and cocoa, and the rainfed production of oranges, cassava, beans, pigeon peas, pineapples, a range of vegetables, millet and rice. Gradually these crops were replaced by silage-feed crops such as maize, groundnuts, and sorghum as the Station moved toward livestock research.

Animal science studies got underway during 1953-55 with the purchase of about 30 head of local cattle. Efforts were made to fence pastures (for the first time on the Accra Plains), refine and improve pasture management techniques, and acquire more livestock. Local varieties of sheep, pigs, and some poultry were purchased to initiate programs of cross-breeding with imported animals. Blackheaded Persian and Wiltshire Horn sheep were introduced generating a new local breed called the Black Headed Nungua. English-bred Large White pigs were also brought in. Plans were laid for the importation of Jersey semen to upgrade the milk production of local breeds. Growing numbers of livestock made mandatory a program of animal health research which began. In addition, a number of socio-economic studies of local cattle rearing by the Ga and Fulani were started.⁶

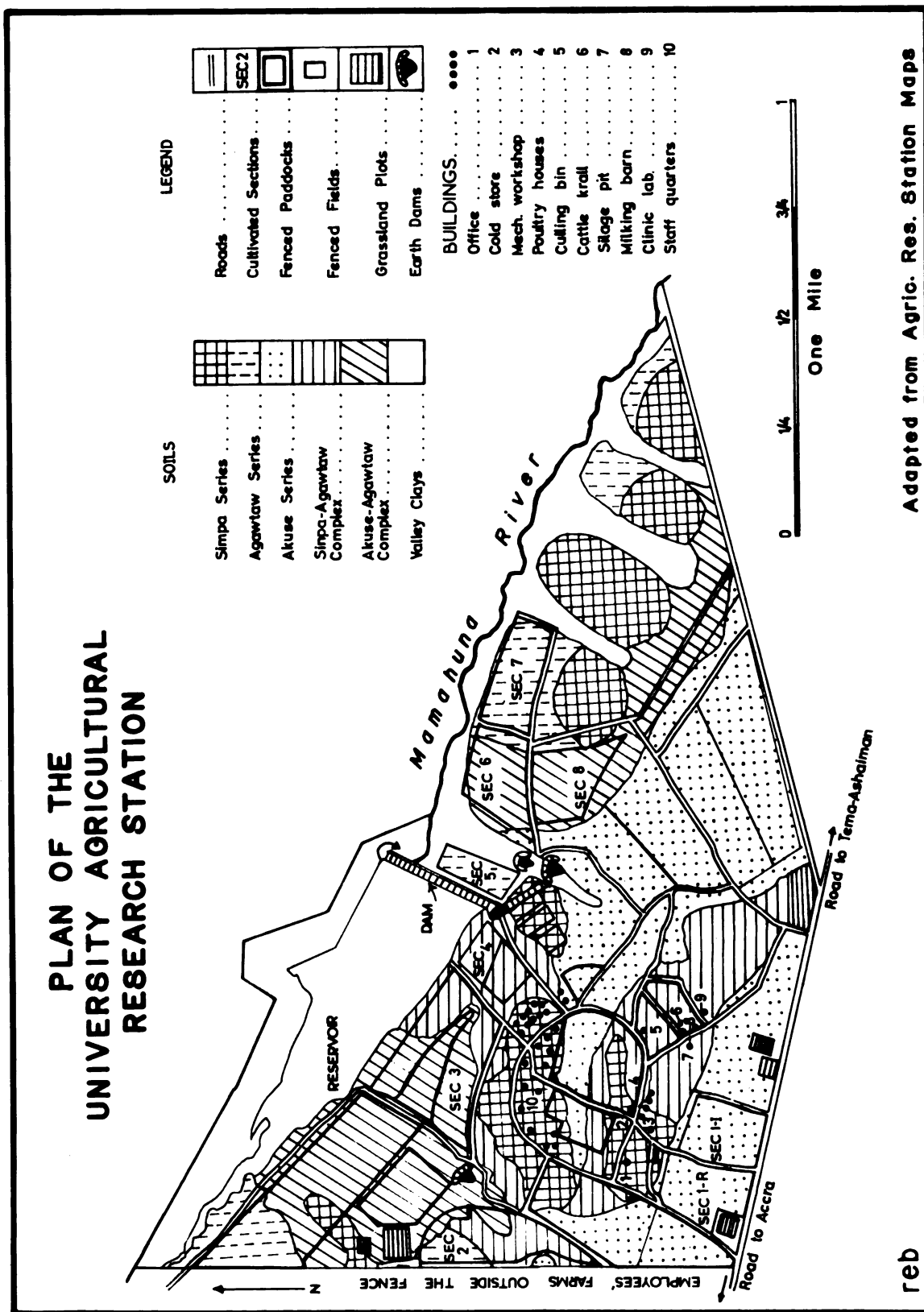
Development of the Agricultural Research Station

Aside from the experiments, there were visible signs of change during the early years. Most important among these were the fencing of 1,000 acres and the construction of a dam and 400 acre-foot reservoir (Figure 10). The farm layout was designed to parallel soil distribution. Most buildings were erected on the well-drained sandy Simpa and Simpa-Agawtaw Series. Major soil groups and 1968 cropping patterns by section are given in Table 32.

Because of the importance of cattle feeds, grassland protection plots were established in 1956 to assess changes in savanna vegetation, including browse plants. When the plots were reanalyzed in 1966, it was found that woody plants, especially Verronia senegalensis, were rapidly replacing the grasslands that continued to dominate annually burned lands.⁷

In 1958 an artificial insemination program began using imported deep-frozen Jersey semen. The objective was to upgrade the milk-producing ability of the common local Zebu breed known as Sanga. The first generation Jersey-Sanga crosses were found to be superior milk producers to all subsequent forward and back-crosses. Ten or more pounds of milk per day were obtained, about ten times the production of local Sanga.⁸

In 1961 pasturage was expanded from 220 to 968 acres with the purchase of the Station Annexe (Figure 9).⁹ This attenuated northwest projection of the original farm was later developed on a commercial basis as an independent unit.¹⁰ By 1969 the Station was almost completely



Adapted from Agric. Res. Station Maps

FIGURE 10

TABLE 32.--Acreage Cropped in 1968 and Soil Type by Sections--Agricultural Research Station (Nungua)

Section	Maize	Sorghum	Soil Series and Complese ^{a,b,c}
1	25.07	. .	Akuse
2	17.43	. .	Agawtaw, Simpa-Agawtaw
3	29.03	. .	Simpa-Agawtaw, Akuse-Agawtaw
4	5.92	. .	Akuse-Agawtaw
5	16.57	. .	Simpa, Agawtaw
6	. .	12.92	Akuse-Agawtaw
7	. .	. .	Agawtaw
8	. .	19.39	Akuse-Agawtaw
Subtotals	94.02	32.31	
Total		126.33	

^aAkuse Series: composed of three-feet-thick black and dark-brown clays; naturally fertile but either very sticky in the presence of water or brick-hard in its absence; require mechanization with heavy implements, and drainage system; but mechanization is often difficult.

^bSimpa Series: composed of six inches to three feet of sand or sandy loam with some clay impregnations; usually well drained; easily eroded.

^cAgawtaw Series: occurs on lower slopes; composed of four to six inches of gray fine sand to fine sandy loam over impermeable sandy clay; easily eroded; but often well suited to mechanization. Source: Files of the Agricultural Research Station (Nungua), passim.

devoted to research on livestock. Crop production consisted solely of maize and sorghum for silage-feed, as demonstrated in the Table 32. Animal populations increased to 500 head of cattle, 250 sheep, 120 goats, 60 pigs, and almost 20,000 fowls. Research on livestock included both beef and dairy cattle breeding, sheep and goat improvement, and investigations into pasture improvement. Unfortunately, economic pressures within the Ghanaian economy had forced a reduction of the Station recurrent budget to about N¢100,000 per year in the late 1960's.¹¹ The research and extension capacity of the Station were seriously challenged as a result.

Despite limited finances extension work continued to be undertaken by the Station through the late 1960's. Local cattlemen were the major beneficiaries, especially those in the Katamanso and Ashaley Botwe areas (Figure 9). Free or inexpensive services were provided including service bulls to upgrade local breeds. Additionally, prior to 1960 the Station provided tick spray and a variety of other drugs to maintain the health of local herds.¹² After 1960 cattlement were largely dependent upon the Animal Health Division and commercial establishments for animal medical supplies. Some cattlemen even bought bulls from the Station. Eight animals were sold in Ashaley Botwe and Katamanso in 1966-67 and four in 1968-69.

The Station was also influencing the livestock watering practices of local cattlement though this was not an explicit segment of the extension program. Prior to the building of the Station Dam in 1952-53, permanent watering points did not exist in the study area nor invirtually

any other part of the Southern Savanna. Formerly, because of seasonal shortages transhumance was practiced by cattle rearers in search of water and pasturage. Thirteen dams existed in the study area in 1969 as shown in Figure 9. The impetus for these was the station dam in large measure. Speaking to this point in 1965 Ahn Stated:

Although the University of Ghana Agricultural Research Station has not been directly involved in the construction of most of these new dams outside the farm, there is no doubt that the original dams in the area, those built by them on the station, showed the local cattle owners how water shortages can be overcome at a reasonable cost and by their example contributed considerably to the present much improved position. There still are dry season shortages, but it is clear that the lead set by the University Farm at Nungua has already done much to improve the position and this is, perhaps, the most striking single result of the present survey.¹³

The Station was thus having a positive influence on local cattlement.

The impact on local food farmers is next to be considered.

Impact on Local Farmers

The impact of the Agricultural Research Station will be reviewed in the context of the several change agents in the study area. Other change agents included the extension services (Crop Production and Mechanization and Transport Divisions) of the Ministry of Agriculture and the secondary influences of other farmers. The sample of 42 farmers included six part-time employees of the Agricultural Research Station at Nungua. Twenty farmers among the sample also owned and/or raised cattle, with herd sizes ranging from 20 to 800 head. A review of the food farming innovations and perceived sources of influences in adoption is presented in Table 33. Data on the cattle industry per se have not been analyzed.

TABLE 33.--Perceived Major Sources of Influence in Adopting New Agricultural Practices by Food Farmers in the Station Study Area, 1969

	Use of Tractor	Use of Ferti- lizer	Use of Im- proved Seed	Use of In- secticide/ weedicide
Total interviewed	42	42	42	42
Number adopting	40	23	5	3
Percentages				
Major Source of Influence:				
Agricultural Research Station	10 ^a	5	2	0
Ministry of Agriculture	59	38	0	7
Secondary Sources	26	12	10	0
Total Percentage Influenced	95	55	12	7
Percentage Not Influenced	5	45	88	93
Total Percentage	100	100	100	100

^aStation employees exclusively.

A total of 71 innovations had been adopted by the 42 food farmers. This represented an average of 1.69 adoptions per farmer. Table 33 demonstrates that food farmers were primarily influenced in adoption by the Ministry of Agriculture's extension services. This was particularly true in the case of tractor (59 per cent of sample) and fertilizer (38 per cent) innovations. The second major source of influence was other food farmers. An important factor here was the Chief of Katamanso who was both innovative and respected among his fellow farmers. Secondary sources influenced 26 per cent of tractor adoptions, 12 per cent of fertilizer adoptions, and ten per cent of improved seed adoptions. The Agricultural Research Station influenced ten per cent, five per cent, two per cent, respectively, primarily among part-time employees of the Station. Though not detailed here, the Station had a relatively greater influence than other sources on the adoption patterns of local cattlement.

Table 33 also shows that a surprising 95 per cent of the sample had adopted the use of the tractor. This adoption rate is higher than in the previous two case studies and may be attributed to both the relatively long term exposure to tractor operation in the area and the efforts of the extension services to demonstrate the utility of mechanized farming. The first large-scale mechanized scheme in the study area was the Livestock Farm set up in 1946 by the Ministry of Agriculture's Animal Husbandry Division adjacent to what is now the Station (Figure 9).¹⁴ However, the more important influence of Ministry of

Agriculture began here in 1952 with an extension program directed at local master farmers.¹⁵ Ministry tractors were only available on a limited basis at the subsidized rate of 12 shillings (\$1.68) per acre. In the early 1960's under Nkrumah tractor totals in Ghana jumped from 140 in 1960 to about 3,800 in 1967.¹⁶ Between 1961 and 1967 nearly N¢26 million worth of agricultural machinery was imported. Table 34 shows the value of the machinery by country of origin. Yugoslavia was the major source by value. Czechoslovakian (Zetor) tractors, however, were the most numerous, totalling 1,400. By 1969, unfortunately, about three-fifths of Ghana's tractors were inoperable.¹⁷

Among the sample of farmers 31 per cent used tractors belonging to private owners. This reflected the inability of the extension services to meet local demand for tractors. There were six private tractor owners in the study area identified during the research. All were hiring out their tractors part-time at rates up to N¢8.00 per acre or about 33 per cent higher than the extension service. This was because the private sector was able to offer greater punctuality and efficiency.

The impact of the Agricultural Research Station upon local farmers was measured by use of the Impact Index, discussed in Chapter I. Table 35 shows that using Index criteria that 37.9 per cent were positively influenced. Sixty per cent had visited the scheme, 52 per cent had received extension, 50 per cent had observed a demonstration, and 30 per cent had bought Station produce. Three-tenths (30 per cent)

TABLE 34.--Countries Exporting Agricultural Machinery into Ghana, 1961-1967^a

Country	Value
Yugoslavia	N¢7,045,621
United Kingdom	5,431,805
U.S.A.	4,149,239
Czechoslovakia	3,249,617
West Germany	2,160,152
U.S.S.R.	2,159,218
Other countries	1,693,576
Total	N¢25,889,228

^aAdapted from Kumar, University of Ghana, op. cit., p. 20, Footnote 16.

perceived the scheme as having been the source of influence in the adoption of at least one innovation. Nearly two-thirds (65 per cent) perceived the scheme as beneficial to them. The Station was having greater impact on the sample of farmers than obtained with the State Farm and Brigade Farm area samples.

The Impact Index has been subjected to correlation analysis, as in the other case studies, using variables listed in Appendix B. For the 42 farmers in this case notable positive correlation coefficients were found between impact and the Radio Index (.343), use of family labor (.412) and number of farms per farmer (.325). There were no notable negative correlations.

The scheme impact hypothesis posits that in the micro-spatial context of the case studies, there would be no "neighborhood effect",

TABLE 35.--Impact Index: Agricultural Research Station, Nungua, 1969^a

Categories	Percentages
Farmer Experience	
1. Bought food products from scheme	30
2. Visited scheme at least once	60
3. Observed scheme "demonstration" ^b	50
4. Received training from scheme ^c	8
5. Received extension program of scheme ^d	52
6. Been paid employees of scheme in the past	8
Farmer Perception	
7. Perceived their innovation adoption as influenced by scheme	30
8. Perceived that they have benefitted from scheme	65
Mean Percentage	37.9

^aFarmer sample: N=40

^bIncludes passive observation of trial plots, scheme activities, "open day" (agricultural show), etc.

^cIncludes any type and length of active training at the scheme in agricultural practices, e.g. fertilizer application.

^dIncludes fertilizer, seeds, plant protectants, advice on particular farm problems, new techniques, credit, etc.

that is, no inverse relationship in distance between farmer and scheme. There is an unexpectedly high inverse correlation (-.391), and, thus, the hypothesis is not supported.

Local Food Farmer Characteristics, Production and Innovation

Let us now take a look at the patterns of personal and household characteristics of local food farmers, the nature and problems of production, and agricultural innovation.

Characteristics

To test the definition of the so-called "traditional farmer" we are reviewing the characteristics of local food farmers. The dominant ethnic group of the study area is the Ga. Different Ga lineages (stools) are established in coastal villages such as Labadi, Teshie, Nungua, Tema and Kpone and over the years local leaders have brought stool lands to the interior under cultivation. Table 37 shows the villages of the study area sample by stool and the population characteristics of the villages.

The typical farmer in the sample was 49.5 years, had lived in his village for 35.5 years, and had an average of 27.8 years of farming experience. Sixty-four per cent of the farmers owned and lived in their own compounds; 21 per cent lived in houses and 15 per cent lived in single rooms. Seventy-nine per cent of farmer dwellings were constructed of swish (mud) and 21 per cent were of cement blocks. The typical household was composed of 10.0 persons including the farmer, an average of 1.3 wives and 6.2 living children, of whom 4.9 lived at

TABLE 36.--Factor Loadings Defining Traditional Farmer, Third Case Study (N=42)

Characteristics			Factor 1	Factor 2
Traditional Farmer				
(a) Domestic Characteristics				
(1)	Age	1	.4223	.5350
(2)	Years Resident	9	.4973	.4802
(3)	Years Farmer	10	.3984	.6129
(4)	Household Size	13	.6691	.2086
(5)	Number Wives	14	.2682	.3050
(6)	Number Children	16	.3253	.4958
(7)	Formal Education	51	-.2407	-.5756
(8)	Stool Land Tenure	83	-.0386	.4336
(b) Productivity Characteristics				
(1)	Acres Savanna Crops	31	.9430	-.1391
(2)	Acres Cassava	32	.8168	.1322
(3)	Acres Tomatoes	36	.7778	-.1288
(4)	Acres Vegetables	37	.8682	.2374
(c) Innovation				
		50	.5535	-.5122

TABLE 37.--Population Characteristics of the Villages of the Station Study Area

Village or Other Location		Stool ^a	No. Inter-viewed	1960 Population ^b	1948 Population ^b
1.	Nkwantanang	Labadi	2	nd	nd
2.	Ashaley-Botwe and Maijaw ^c	Teshie	9 ^c	215	117
3.	Ogbojo	Teshie	1	84	54
4.	Ajiringano	Teshie	1	nd	nd
5.	University Farm	(Nungua)	4	211	0
6.	Santeo	Nungua	3	69	91
7.	Katamanso	Nungua	8	303	167
8.	Ashaiman	Tema	4	624	185
9.	Mensahkope	(Ada)	2	nd	nd
10.	Zenu	Tema	1	39	149
11.	Kubekro and New Kubekro	Tema	2	65	174
12.	Nshrehum	(Stranger)	2	nd	nd
13.	Apoionia	Kpone	2	337	221
14.	Bruce's Nursery	(Teshie)	1	. .	. .
Total		. .	42	. .	. .

^aSource: field data. Also refer to Figure 9. Places shown in parentheses are not under Ga Stools' control. Nshrehum is composed of Ada, Ewe, and other "strangers."

^bSource: Ghana, Census of Population, 1960, I and II, op. cit., Footnote 2, Chapter II.

^cMaijaw encompassed several widely dispersed Fulani Settlements. Three of the nine interviewed at Ashaley-Botwe and Maijaw were Fulani cattle rearers.

home. The average number of school age children (six years and older) in these households was 4.6 of whom 80 per cent had received some formal education. The religious affiliation claimed by 52 per cent was Presbyterian, 18 per cent local fetish religions, 12 per cent Apostolic, and Muslim and Methodist 9 per cent each. As elsewhere in the Southern Savanna, syncretism was commonly practiced.

Factor analysis has been employed to obtain a definition of the "traditional farmer". Data on domestic, productivity and innovation characteristics of the 42 farmers are analyzed in Table 36 following the process of analysis discussed earlier. The second hypothesis postulated that the traditional farmer can be defined by common domestic characteristics but not necessarily in terms of low productivity or lack of innovation. Factor 1 in Table 36 demonstrates a relatively high degree of communality among domestic characteristics and very strong measures of productivity and innovation. However, Factor 2 follows a rather similar pattern of domestic characteristics though productivity and innovation scores are quite different. Therefore, one must conclude that the hypothesis is only weakly supported by the data in this case study and the result is inconclusive.

Production and Problems

The principal crops of the study area are cassava, peppers,¹⁸ tomatoes, okro and other vegetables such as garden eggs which were grown primarily by Ga from Teshie and Labadi.¹⁹ Though maize was grown by 22 per cent of the farmers, cassava was grown by 90 per cent, preferred

because of its superior adaptability to changing patterns of precipitation. Table 38 presents data on the savanna food crops and acreages of the study area sample. Fish was a common part of the local diet, usually eaten in combination with a cassava fufu and a variety of vegetable-base soups. Tomatoes were raised by 74 per cent, peppers by 79 per cent, and okro by 64 per cent. Intercropping was practiced by only 17 per cent of the sample.

The total acreage of the 42 farmers was 295, a mean of 11.1 acres and a median of 7.0 acres, ranging in size from 1/2 to 132 acres. In addition, sample farmers estimated that they would plant 110 more acres prior to the onset of the major rainy season, primarily in tomatoes and peppers. Calculation of acreages, based on farmer estimates, was simplified because of the common use of the tractor in the study area, charges for which were based on acreage. As is common through Africa, farmers practiced the "bush fallow" or "land rotation" system of land use in which the farmer changes plots after a year or two of use and lets a part of his land go to fallow to rebuild soil nutrients.²⁰

As elsewhere in the region, a trend noticed was the growing reliance upon hired labor and mechanization rather than the extended family as a source of labor. Seventy-four per cent of the sample employed hired labor and as mentioned earlier, 95 per cent used tractors. Labor bottlenecks were overcome in cultivation and weeding, in the first instance, and in land preparation, in the second. Child labor was limited and confined largely to non-school periods. However, the traditional pattern of woman-dominated harvesting and marketing functions was not affected

TABLE 38.--Crops and Acreages of Forty-Two Food Farmers in the Station Study Area, 1969

Crops	No. of Farmers Growing This Crop ^a	Acres Planted --1969 ^b	Estimated Acres to be Planted --1969
Cassava	38 (2)	159	0
Maize	9 (0)	25	nd
Tomatoes	31 (4)	0	89
Okro	27 (3)	47	1
Peppers	33 (4)	45	15
Garden Eggs	15 (3)	10	5
Others ^c	10 (2)	9	nd
Totals	42 (7)	295	110

^aNumbers in parentheses refer to farmers who interplanted this crop with other crops.

^bSurvey taken February-April, 1969, before tomatoes, peppers and some other crops had been planted. Numbers are rounded to the nearest whole acre.

^cIncludes: Calabashes (three farmers), rice (two farmers), onions (two farmers), sweet potatoes (one farmer), yams (one farmer), and flowers (one farmer).

by the new labor trends. Few farmer wives were full-time traders, but many sold to forestallers of other "middlemen", which the Ga call Kpeloi. Hired laborers were usually Northerners, generally referred to as the "Hausa". They lived in nearby towns, like Ashaiman and Madina and wandered from village to village looking for work. Labor was usually distributed on a spatial rather than a temporal basis, at the rate of N¢3.50 to N¢7.00 per acre depending upon difficulty. Arrangements sometimes included meals but seldom were considered steady sources of employment for the hired laborers.

Fifty per cent of the sample farmers observed the Ga land taboo on Fridays. Ga and non-Ga observance patterns were similar. In the study area, ethnicity, age and acreage did not seem to be related to resting the land. Observers were only slightly older (53 years) than non-observers (47 years) and both had median acreages of seven. The custom seemed to offer no obstacle to adopting farming innovations such as tractor utilization. Actually, Sunday was observed as a day of rest by 60 per cent of the sample, for religious, funeral and family reasons not related to observance of the earth fetish.

Land tenure patterns were also evolving. Ga land by tradition is held in common under the control of each patriarchal stool.²¹ The Gbobo fetish priest is the landlord, located in the lineage homes such as Teshie or Nungua, who may distribute land himself or delegate this duty to chiefs in interior villages. Seventy-nine per cent of the sample were Ga, and in every instance they were farming stool land with chief or priest permission. The 21 per cent non-Ga were all renting

land from the Ga, though the fees were minimal or non-existent. Unlike the other case study areas, no sample farmer held allodial rights and none had purchased or sold land.

Major sources of capital among the 42 food farmers were sale of crops (31 per cent), personal or market loans (29 per cent), and sale of animals (26 per cent). Table 39 displays the major sources of capital, differentiated as raisers and non-raisers of cattle. Food farmers who raised cattle found the sale of animals to be the first major income source (55 per cent) and sale of crops second (30 per cent). Those without cattle depended upon personal and market loans (45 per cent) and sale of crops (32 per cent). Five of six part-time employees of the Agricultural Station found wage income most important.

The major problems among farmers were inadequate credit, irregular rainfall and water supply, animal diseases and drug scarcity, and tractor scarcity. An inventory of the perceived problems of the sample is presented in Table 40. The patterns of problems were similar for food farmers with and without cattle. However, tractor scarcity was rather more important for the latter group. The leading first-mentioned problems were animal diseases/drug scarcity and lack of credit.

Innovation

Among the sample the average number of innovations was 1.69. Seventy-one innovations had been adopted by 41 farmers. Only one farmer had not adopted an innovation. In the following tables innovation has been compared with indices of travel experience (Table 41), radio accessibility (Table 42), extension service contact (Table 43), and formal education (Table 44).

TABLE 39.--Major Sources of Capital for Agriculturalists in the Station Study Area, 1969

Major Source of Capital	Food Farmers Without Cattle		Food Farmers Owning Cattle		Total	
	No.	%	No.	%	No.	%
Sale of Crops	7	32	6	30	13	31
Sale of Animals	. .	. .	11	55	11	26
Personal or market loans	10	45	2	10	12	29
Bank Loans	0	0	1	5	1	2
Wage income	5	23	0	0	5	12
Total	22	100	20	100	42	100

TABLE 40.--Inventory of Perceived Problems of Farmers, with and without Cattle, in the Station Study Area, 1969^a

Problem	Food Farmers Without Cattle		Food Farmers Owning Cattle		Totals	
1. Credit/money	13	(5)	11	(4)	24	(9)
2. Rainfall irregularity/dams/water supply	11	(1)	9	(1)	20	(2)
3. Animal diseases/drug scarcity	2	(0)	15	(10)	17	(10)
4. Tractor scarcity	8	(3)	4	(2)	12	(5)
5. Transportation/roads	4	(1)	2	(2)	6	(3)
6. White ants/rodents/insects	4	(2)	2	(0)	6	(2)
7. Fertilizer scarcity	2	(0)	1	(0)	3	(0)
8. Others ^b	5	(0)	5	(0)	10	(0)

^aNumbers in parentheses represent the number of people who said that this was their most serious problem. One or more answers were possible for each interviewee.

^bInadequate training/knowledge of agriculture (two farmers), irrigation (two farmers), seeds unavailable (one farmer), thieves (one farmer), land moving (one farmer), encroachment of farms on cattle grazing areas (one farmer), poor extension (one farmer), and poor markets (one farmer).

TABLE 41.--Travel Experience and Adoption of Innovations Among Station Study Area Food Farmers, 1969^a

Travel Experience ^a	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
1 (most experienced)	0	3	2	0	3	8	19	2.38
2	0	1	0	1	0	2	5	2.00
3	0	1	0	0	0	1	3	1.00
4	0	3	3	1	0	7	17	1.72
5	0	7	8	0	0	15	36	1.53
6	0	2	4	0	0	6	14	1.67
7 (least experienced)	1	2	0	0	0	3	6	0.67
Total Food Farmers	1	19	17	2	3	42	100	1.69

^a1=travel to another region, Kumasi, Takoradi, Tamale, many other areas of Ghana and abroad; 2=to another region, Kumasi, Takoradi, Tamale and many other areas of Ghana; 3=to another region, Kumasi, Takoradi, and some other areas of Ghana; 4=to another region, Kumasi, and some other local places; 5=to another region and a few other local places; 6=only traveled in this region; and 7=very limited travel.

TABLE 42.--Radio Accessibility and Adoption of Innovations Among Station Study Area Food Farmers, 1969

Status	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Have radio	1	13	10	1	3	28	67	1.71
Have access	0	2	5	1	0	8	19	1.87
Have no radio and no access	0	4	2	0	0	6	14	1.33
Total Food Farmers	1	19	17	2	3	42	100	1.69

TABLE 43.--Extension Services Contact and Adoption of Innovations Among Station Study Area Food Farmers, 1969

Extension Service Contact	Number of Inno- vations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Contact	1	13	12	2	3	31	74	1.77
No contact	0	6	5	0	0	11	26	1.45
Total Food Farmers	1	19	17	2	3	42	100	1.96

TABLE 44.--Formal Education and Adoption of Innovations Among Station Study Area Food Farmers, 1969

Formal Education Attempted	Number of Inno- vations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
None	1	12	12	2	1	28	67	1.64
Primary	0	3	0	0	0	3	7	1.00
Middle	0	3	4	0	0	7	17	1.57
Advanced ^b	0	1	1	0	2	4	9	2.75
Total Food Farmers	1	19	17	2	3	42	100	1.69

The third hypothesis states that innovation among farmers is directly related to measures of farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience, and access to radios. There are direct correlations between all of these variables and innovation, and are notably higher in the instances of productivity (.493) and travel (.416). However, the other coefficients are rather weak, and it must therefore be concluded that the data are inconclusive and inadequately support the innovative farmer hypothesis.

The fourth hypothesis assumes that formal education is not related to agricultural productivity or innovation. The formal education hypothesis is supported by the case study data. The Education Index shows no notable correlation with productivity (-.115) and only a weak direct relationship (.189) with innovation.

Summary

The third case study has focussed on the Nungua Agricultural Research Station of the University of Ghana. It was set up in 1952 both to investigate the problems of Southern Savanna agricultural development and to train Ghanaian agricultural science students. Extension work was also initiated by the Station both in the areas of crop and animal production. Numerous research projects have been undertaken by the Farm with special success coming in breeding and adaptation of imported livestock and local breeds for increased meat and milk production. In 1969 budgetary structures were unfortunately reducing the research output and effectiveness of the Station.

The impact of the Station on local food farmers was not as great as among local cattlemen. However, the Impact Index was 37.9 per cent. Greater influence in food farming came from the Ministry of Agriculture and secondary adopters among other farmers. The factor analysis of farmer domestic characteristics was not able to provide an adequately clear definition of the "traditional farmer." The typical farmer was found to grow cassava and vegetables primarily, on a median of 7.0 acres. A surprising 95 per cent of the sample used tractors and 74 percent used hired labor to break labor bottlenecks at land preparation and weeding periods, respectively. The land tenure was fairly stable with no sample farmer holding allodial rights. A land taboo was observed by 50 per cent of the sample. Major sources of capital were sale of crops (31 per cent), especially for farmers who were not raising cattle as well, and sale of animals (26 per cent) for those with animals. Major problems were perceived as inadequate credit, irregular water supply, animal problems, and tractor scarcity.

Only the education hypothesis is adequately supported by the data; the traditional farmer and innovative farmer hypotheses are weakly supported; and the scheme impact hypothesis is not supported by this case study.

FOOTNOTES--CHAPTER V

¹Other University Agricultural Research Stations were set up at Kpoing (1954) and Kade (1959) to study irrigated farming and forest agriculture, respectively. Much information on the history of the Nungua Station was collected from Agricultural Research Station file notes written by A.S.B. Wilson, a former Farm Manager.

²See Peter Hill, et. al., Guide to the Agricultural Research Station, Nungua (University College of the Gold Coast, Faculty of Agriculture: 1955).

³Files of the Agricultural Research Station, Nungua, c. 1954, File 57, p. 77.

⁴Wilson, op. cit., Footnote 1.

⁵Peter Hill was the first Station Manager (1952-1960). He was the son-in-law of John Phillips, the head of the new Faculty of Agriculture in 1952. Both were men with considerable experience in live-stock-rearing in South Africa.

⁶See J. L. Steward and M. D. W. Jefferys, The Cattle of the Gold Coast (Accra: Government Printer, 1956); P. M. Ahn, "Water Resources in the Ashaiman-Dodowa Area of the Accra Plains, South-East Ghana," (Faculty of Agriculture, Legon, January, 1965). (Mimeographed); Valuable contributions have been made by E. O. Otchere, "Preliminary Observations on Milk Production Among the Fulani on the Accra Plains," (unpublished B.S. dissertation, Faculty of Agriculture, Legon, 1966). Later, similar ground was covered by Charles Kojo Graham, "A Report on the Cattle Industry Around Nungua," (Legon: 1968), which won the Shell Prize for Agriculture in 1968; and E. K. Tetteh, "Commercial Cattle Raising on the Accra Plains" (unpublished B.A. dissertation, Department of Geography, Legon, 1968); Polly Hill, "A Socio-Economic Report on Cattle Ownership and Fulani Herdsmen in the Ashaimen/Dodowa District of the Accra Plains" (Institute of African Studies, Legon, October, 1964). (Mimeographed); also incorporated in Polly Hill, Studies in Rural Capitalism in West Africa (Ibadan: C. U. P., 1970).

⁷R. Rose Innes, "Grasslands, Pastures and Fodder Production," Agriculture and Land Use in Ghana, Brian Wills (ed.) (London: Oxford University Press, 1962), Chapter 23; and University of Ghana, Agricultural Research Station (Nungua), 1967 Annual Report (Legon: 1968), p. 70.

⁸University of Ghana, ibid., p. 74; and interviews with several Station personnel, April-May, 1969.

⁹An agreement was signed in 1961 by John Phillips, Dean of the Faculty of Agriculture and Nii Odai Ayiky III for the acquisition of 670 acres (increased later after cadastral survey to 748 acres) for £502.10.0 (about \$1,400).

¹⁰In 1969, former Farm Manager, Mr. Quarty-Papafio, was put in charge. Plans were designed to achieve full production by 1972 with 200 steers, 525 lambs, 2,100 goats, plus annual production of 8,100 eggs, 4,500 boilers, and 26,400 broilers. At the time of writing a loan of N¢250,000 was under consideration at the Agricultural Development Bank, Proposal--Nungua Commercial Unit, pp. 1-3, and Agricultural Development Bank Interview, May, 1969.

¹¹Interview with Dr. F. Vohradsky, Senior Research Officer, Agricultural Research Station, Nungua, 18 February, 1969. Specific figures were not available at the time of writing.

¹²Major tick sprays used were Gammotox and Cupitox which were available from retail establishments in Accra such as the Ghana National Trading Company, Ltd. (G.N.T.C.).

¹³Ahn, op. cit., p. 15, Footnote 6.

¹⁴Interviews with E. T. Ablakwa, former Farm Manager, and P. M. Adansi, Farm Manager, Animal Husbandry Division (Livestock Farm), 24 April, 1969.

¹⁵Interview with Chief Seth Laryes Afotey Agbo, Katamanso, 20 February, 1969. The chief was one of the first to adopt government advice on crop and animal production in the study area. He was proud of this "first" and had the original letter from the Ministry inviting him to participate in the extension program.

¹⁶Hans Kumar, "Agricultural Machinery Inventory," University of Ghana, Faculty of Agriculture, Report of the Symposium on Farm Mechanization, Legon, 7th and 8th January, 1969 (Accra: Council for Scientific and Industrial Research, 1969), p. 15.

¹⁷F. M. Akuffo estimated that because of lack of standardization and scarcity of spare parts 60 per cent of the vehicles transferred to his division (Mechanization and Transport) by the United Ghana Farmers' Council Cooperatives in 1967 were inoperable: F. M. Akuffo, "Utilizing and Maintaining Present Equipment," University of Ghana, op. cit., p. 66, Footnote 16.

¹⁸Peppers are of four types: (1) the round red kpong-kpo, meaning "ground-up," which sold in 1969 at four for 1 NP; (2) the kpakpo, small and also round and sold for 2 NP to 10 NP per cigarette tin; (3) the ojeng kpa meaning "smells sweet" and sold for four for 3 NP; (4) and the popular long red Akwele-Wabi meaning "the finger of a girl named Akwele" which sold at 80 to 100 NP per burlap bagful.

¹⁹For discussions of the agriculture of the area see "Teshie Settlements of Accra Plains," Nigerian Geographical Journal, IX, No. 1 (1966), pp. 45-53; and F. G. Abiorh, "Land Use of Teshie and its Villages" (unpublished B.A. dissertation, Department of Geography, Legon, 1969).

²⁰These terms are preferred to "shifting cultivation" which implies a movement of people and their domiciles or villages rather than the more common practice of farming different plots of land from year to year without moving one's home. See Brammer, 1965, op. cit., p. 22, Footnote 1, Chapter II; and discussions of the "bush-fallow system" in Ester Boserup, op. cit., Footnote 14, Chapter I; and P. H. Nye and D. J. Greenland, op. cit., Footnote 30, Chapter II.

²¹See Pogucki, op. cit., Footnote 45, Chapter II.

CHAPTER VI

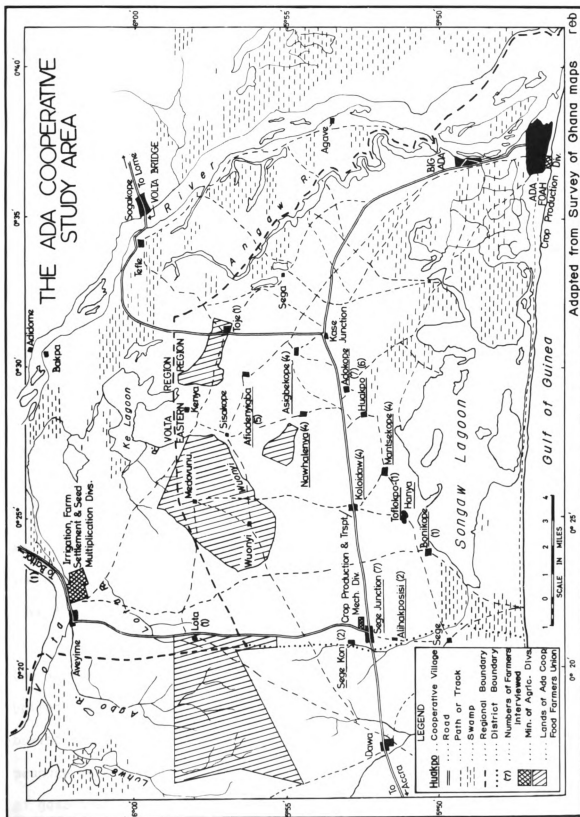
THE FOURTH CASE STUDY: LOCAL FOOD FARMERS AND THE ADA COOPERATIVE

The fourth case study is concerned with the local food farmers in the area centering on the Ada Cooperative Food Farmers Union, Ltd. The study area is located about 50 miles east of Accra in the south-eastern-most part of the Accra Plains. It is wedged between the Gulf of Guinea and the Volta River estuary (Figure 11). The Ada Cooperative has acquired farm land north of the Songaw Lagoon. Its membership is made up of local farmers who are relatively poor and dependent upon the growing of food crops for their major source of income. The Ada Adangbe are the dominant ethnic group.

The objectives of this study, as with earlier ones, are: (a) to review the background and development of the Ada Cooperative scheme, (b) to examine its impact on local farmers in the context of other influences, and (c) to look at the characteristics of these farmers in terms of agricultural innovation and production. Eighty-two per cent of the sample were members of the scheme. The data will be used to test the hypotheses presented in the introductory chapter.

Background and Development of the Scheme

The Ada Cooperative Food Farmers Union, Ltd. was established in 1966. A series of cooperatives had preceded the Ada Cooperative during



the early 1960's. With the increasing commercial character of food farming in the area, food production and marketing were subject to greater indigenous organization. Major food products were a partially processed cassava dough, tomatoes and other vegetables.

Background

The cooperative has been prescribed as a remedy for the economic ills of small acreage farmers in Ghana for many years.¹ The movement was institutionalized in the colonial period with the creation of the Department of Cooperatives in April, 1944.² During the late 1940's and through the 1950's the Department was successful in organizing the marketing function of cocoa farmers.³ Much less attention was shown to production, especially of food crops. Supervision and control of the cooperative movement remained the primary functions of the Department until 1958, when two auditing unions were created to partially decentralize accounting. To devolve responsibility further, between 1958 and 1960 three apex organizations, the Alliance of Ghana Cooperatives, the Ghana Cooperative Marketing Association, Ltd. and the Ghana Cooperative Bank, Ltd., were assigned government-appointed directors.

In June, 1961, the Department of Cooperatives was abolished by the Nkrumah government. Its responsibilities were taken up by the United Ghana Farmers' Council Cooperatives. It had exclusive cocoa buying rights from the State Cocoa Marketing Board and supervised other produce marketing societies. It also served as a political mechanism of government in rural areas under Nkrumah. The scale of operations

grew rapidly during the early 1960's. By 1965 acreage of cooperatives (18,413) was second only to that of State Farms (63,812) among large-scale agricultural schemes in Ghana.⁴ In the year preceding Nkrumah's fall the Ministry of Cooperatives was created to centralize organization of the disparate rural influences of the United Ghana Farmers' Council Cooperatives. The cooperative movement fell out of favor among many farmers.

After the coup in 1966 the Department of Cooperatives was reinstated. It set about to resolve the loss of confidence in the cooperative movement among peasant farmers and workers. New rules and regulations for societies were laid down and the Agricultural Development Bank came into being in 1967 to increase rural credit.⁵ A "Cooperative Societies Decree" was issued by the National Liberation Council in 1968 to strengthen the auditing, inspection and enquiry functions of the Registrar and Department of Cooperatives.⁶

In 1967 there were 2,137 registered cooperative societies.⁷ Only seven per cent (147) of these were produce marketing societies for food crops. Most (1,047) were devoted to cocoa marketing. Other functions served by cooperatives were the distilling of local gin called akpeteshi, fish marketing, small industrial production (such as weaving, mat making, baking, and handicrafts), thrift and loan organization, transportation and livestock production. There were also 41 cooperative unions and six apex organizations.

Few societies in Ghana have actually been the indigenously-generated, grass-roots organizations usually associated with the

cooperative movement. Most have been developed externally by government as vehicles for overcoming economic impotency in rural farming areas. Cooperatives have been seen by Government as means of linking rural and urban development and of quelling the frustrations of the poor. At the time of writing, despite a tattered history of failure among cooperatives in Ghana, enthusiasm remained high among decision-makers for cooperatives as mechanisms of change.

It is perhaps not surprising that few cooperatives in Ghana have come into being through local initiative. Peasant farmers hesitate to compound the insecurity of the agricultural environment with the further risks inherent in intrusting one's produce and profits to cooperative leaders. This is probably because of (a) the organizational structure of cooperative in Ghana, and (b) differential levels of education. Cooperative leadership consists of the President, Vice President, Treasurer and Secretary, who are often of the same ethnic background. The Secretary is usually the most powerful of these. He represents the society to government and is the only leader who must be literate in English to perform his role in the cooperative.⁸

There are frequent cleavages between the educated leadership and the illiterate membership. In joining a cooperative the farmer lays his trust of the leadership and fellow membership on the line. In these circumstances trust can often be translated as common ethnicity which provides bonds of culture, language and morality. Even within an ethnic group the uneducated are often suspicious of the educated, for education loosens ethnic bonds. The leadership and particularly the Secretary must be clever to bridge the gap of distrust. This problem might not

only be an explanation of the lack of indigenously-initiated cooperatives, but also an element in the frequent failure of those organizations which do come into being.

Development of the Ada Cooperative

The Ada Cooperative Food Farmers' Union, Ltd. is an example of a cooperative based on local initiative. In 1969 it was the only significant agricultural development scheme of the Ada people. It was considered the single viable cooperative in the Accra Plains.⁹ As such it was not typical of cooperatives in Ghana. It consisted of 12 food crop marketing societies including eight which were registered (Adokope, Huakpo, Koloidaw, Nawhalenya, Alihakposisi, Nantsekope, Sege Junction and Sege Koni) and four which were unregistered (Bonikope associated with Sege Junction, Toflokpo-Hanya with Koloidaw, Asigbekope and Afiadenyigba with Nawhalenya) (Figure 11).

The first Cooperative of the Ada people was created in late 1961 in association with Nkrumah's United Ghana Farmers' Council Cooperatives. It folded in 1964 for lack of adequate planting materials and equipment. A second Ada Cooperative with a membership of 45 was formed in 1965 by the United Ghana Farmers Council Cooperatives but failed for similar reasons as the first. The rise of the third Ada Cooperative Food Farmers' Union, Ltd., in 1966 quickened the demise of its predecessor. It was formed by a dissident element of 30 farmers who did not trust the Council Cooperatives and had, up to that time, been skeptical about cooperatives in general. However, strong leadership in the person of A. O. Zogblah, an Ada who became its Secretary, had much to do with the genesis of the new union.

The Secretary had had 15 years experience with the Ministry of Agriculture and in 1965 completed a diploma in cooperative development in the infamous Kwame Nkrumah Ideological Institute at Winneba. Just before the coup he was offered the position of District Organizer of Cooperatives for Ada and Adangbe-Shai-Osudoku Districts. When fate nullified this role, Mr. Zogblah was encouraged by the Federation of Food Farmers' Cooperatives in Accra to organize Ada Farmers on his own initiative.¹⁰

In 1966 Mr. Zogblah visited villages surrounding Ada and successfully encouraged membership in cooperatives. Some cropping was even undertaken that year. The Ada Cooperative obtained leases on Adibiawe land in the Medovunu-Wuonyi area and Lomobiawe land in the Lota area, through the heads of the respective Ada lineages in Big Ada (Figure 11). In 1967 the 12 societies noted above formed the Union, each paying N¢100. Some 3,600 acres were bought under production and yielded 11,000 tons of cassava, 275 tons of tomatoes, 2,000 bags of peppers, 1,250 bags of groundnuts and some other vegetables.

The office of the Ada Cooperative was located in Ada Foah, the largest market town of the area, to establish links with market women, particularly for the sale of cassava dough. The major cash crop, tomatoes, was sold to (a) market women, (b) the State Cannaries Corporation at Nsawam, 20 miles north of Accra, and (c) Economic Industries of the indigenous Baah Industrial Group, located 25 miles west of Accra.¹¹ Unfortunately, 1968 proved to be a year of excessively heavy rains and most tomatoe production was severely affected.

A loan request (originally pegged at N¢100,000) was submitted by the Ada Cooperative to the Agricultural Development Bank in 1968 for mechanized equipment, fuel and maintenance and other assistance. In February, 1969 the application was approved and a loan of N¢40,000, at eight per cent interest for five years, was made for tractors, accessories and other equipment, fuel and maintenance.¹² The loan stimulated increased membership which rose to 247 in 1969. Members paid N¢3.00 to join a society and contributed N¢10.00 share capital per year. These funds were used to capitalize operations. Equipment was purchased and a monthly servicing contract was written with Massey-Ferguson.¹³ A mechanization officer was employed, tractor drivers were trained and rates and schedules of utilization were drawn up.¹⁴ The focus of Ada Cooperative shifted from Ada Foah to Koloidaw, the scheme center, in early 1969 (Figure 11). A new tractor shed with adjoining office was constructed there to protect equipment and to provide a venue for weekly meetings of the Committee.

As with other cooperatives in Ghana, the Committee was the governing body of the Ada Cooperative. In Ada it consisted of the President-Chairman, Vice-President, Treasurer, Assistant Treasurer plus three other members, each representing different societies in the Union. Representatives of each of the other societies were co-opted as non-voting members to assure participation by all 12 societies. The Committee officially appointed the Secretary, who acted as a non-member recorder and link with government. Regular Thursday meetings were held to discuss operations, targets, and establish common rules, regulations and understandings among members.¹⁵

Ambitious production targets were set for the 1969 major growing season. The "official" 1969 goal of 8,106 acres is shown by crop and society in Table 45. Major crops are cassava, tomatoes, groundnuts, peppers, okro, onions and bambarra beans. However, these targets were inflated for strategic discussions with the Agricultural Development Bank. In the Secretary's own candid view 5,000 acres was considered more representative of a one-year maximum target. Among 26 cooperative members interviewed there was a projected 11.1 acres to be planted (median 10.0), or roughly a third of the "official" per-farmer target acreages. This would produce in linear progression a total of about 2,742 acres rather than the "official" figure of 8,106.

These were to be planted in addition to personal farm acreages, averaging 11.0 acres (mean) among 41 members sampled. Even a scheme target of 2,742 acres compares favorably with those noted in previous case studies. This did not seem a wholly unrealistic goal in view of the fact that 3,600 acres were planted during the 1967 season.

A long-range objective of the Ada Cooperative was to establish settlements on cooperative lands in the interior. In 1969 that was impossible because of the lack of adequate domestic water supply and irrigation facilities on the new farming sites. However, the land was under cultivation, with particular effort being given to the development of the area surrounding Medovunu-Wuonyi.

The problems facing the Union, to be discussed in the following sections, resembled those facing peasant agriculture everywhere in the Southern Savanna. Scarce water supply, endemic plant diseases, insect

TABLE 45.--Acreage Targets for the Ada Cooperative Food Farmers' Union, Ltd., By Society and Crop, 1969^a

Cooperative Society	No. of Members	Mean Acreage	Total Acreage	Crops (in Acres)						
				Cassava	Tomatoes	Ground-nuts	Peanuts	Okro	Onions	Bambara beans
Asigbekope	35	43.8	1,533	613	522	126	108	97	34	33
Koloidaw	32	31.3	1,000	322	308	100	93	94	53	30
Toflokpo-Hanya	26	32.2	836	294	263	69	81	48	47	34
Sege Junction	24	32.6	782	239	269	86	83	75	27	3
Alihakposisi	18	40.3	725	221	176	58	90	139	26	15
Sege Koni	20	35.7	714	312	140	93	65	70	26	8
Hwakpo	21	28.9	606	241	224	24	43	38	21	15
Mantseko	19	29.3	556	158	139	67	68	53	45	26
Afiedenyigba	13	27.2	354	150	116	23	23	26	16	0
Newhalenya	13	27.1	352	124	100	53	29	26	13	7
Adoko	15	23.2	348	114	117	34	29	28	14	12
Bonikope	11	27.3	300	113	101	24	29	19	11	3
Totals	247	32.8	8,106	2,901	2,475	757	741	713	333	186

^aSource: Ada Cooperative records, 1969.

infestation, lack of credit, and inadequate planting materials were compounded by problems of cooperative society organization and inferior marketing arrangements. Tomatoes posed particular problems since they were subject to market gluts and inadequate prices. The Ada Cooperative also did not appear immune to problems of mismanagement of funds, internal rivalries and apathy among members, though its economic potential offered hope that these difficulties were not insoluble.

Impact on the Farmers

The impact of the Ada Cooperative Food Farmers' Union, Ltd. will be reviewed in the context of the other change agents in the study area. These include; the extension services of the Ministry of Agriculture and secondary sources such as farmer friends and relatives. Fifty local food farmers, including 41 members of the Ada Cooperatives were interviewed concerning agricultural innovation and perceived sources of influence. Data on impact are presented in Table 46.

A total of 102 innovations had been adopted by the 50 food farmers. This represented an average of 2.04 adoptions per farmer. Table 46 demonstrates that the Ada Cooperative was the primary source of influence overall. It was the perceived major source of influence in the adoption of 40 innovations. However, secondary sources (37 innovations) and the extension services (25 innovations) were nearly as important as the scheme. Tractor adoption was primarily influenced

TABLE 46.--Perceived Major Sources of Influence in Adopting New Agricultural Practices by Fifty Farmers in the Ada Cooperative Study Area, 1969

	Use of Tractor	Use of Ferti- lizer	Use of Im- proved Seed	Use of In- secticide/ weedicide
Total interviewed	50	50	50	50
Number adopting	50	35	5	12
Percentages				
Major Source of Influence:				
Ada Cooperative	40	38	2	0
Ministry of Agriculture	18	26	2	4
Secondary Sources ^a	42	6	6	20
Total Percentage Influenced	100	70	10	24
Percentage Not Influenced	0	30	90	76
Total Percentage	100	100	100	100

^aThese included private tractor owners, relatives, and freinds.

by secondary sources (42 per cent) followed closely by the Ada Cooperative (40 per cent). Use of fertilizer was perceived as largely influenced by the Ada Cooperative (38 per cent) and the Ministry of Agriculture (26 per cent). Secondary sources were considered most influential in adoption of improved seed (six per cent) and insecticide/weedicide (20 per cent).

All farmers interviewed had adopted the use of the tractor. This extraordinary rate of adoption may be attributable to (a) the influence of secondary sources including friends, relatives and private tractor owners and (b) a history of tractor use in the area. Forty-two per cent of the sample used privately owned tractors. Although the degree of private ownership of tractors could not be verified, the researcher heard claims from several sources that about 30 private owners rented tractors in the Ada Cooperative area. The sample included two drivers of tractors that were hired out. Even if the claims were exaggerated by a factor of two, the number would have been significant in such a limited spatial context. The claim seems to have been supported by the high per-farm unit acreages in the study area. As one farmer informant indicated, to use a tractor meant that a strong man could farm ten acres instead of two.

The Transport and Mechanization Division introduced the tractor in Sege and Mantseko in 1962 and 1963 and established a station as Sege Junction in 1963.¹⁶ After this, according to interviewees, a number of farmers began using tractors for land preparation. By 1969 demand for tractors far exceeded supply and many farmers began to turn to private owners and the Ada Cooperative to fill the needs.

Extension services in the study area were located at Ada Foah (Crop Production Division) and Sege Junction (Crop Production and Transport and Mechanization Division) (Figure 11). Extension efforts in the study area were primarily directed at Ada Cooperative members to the extent that several non-member interviewees complained that extension only helped Union members. It is interesting to note the striking coincidence of high acreages, high innovation, and high cooperative-extension service cooperation.

The impact of the Ada Cooperative Food Farmers Union, Ltd, upon 41 of its members was measured by use of the Impact Index, discussed in Chapter I. Table 47 shows that 55.9 per cent of the sample were positively influenced, according to Index criteria. This is the highest rate among the four case studies. This is not surprising since the sample of 41 consisted entirely of scheme member; however, there may be implications for maximizing scheme impact.

All of the members had visited the new scheme land and nearly all (97 per cent) had purchased food produced by the scheme. About three-quarters (74 per cent) had received scheme extension in the form of tractors, planting materials, or advice on farm problems. However, few had observed a scheme demonstration (13 per cent), or received training (five per cent), or been previous employees of the scheme (0 per cent). Thus, there appeared to be some room for improvement in the demonstration and training functions of the scheme. Nearly two-thirds (63 per cent) perceived the scheme as having been the source of influence in the adoption of at least one innovation.

TABLE 47.--Impact Index: Ada Cooperative Food Farmers' Union, 1969^a

Categories	Percentages
Farmer Experience	
1. Bought food products from scheme	97
2. Visited scheme at least once	100
3. Observed scheme "demonstration" ^b	13
4. Received training from scheme ^c	5
5. Received extension program of scheme ^c	74
6. Been paid employees of scheme in the past	0
Farmer Perception	
7. Perceived their innovation adoption as influenced by scheme	63
8. Perceived that they have benefitted from scheme	95
Mean Percentage	55.9

^aFarmer sample: N=41

^bIncludes passive observation of trail plots, scheme activities, "open day" (agricultural show), etc.

^cIncludes any type and length of active training at the scheme in agricultural practices, e.g. fertilizer application.

^dIncludes tractors, fertilizer, seeds, plant protectants, advice on particular farm problems new techniques, etc.

Nearly all (95 per cent) perceived the scheme as beneficial to them. The Ada Cooperative was thus having major impact upon its membership.

The relatively high level of scheme impact may be attributed to: (a) the direct participation of local farmers through membership in the Cooperative: (b) the greater availability of credit through Cooperative association, and therefore, greater economic flexibility for innovation adoption; and (c) the focussing of extension service support on the Cooperative with greater accessibility to planting materials.

As described in previous case studies, the Impact Index has been subjected to correlation analysis using variables listed in Appendix B. For this sample of 50 farmers notable positive correlation coefficients are found between impact and employment by the scheme (.688), extension service contact (.654), adoption of fertilizer (.384), and number of innovations adopted (.336).

The scheme impact hypothesis assumes that in the micro-spatial context of the case studies there would be no "neighborhood effect", that is, no inverse relationship in distance between farmer and scheme. There was no relationship ($r = .010$), and therefore, the hypothesis is supported.

Local Food Farmer Characteristics, Production and Innovation

In this section we will review the patterns of personal and household characteristics of local food farmers, the nature and problems of production, and agricultural innovation.

TABLE 48.--Factor Loadings Defining Traditional Farmer, Fourth Case Study (N=50)

Characteristics			Factor 1	Factor 2
Traditional Farmer				
(a) Domestic Characteristics				
(1)	Age	1	.4939	.5873
(2)	Years Resident	9	.5041	.3771
(3)	Years Farmer	10	.5303	.6119
(4)	Household Size	13	.3446	.1468
(5)	Number Wives	14	.5874	.3253
(6)	Number Children	16	.6674	.4900
(7)	Formal Education	51	-.5285	-.2759
(8)	Stool Land Tenure	83	.4463	-.2747
(b) Productivity Characteristics				
(1)	Acres Savanna Crops	31	.7969	-.2586
(2)	Acres Cassava	32	.6788	-.2097
(3)	Acres Tomatoes	36	.6818	-.1919
(4)	Acres Vegetables	37	.5853	-.2669
(c) Innovation				
		50	.5017	-.6285

Characteristics

As in the other three case studies we are testing a definition of the so-called "traditional farmer" by assessing the characteristics of local food farmers. The dominant ethnic group of the study area is the Ada. They consist of several lineages (houses) all of which have origins in Big Ada (Figure 11). The oldest lineage is the Adibiawe which according to tradition established Big Ada.¹⁷ The second lineage in age and influence is the Lomobiawe who dominate the town of Ada Foah. Five other lineages of lesser influence, including the Terkperbiawe, Kabubiawe, Ohuawem, Kudjragbe, and the Dangbebiawe, are scattered about the district. Table 49 shows the villages of the study area sample by lineage and the population characteristics of the villages.

The typical farmer in the sample was 52.5 years old, had lived in his village for 43.7 years, and had an average of 36.2 years of farming experience. Eighty per cent were living in compounds, four per cent in houses, and 16 per cent in rooms. Ninety per cent of the homes were constructed of swish (mud) and ten per cent of bricks. The typical household was composed of 17.4 persons including the farmer, 1.9 wives and 8.2 living children of whom 6.1 lived at home. The average number of school age children (six years and older) in these households was 5.3 of whom 51 per cent had received some formal education. The relatively low percentage of formally educated children, the larger households and the advanced age and length of residency were slightly more extreme than in the other case studies, and typified

TABLE 49.--Population Characteristics of the Villages of the Ada Cooperative Study Area

Village or Other Location	Primary Lineage ^a	No. Inter- viewed	1960 Popu- lation ^b	1948 Popu- lation ^b
Adokope ^c	Mixed	7	639	1,086
Huakpo ^c	Adibiawe	6	253	336
Mantsekope ^c	Adibiawe	4	534	514
Koloidaw ^c	Mixed	4	536	263
Toflokpo- Hanya ^c	Adibiawe	1	131	0
Bonikope ^c	Lomobiawe	1	nd	nd
Asigbekope ^c	Ohuewem	4	184	0
Afiadenyigba ^c	Mixed	5	268	0
Nawhalenya ^c	Adibiawe	4	54	109
Sege Junction ^c	Mixed	7	522	793
Sege Koni ^c	Kudjragbe	2	176	0
Alihakposisi ^c	Mixed	2	128	0
Toje	Mixed	1	192	94
Lota	Mixed	1	27	273
Battor	(Ewe)	1	661	520
Total		50		

^aSource: field data, 1969. See also Figure 11.

^bSource: Ghana, Census of Population, 1960, I and II, op. cit., Footnote 2, Chapter II.

^cFarmers in these 12 villages formed separate cooperative societies which were affiliated with and coordinated by the Ada Cooperative Food Farmers' Union, Ltd.

the older generation of Ghanaians. The religious affiliation claimed by 52 per cent was local fetishes (animism), 18 per cent Presbyterian, 14 per cent Apostolic, and 16 per cent other. Sycretism was commonly practiced as well.¹⁸

Factor analysis has been employed to obtain a definition of the "traditional farmer". Data on the domestic, productivity and innovation characteristics of the 50 farmers are analyzed in Table 48 following the process of analysis described in previous cases. The second hypothesis postulates that the traditional farmer can be defined by common domestic characteristics but not necessarily in terms of low productivity or lack of innovativeness. Factor 1 in Table 48 shows a high loadings among domestic characteristics, as well as reasonably strong measures of productivity and innovation. The case study data, therefore, support the second hypothesis.

Production and Problems

The primary crops of the study area are cassava, tomatoes and other vegetables and groundnuts. Table 50 presents data on the savanna food crops and acreages of the study area sample. Ninety-four per cent of the farmers were raising cassava while only 14 per cent grew maize. Tomatoes were raised, as a cash crop primarily, by 68 per cent of the sample. Other vegetables included okro, garden eggs, peppers, shallots, and bambarra beans. Intercropping was practiced by only six per cent of the farmers interviewed.

The total acreage for 50 farmers' individual farms was 566, a mean of 11.3 acres and median of 10.0, ranging in size from 1 1/2

TABLE 50.--Food Crop Production and Acreages of Private Holdings for Fifty Farmers in the Ada Cooperative Study Area, 1969^a

Crop	No. of Farmers	Acreage of Private Farms	
		Planted	To Be Planted
Cassava	47 (2)	294	0
Maize	7 (1)	6	0
Tomatoes	34 (3)	130	60
Other vegetables ^b	43 (3)	104	38
Groundnuts	20 (1)	32	4
Other ^c	0 (0)	0	0
Total	50 (3)	566	102

^aField data collected in early April, 1969. Numbers in parentheses represent farmers inter-planting this crop with other crops. Acreages rounded to nearest whole acre.

^bVegetables include: okro, garden eggs, peppers, shallots, and bambarra beans.

^cNo other food crops were being grown by interviewees.

to 37 acres. These were the highest average acreages found among the case studies. In addition, sample farmers estimated that they would plant 102 more acres prior to the onset of the major rainy season, primarily in tomatoes and peppers. Calculation of acreages, based on farmer estimates, was simplified because of the common use of the tractor. Tractor use was charged by the acre. These acreages were exclusive of those to be planted on Ada Cooperative land, as noted earlier.

Unlike their Krobo brothers, the Ada did not commonly use the rope, or kpa, as the unit of land measure. The extensive adoption of the tractor in the study area may explain this. Furthermore, those farmers using the kpa generally used the kpakake, or ten fathom rope of 60 feet in length, rather than the 12 fathom rope frequently used by the Krobo. This was probably a result of contact with the neighboring Ewe who use the abo wo of ten fathoms.

There were trends in 1969 toward greater utilization of hired labor and mechanization, as noted in other parts of the Southern Savanna. To supplement family labor 92 per cent of the 50 farmers had employed hired labor, and as noted earlier, 100 per cent used tractors. These were the highest percentages among the four case studies. Hired laborers were generally migrant Northerners. However, eight farmers had permanent employees. Laborers were employed to handle the demanding weeding chores and to overcome labor bottlenecks during the growing season. Labor was generally distributed on a spatial (81 per cent of sample of laborers) rather than a temporal

(daily) basis (19 per cent). Among those using a spatial basis, most (55 per cent) paid by the acre (N¢5.00-N¢7.00) while a smaller percentage (26 per cent) used the traditional kpakake. Rates for the latter varied from N¢25-N¢0.50 for a kpanyafi (small) kpakake (about 2,160 square feet) to N¢0.60-N¢1.20 for a kpangwa (large) kpakake (about 4,320 square feet). Daily labor was paid N¢0.45-N¢0.75 per man/day. Weeding normally required 12 man/days per acre.

Seventy-two per cent of the sample observed the land taboo of the Adangbe. The days of observance varied but Thursday was common to all. Thursday and Friday were land rest days of the houses of Adibiawe, Dangbebiawe and Kudjragbe. The Lomobiawe, Terkperbiawe, Kabubiawe and Ohuewem observed Thursday and Sunday, like their Manyakrobo brothers. Members of the Ada Cooperative were generally strict in taboo observance for both family and Cooperative land. Since Thursday was common to all Ada, the Union held weekly business meetings on that day. Union members felt observance was important to avoid offending traditional Ada leaders. However, many of the younger men expressed the view that land taboos would probably disappear in time.

Ada land tenure patterns were in the process of change. Refer to the discussion of Adangbe land tenure in Chapter IV.¹⁹ On private farms among the sample of 50 94 per cent held family (stool) land and only six per cent worked individually-owned land. Those with allodial rights were located on the western periphery of Ada lands, in the Sege Junction and Lota areas (Figure 11). Family land was

inherited from one's father according to his house. If one desired new land he sought it from the head of his house in Big Ada. The pressure of population on the land was minimal, which compounded with a net outflow of migrants, produced few land tenure disputes in the study area.

Major sources of capital among the sample were sale of crops (88 per cent) and job wages (12 per cent). Of course, all 41 Cooperative members also indirectly benefitted from the Agricultural Development Bank's loan, noted earlier. Table 51 displays the major sources of capital, differentiated by membership or non-membership in the Cooperative. The patterns were similar for these two groups. This appears to indicate a high level of commercialization in food farming in this area.

The major problems among the 50 farmers were perceived as irregular rainfall and water supply, diseases, insects, rodents and birds, inadequate credit, and the scarcity of good seed. An inventory of the perceived problems is presented in Table 52. Patterns were similar for members and non-members. Another problem of increasing magnitude was price fixing among market women.²⁰ The leading first-mentioned problem was irregular rainfall and water supply.

Innovation

Among the sample of farmers the average number of innovations was 2.04. One-hundred-and-two innovations had been adopted by the 50 food farmers. All had adopted at least one innovation. In the

TABLE 51.--Major Sources of Capital Among Fifty Farmers in the Ada Cooperative Study Area, 1969

Major Source of Capital	Other Food Farmers		Cooperative Members		Total	
	No.	%	No.	%	No.	%
Sale of Crops	37	90	7	78	44	88
Personal Loans	0	0	0	0	0	0
Bank Loans	0	0	0	0	0	0
Job Wages	4	10	2	22	6	12
Totals	41	100	9	100	50	100

TABLE 52.--Inventory of Perceived Problems of Fifty Food Farmers in the Ada Cooperative Study Area, 1969^a

Problem	Non-Members		Cooperative Members		Totals	
1. Water supply/rainfall irregularity	5	(3)	26	(13)	31	(16)
2. Diseases/white ants/insects/rodents/birds	3	(1)	26	(6)	29	(7)
3. Credit/money	4	(1)	15	(8)	19	(9)
4. Seed scarcity	0	(0)	13	(3)	13	(3)
5. Clearing land	0	(0)	5	(3)	5	(3)
6. Labor supply	1	(1)	4	(0)	5	(1)
7. Roads/transport/marketing	2	(2)	3	(1)	5	(3)
8. Storage of crops	0	(0)	4	(0)	4	(0)
9. Tractor scarcity	0	(0)	4	(4)	4	(4)
10. Fertilizer scarcity	0	(0)	3	(1)	3	(1)
11. Others ^b	1	(0)	7	(0)	8	(0)

^aNumbers in parentheses represent people who indicated this was their most serious problem.

^bOthers include: cattle destroyed crops (two farmers), birds ate tomatoes (one farmer), harvesting expensive (one farmer), implements needed (one farmer), scorpions (one farmer), needed a wife (one farmer), tractor partner no good (one farmer).

following tables innovation has been compared with indices of travel experience (Table 53), radio accessibility (Table 54), extension service contact (Table 55), and formal education (Table 56).

The Third hypothesis states that innovation among farmers is directly related to measures of farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience and radio access. In this case study there are direct relationships between innovation and each of these, particularly strong in the instance of productivity (.552). Coefficients for travel experience (.205) and radio access (.098) are weak. One must conclude that the innovative farmer hypothesis is substantially supported by the data.

The fourth hypothesis posits that formal education is not related to agricultural productivity or innovation. This hypothesis is supported by the case study data. The Education Index shows no correlation to innovation (-.047) and is even negatively correlated with productivity (-.429). These data indicate that in this case formal education was not a necessary condition for farmer innovation and productivity, and, therefore, the hypothesis is supported.

Summary

This fourth and last case study has focussed on the Ada Cooperative Food Farmers Union Ltd., an indigenous large-scale agricultural development scheme. It was formed in 1966 by a local initiative of the Ada people. The union was considered by the Agricultural Development Bank, which provided it a loan of N40,000 in 1969, as one of the

TABLE 53.--Travel Experience and Adoption of Innovations Among Study Area Food Farmers, 1969

Travel Experience ^a	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
1 (most experienced)	0	1	1	0	0	2	4	1.50
2	0	0	3	2	1	6	12	2.67
3	0	2	5	2	1	10	20	2.20
4	0	3	9	2	0	14	28	1.93
5	0	4	12	2	0	18	36	1.89
6 (least experienced)	0	0	0	0	0	0	0	. .
Totals	0	10	30	8	2	50	100	2.04

^a1=travel to another region, Kumasi, Takoradi, Tamale, many other areas of Ghana and abroad; 2=to another region, Kumasi, Takoradi, Tamale and many other areas of Ghana; 3=to another region, Kumasi, Takoradi, and some other areas of Ghana; 4=to another region, Kumasi, and some other local places; 5=to another region and a few other local places; 6=only traveled in this region.

TABLE 54.--Radio Accessibility and Adoption of Innovations Among Study Area Food Farmers, 1969

Status	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Have radio	0	3	10	4	1	18	36	2.17
Have access	0	5	6	2	1	14	28	1.93
Have no radio and no access	0	2	14	2	0	18	36	2.00
Totals	0	10	30	8	2	50	100	2.04

TABLE 55.--Extension Services Contact and Adoption of Innovations Among Study Area Food Farmers, 1969

Extension Service Contact	Number of Inno- vations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
Cooperative Member Food Farmers								
Contact	0	5	22	8	2	37	74	2.19
No contact	0	0	4	0	0	4	8	2.00
Total Cooperative Members	0	5	26	8	2	41	82	
Non-Member Food Farmers								
Contact	0	0	2	0	0	2	4	2.00
No contact	0	5	2	0	0	7	14	1.29
Total Non-members	0	5	4	0	0	9	18	
Totals								
Contact	0	5	24	8	2	39	78	2.18
No contact	0	5	6	0	0	11	22	1.55
Totals	0	10	30	8	2	50	100	2.04

TABLE 56.--Formal Education and Adoption of Innovations Among Study Area Food Farmers, 1969

Formal Education Attempted	Number of Innovations Adopted					Farmer Totals		Innovation Index
	0	1	2	3	4	No.	%	
None	0	8	24	6	2	40	80	2.05
Primary	0	0	2	0	0	2	4	2.00
Middle	0	1	4	2	0	7	14	2.14
Advanced	0	1	0	0	0	1	2	1.00
Totals	0	10	30	8	2	50	100	2.04

most viable agricultural projects in the Southern Savanna. It was to produce cassava, tomatoes and other cash crops for commercial purposes on a projected 5,000 acres in 1969. Its 247 members were formed into 12 societies and a Union under Ghanaian rules for cooperative development. Despite problems of scarce water resources, inadequate inputs, and marketing, the Ada Cooperative offered hope of future economic success.

The impact of the Union upon 50 farmers including 41 of its own members was the highest among the four case studies. The Impact Index was 55.9 per cent. It along with the extension services and secondary farmer sources had influenced high adoption rates for tractors (100 per cent) and fertilizer (70 per cent). A factor analysis of the domestic characteristics of the sample provided a definition of the so-called "traditional farmer". A survey of food production showed the typical farmer grew a median of 10.0 acres on private farms, primarily

in cassava, tomatoes and other vegetables. Ninety-two per cent of the sample employed hired labor to overcome labor bottlenecks during the weeding season. Land tenure hewed close to tradition, with 94 per cent of the farmers working family (stool) land. The major source of capital was the sale of food crops (88 per cent). The greatest problems perceived in the study area were inadequate rainfall, pests, poor credit, and scarce seed. An average of 2.04 innovations had been adopted.

All four hypotheses were supported by the case study data.

FOOTNOTES--CHAPTER VI

¹See a review in Marvin P. Miracle and Ann Seidman, Agricultural Cooperatives and Quasi-Cooperatives in Ghana, 1951-1965 (Madison: Land Tenure Center, 1968).

²Ghana, Annual Report of the Registrar of Cooperative Societies, 1st July, 1966 through 31st June, 1967 (Accra: August, 1968), p. 1.

³See K. K. Apeadu, "Notes on the History of the Gold Coast Cooperative Movement" (Ministry of Agriculture, Accra: November, 1956); and Ghana Development Service Institute, Cooperatives (Accra: National Investment Bank (Ghana), 1964).

⁴Ghana, Ministry of Agriculture, Division of Economics and Statistics, Statistics of Large Scale, Specialized, Institutional, Cooperative and Young Farmers' League and Service Stations, 1965, op. cit.

⁵Ghana, Model Rules for a Cooperative Farming Society (Accra: Registrar of Cooperative Societies, 1969). This publication updates a similar one by the United Ghana Farmers' Council Cooperatives of 1962; and Ghana, "Agricultural Development Bank, Organization and Function" (Accra: 1968). The Agricultural Development Bank replaced the Agricultural Credit and Cooperative Bank which had been created in April, 1965.

⁶Ghana, Cooperative Societies Decree, 1968 (Decree 151; Accra: National Liberation Council, June, 1968).

⁷These were the most current data available at the time of writing: Ghana, Annual Report of the Registrar of Cooperative Societies, op. cit.

⁸See Ghana, Model Rules for a Cooperative Farming Society, op. cit. The Secretary is often more powerful because the President, Vice President, and Treasurer are frequently illiterates. The Secretary acts as the connecting link between Government and his cooperative. He must be literate to fulfill his responsibilities of correspondence, preparing an annual report, balance sheets, and statements of accounts. The Secretary is always a paid employee and not a member of the cooperative.

⁹Interviews with Gilbert Owusu and A. Amoah of the Agricultural Development Bank in Accra on several occasions during January through March, 1969.

¹⁰Mr. Zoglah's personal history was obtained from him in interviews on 10 and 21 April, 1969. The Federation of Food Farmers Cooperatives was an apex organization which was dissolved in 1969 because of mismanagement. The erst-while leader, Mr. Agyirey-Kwakye later formed the Federation of Food Farmers Association which was not a cooperative but a private company largely in the business of cocoa buying. Mr. Zoglah fell out with Mr. Agyirey-Kwakye in 1968 and the Ada Cooperative had no tie with the latter's private company.

¹¹The best tomato prices were paid by market women who would buy only in the off-season (October-June). The rate of N¢4.00 per six-pound crate was common in 1969. In contrast, Economic Industries and the State Canneries paid N¢1.80 per crate in the off-season and only N¢.40 per crate in July through September. In 1967 about 40 per cent of the Union crop was sold to Economic Industries, 20 per cent to State Canneries, 10 per cent to market women, and 30 per cent spoiled. Similarly low prices existed for other food crops at the two factories, for example fresh peppers (N¢.80 per 112 - pound bag), dry peppers (N¢.15 per pound), okro (N¢1.40 per 88 - pound bag), and bambara beans (N¢16.00 per 192 - pound bag).

¹²Interview with Mr. Laryea of the Agricultural Development Bank in Accra, 28 May, 1969.

¹³The Ada Cooperative bought tractors from the Ghana Consolidated Machinery and Trading Company, according to E. K. Buer, the Union's Mechanization Officer. Prices for equipment were high: tractors cost N¢3,600 for a Massey-Ferguson M-F 165, N¢860 for a trailer, N¢530 for a disc plow, and N¢500 for a harrow.

¹⁴In May, 1969, rates were tentatively set at N¢4.00 per acre for members conditional upon the plowing and harrowing of a minimum Union total of 2,000 acres over the major and minor seasons. If not achieved, members were to pay N¢5.00 plus 10 per cent of each member's gross profits at the time of harvest. Collections were to be put toward amortization of the loan.

¹⁵The writer attended parts of three Thursday meetings which lasted in each instance from about 10:00 AM until after sundown.

¹⁶Interviews with Tetteh Boako, Ada Foah, 16 and 21 April, 1969, and with A. Amoako, Sege, 14 April, 1969, of the Crop Production Division.

¹⁷Based on field interviews. In the Adangbe language bi means "house" and awe means "children." For example, Adibiawe means "the children of the house of Adi." Seven major ada lineages still maintain traditional houses in Big Ada, though the Adibiawe dominate the town.

¹⁸For an interesting review of Ada and other religious practices in the Southern Savanna see M. J. Field, Search for Security (London: Faber and Faber, 1960), pp. 90, and pari passim.

¹⁹Pogucki, op. cit., p. 18, Footnote 24, Chapter IV.

²⁰During the survey several farmers noted the problem of price-fixing by market women. This practice was also well known to the government which had not yet been successful in dealing with it. Interviews with Mr. Atta-Konadu, Ministry of Agriculture, on numerous occasions throughout the author's work in Ghana. See corroborative evidence in Eberhard Reusse and Rowena M. Lawson, "The Effect on Economic Development of Metropolitan Marketing--A Case Study of Food Retail Trade in Accra" (Department of Economics, University of Ghana, Legon, 1968). (Mimeographed); 15 pp.

CHAPTER VII

COMPARATIVE ANALYSIS

The purpose of this chapter is to provide a comparative analysis of the data presented in the four preceding case studies to allow a synthesis of observations. The analysis is divided into two sections: first, we will examine the collective data for the full sample of 192 farmers and assess the validity of the four hypotheses; and second, we will review the spatial variations from case to case.

Hypothesis Examination

The following hypotheses have been tested on the basis of data from the four case studies in the Southern Savanna of Ghana:

- (1) Scheme impact on small-acreage farmers is not inversely related to the micro-spatial distance between farmer and scheme.
- (2) The traditional farmer can be defined in terms of domestic characteristics (age, residence, years of farming, land tenure, household/family size and formal education) but not in terms of low productivity or lack of innovativeness.
- (3) Innovation among farmers is directly related to farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience and access to radios.
- (4) Formal education among farmers is not related to agricultural production or innovation.

The analyses of hypotheses by case study are presented in Table 57.

TABLE 57.--Hypothesis Support by Case Study

Hypothesis (short title)	Hypothesis supported by case study data? ^a			
	I State Farm (N = 50) ^b	II Workers' Brigade (N = 50) ^b	III Agricultural Research Station (N = 42) ^b	IV Ada Cooperative (N = 50) ^b All Cases (N = 192) ^b
1. Scheme Impact	weak	no	no	yes
2. Traditional Farmer	yes	yes	weak	yes
3. Innovative Farmer	weak	weak	weak	yes
4. Formal Education	yes	yes	yes	yes

^aKey to Responses: Yes = hypothesis supported; No = hypothesis not supported; Weak = data is inconclusive or only weakly supports hypothesis.

^bTabular hypothesis analyses of the individual case studies are found in Table 9 (State Farm), Table 22 (Workers' Brigade), Table 36 (Agricultural Research Station), and Table 48 (Ada Cooperative). A tabular hypothesis analysis of all case study data is presented in Table 58.

All four hypotheses are supported using data for the full sample of 192 food farmers in the four case study areas. The tabular hypothesis analysis for all cases is presented in Table 58. Analyses of hypotheses are discussed in the following subsections.

Scheme Impact

Scheme impact was measured by use of the Impact Index. This assessed the farmer's perception of the scheme and his participation in its activities such as demonstration farming, training and extension services. Table 58 shows that for the full sample of 192 farmers the hypothesis was supported: there was no inverse relationship between scheme impact and the micro-spatial distance between farmer and scheme ($r = .139$). However, this conclusion must be qualified as follows:

(a) impact was based on the perception of farmers in the micro-spatial context, a one-day, round-trip, maximum walking distance between farmer and scheme, not in a regional context; (b) the schemes examined generally had relatively limited impact on farmers, thus, we do not know what the impact-distance relationship might have been had the schemes been more influential; and (c) there was in fact some slight but observable "neighborhood effect" in the Workers' Brigade and Agricultural Research Station case study areas.

A multiple regression was run using the Impact Index as the dependent variable. This and nine other selected key variables are presented in a simple correlation matrix in Table 59. The regression indicates that only 24% of total variance ($r^2=0.2409$) was explained by the following three variables:

TABLE 58.--Tabular Hypothesis Analysis All Cases (N = 192)

Hypotheses (Short Title) and Variables	Variable Number	Correla- tion (r) ^a	Factor Analysis		Hypothesis Supported?
			Factor 1	Factor 2	
					Subsets Sets
1. Scheme Impact					yes
(a) Perception-Partici- pation (Impact Index) and Micro-Spatial Distance	82	.139	--	--	yes
11					
2. Traditional Farmer					yes
(a) Domestic Characteristics					
(1) Age	1		.5040	.0797	yes
(2) Years Resident	9		.5430	-.0972	yes
(3) Years Farmer	10		.5477	-.0877	yes
(4) Household Size	13		.5248	-.0775	yes
(5) Number Wives	14		.4666	-.0253	yes
(6) Number Children	16		.5332	-.0193	yes
(7) Formal Education	51		-.3151	.2573	yes
(8) Stool Land Tenure	83		.3100	-.3320	yes
(b) Productivity Characteristics					
(1) Acres Savanna Crops	31		.6634	.3797	yes
(2) Acres Cassava	32		.7550	.0023	yes
(3) Acres Tomatoes	36		.6749	-.0110	yes
(4) Acres Vegetables	37		.6820	.2317	yes
(c) Innovation	50		.6626	-.0236	yes

Hypotheses (Short Title) and Variables	Variable Number	Correla- tion (r) ^a	Factor Analysis		Hypothesis Supported?
			Factor 1	Factor 2	
					Subsets Sets
3. Innovative Farmer (a) Innovation and Productivity	50	.377	--	--	yes
(b) Innovation and Impact	31 50	.444	--	--	yes
(c) Innovation and Extension Contact	82 50	.338	--	--	yes
(d) Innovation and Travel	81 50	.273	--	--	yes
(e) Innovation and Radio	77 50 78	.206	--	--	yes
4. Formal Education (a) Education Index and Productivity	51 31	-.125	--	--	yes
(b) Education Index and Innovation	51 50	-.012	--	--	yes

^aThese data have not been demonstrated to be normally distributed, therefore, tests of statistical significance cannot appropriately be applied.

TABLE 59. Simple Correlation Matrix for Ten Key Variables (N = 192)

Variables ^a	1	2	3	4	5	6	7	8	9	10
1 AGE	1.000									
2 DISTANCE	.156	1.000								
3 RECHOME	.433	.072	1.000							
4 PERSHOUS	.333	.159	.283	1.000						
5 ACREAGE	.290	.146	.120	.227	1.000					
6 INNOVATE	.113	.190	-.015	.238	.377	1.000				
7 EDUCATIN	-.352	-.113	-.208	-.208	-.125	-.012	1.000			
8 TRAVELIN	-.030	.182	.066	.110	.166	.273	.328	1.000		
9 RADIOIN	-.101	.045	-.081	-.011	.129	.206	.288	.134	1.000	
10 IMPACTIN	-.066	.139	.101	.230	.140	.444	-.029	.187	.102	1.000

^aAGE = age of farmer; DISTANCE = distance between farmer home and scheme office; RECHOME = household head occupancy responsibility for room, house or compound; PERSHOUS = persons in household; ACREAGE = total acreage planted in savanna crops; INNOVATE = number of innovations adopted (Innovation Index); EDUCATIN = Education Index; TRAVELIN = Travel Index; RADIOIN = Radio Index; and IMPACTIN = Impact Index.

(1)	Number of innovations	(INNOVATE)
(2)	Persons per household	(PERSHOUS)
(3)	Farmer age	(AGE)

This means that the farmers most influenced by the scheme were those who were most innovative, had relatively larger households and were of relatively more advanced age. This observation was supported by empirical evidence in each of the four case studies. However, the fact that 76 per cent of the variance was not explained by the three variables means that much of the impact of schemes was dependent upon variables outside the purview of this study. The results constitute only a partial explanation and should be interpreted with caution.

The Traditional Farmer

A common view in developing countries is that the so-called traditional, small-acreage farmer is the principal operative in any program of agricultural growth. Yet, paradoxically, he is at once seen as conservative, subsistence-oriented, unproductive, unchanging or even unchangeable. In this thesis an effort has been made to get at a functional definition of such a farmer. The hypothesis is posited that the traditional farmer cannot be defined only on the basis of domestic characteristics (age, household size, education, etc.), since productivity and levels of innovation may be significant among food farmers.

Factor analysis has been employed to obtain a definition of the traditional farmer. Data on the domestic, productivity and innovation characteristics of the 50 farmers are analyzed in Table 58. If the hypothesis is correct factor analysis should reveal (a) a grouping

together in a common factor of high factor scores for domestic characteristics, and (b) a grouping together in the same factor of high factor scores for characteristics of productivity and innovation. Table 58 shows that Factor 1, the factor with the greatest proportion of total variance, meets the above-stated conditions.

On the basis of these data the traditional farmer is one who may be defined as of advanced age, who has a large household, consisting of many wives and children, and many years of farming experience and residence in a given locale, and one who enjoys the advantages of the land tenure of his lineage. However, he is not necessarily unproductive nor innovative. In the Southern Savanna it has been observed that the traditional farmer, so defined, was indeed, productive and innovative.

The Innovative Farmer

Farmer innovativeness was measured by use of the Innovation Index, i.e. simply the mean innovations per farmer. Innovations surveyed were adoption of the use of the tractor, fertilizer, improved seeds or seedlings, and weedicides/insecticides. Among the sample of 192 farmers innovations adopted totaled 252, an average of 1.31 innovations per farmer.

The third hypothesis postulates that innovation among farmers is directly related to measures of farmer productivity, susceptibility to scheme impact, and extension service contact, travel experience and radio access. The hypothesis is substantially supported by the data presented in Table 58. There is a positive, direct correlation between

innovation and each of the five variables. Coefficients for impact ($r = .444$) and productivity ($r = .377$) are the strongest.

In the following tables innovation has been compared with indices of travel (Table 60), radio accessibility (Table 61), and extension service contact (Table 62). The most innovative farmer tended to have more travel experience, greater access to radio communication and a higher rate of extension service contact. Chi-squared tests show that the variances cannot be explained by chance ($p = <0.01$).

To explain the variance in innovation a multiple regression was run using the Innovation Index as the dependent variable with nine other selected key variables, presented in the simple correlation matrix in Table 59. Only 33 per cent of the total variance ($r^2 = 0.3324$) was explained by the following four independent variables:

- | | |
|-----------------------|------------|
| (1) Farmer acreage | (ACREAGE) |
| (2) Scheme impact | (IMPACTIN) |
| (3) Travel experience | (TRAVELIN) |
| (4) Radio access | (RADIOIN) |

The most innovative farmer was one with the greatest number of acres planted, experienced the greatest scheme impact, and had the most travel experience and accessibility to radio communication. However, the fact that 67 per cent of the variance was not explained by these four variables means that much of the innovation of farmers was dependent upon variables outside the purview of this study. Thus, the regression results offer only a partial explanation and must be interpreted cautiously.

Formal Education

The fourth hypothesis states that formal education is not related to agricultural productivity or innovation. Table 58 demonstrates that

TABLE 60.--Travel Index

Travel Index	Percentages	N	Number of Innovations	Innovation Index ^a
1 (most experienced)	8	15	31	2.07
2	9	18	30	1.67
3	15	28	42	1.50
4	23	44	53	1.20
5	36	69	82	1.19
6	8	15	12	0.80
7 (least experienced)	1	3	2	0.67
Average Totals	100	192	252	1.31

^a $\chi = 107$, $df = 6$, $p = < 0.001$.

TABLE 61.--Radio Index

Status	Percentages	N	Number of Innovations	Innovation Index ^a
Have radio	40	76	121	1.59
Have access	33	63	74	1.17
Have no radio and no access	27	53	57	1.08
Averages				1.31
Totals	100	192	252	

^a $\chi = 11$, $df = 2$, $p = < 0.01$

TABLE 62.--Extension Service Contact and Innovation

Extension Service Contact	Percentages	N	Number of Innovations	Innovation Index ^a
Contact	64	122	193	1.58
No contact	36	70	59	0.84
Average				1.31
Totals	100	192	252	

$$\chi^2 = 23, df = 1, p = <0.001$$

the formal education hypothesis as supported by the data for 192 food farmers. The Education Index, based on the number of years of formal education, shows no correlation with innovation ($r = -.012$) or productivity ($r = -.125$).

Table 59 shows some interesting though not expected relationships with other variables. Formal education is positively correlated with travel experience ($r = .328$) and radio accessibility ($r = .288$) and negatively correlated with age ($r = -.352$), household head occupance responsibility ($r = -.208$) and persons per household ($r = -.208$).

Table 63 shows that the most innovative farmers were those without any formal education. The table indicates that there is little variance in innovation among the categories of formal education, when those farmers with specialized agricultural training are excluded from the sample. Farmers with specialized training in agriculture unsurprisingly are most innovative. On the basis of this evidence it would

TABLE 63.--Education Index

Formal Education Begun	Percentages	N	Number of Innovations	Innovation Index
None	61	118	164	1.39
Primary	9	17	12	0.71
Middle	23	45	53	1.18
Advanced: non-agricultural	3	5	5	1.00
Subtotal	96	185	234	1.26
Advanced: agricultural ^a	4	7	18	2.57
Total	100	192	252	1.31

^aCompleted post-high school agricultural training at the Agricultural College, Kwadaso, Kumasi.

appear that formal education is not a necessary condition for agricultural innovation or production.

Spatial Variations

This section of our comparative analysis is concerned with the spatial variations of the data from case to case. Variations in scheme impact and farmer characteristics and innovation will be studied in the following subsections.

Differential Scheme Impact

Considerable variation in scheme impact was observed from case to case. The Ada Cooperative and the Agricultural Research Station

had the greatest impact on Farmers, with Impact Indices of 55.9 per cent and 37.9 per cent, respectively (Table 64). The influence of these indigenous Ghanaian schemes was significantly greater ($p = 0.001$) than the Impact Indices of 10.4 per cent and 14.5 per cent for the Workers' Brigade and State Farm schemes, respectively. In the former cases there were greater efforts to extend the influence of the schemes. For the Research Station, extension was an integral part of the work in animal husbandry. In the case of the Ada Cooperative, the extension services of the Ministry of Agriculture used the scheme as a vehicle for its work in the Ada area. In fact, Cooperative members were the primary recipients of extension services among food farmers around Ada.

In contrast, the State Farm and Workers' Brigade lacked effective relationships with the extension services in their areas. These two schemes operated largely independently of surrounding farmers, were seldom visited by local farmers and only infrequently marketed produce locally.

When viewed in the context of other change agents the schemes were generally less influential than the extension services and secondary farmer sources. Table 65 demonstrates this. Though 33 per cent of the farmers were influenced in innovation adoption, only six per cent perceived the scheme as the major source of influence in this process.

The Ministry of Agriculture's extension services were the most significant change agents in three of the case studies. The exception was the Ada Cooperative case in which the Cooperative was the most

TABLE 64.--Comparative Impact Index

Scheme	Farmer N	Impact Index ^a
		Percentage
1. Afife-Weta State Farm	40	14.5
2. Somanya Workers' Brigade Farm	39	10.4
3. Nungua Agricultural Research Station	40	37.9
4. Ada Cooperative Food Farmers' Union	41 ^b	55.9
Total Average	160	29.7

^a $\chi^2 = 45.6$, $df = 3$, $p = < 0.001$.

^bMembers of scheme only.

TABLE 65.--Perceived Major Sources of Influence on Innovations

Case Study	Total Farmers Influ- enced ^a	Sources of Influence on Innovation			
		Scheme	Extension	Secondary	Other
Percentages					
Afife-Weta State Farm (N=50)	22.5	0.5	11.5	3.0	7.5 ^b
Workers' Brigade Farm (N=50)	19.5	0.0	10.0	3.5	6.0 ^c
Agricultural Research Station (N=42)	41.7	4.2	25.6	11.9	. .
Ada Cooperative (N=50)	51.0	20.0	12.5	18.5	. .
Average (N=192)	33.0	6.0	14.4	9.1	3.5

^a $\chi^2 = 22.3$, $df = 3$, $p = <0.001$.

^b Pioneer Tobacco Company.

^c Sugar Factory and Cooperatives of the State Sugar Products Corporation.

important. Eighty-two per cent of the Cooperative case sample were scheme members. Adoption rates were highest in cases where scheme impacts were greatest. The total variation in percentage of farmers influenced from study area to study area could not be explained by chance alone ($p = < 0.001$).

Farmer Characteristics and Innovation

Farmer characteristics varied little among the case studies. For the full sample of 192 farmers the means were: 48.2 years of age, 35.4 years of residence, 29.0 years of farming experience, 12.0 persons per household consisting of 1.6 wives and 6.7 children of whom 4.6 were living at home. The mean number of school age children (six years and older) was 4.7 of whom 67 per cent had received some formal education. A pattern of a relatively mature and established farming population typified each of the case study areas.

In contrast agricultural production¹ and innovation among food farmers varied considerably from case to case in the Southern Savanna. In the State Farm and Workers' Brigade study areas median acreages approximated those found throughout much of Ghana, averaging 2.0 and 3.1 acres planted per farmer (Table 66). Significantly greater were the median acreages in the study areas of the Research Station (7.0)

TABLE 66.--Acreage and Intercropping

Case Study	Acreage		Farmers Intercropping ^b
	Mean	Mediana	Percentages
Afife-Weta State Farm (N=50)	3.8	2.0	60
Somanya Workers' Brigade Farm (N=50)	4.8	3.1	48
Nungua Agricultural Research Station (N=42)	11.1	7.0	17
Ada Cooperative Food Farmers' Union (N=50)	11.3	10.0	6
Average (N=192)	6.4	5.5	33

^a $\chi = 73.9$, $df = 3$, $p = < 0.001$.

^b $\chi = 58.6$, $df = 3$, $p = < 0.001$.

and the Ada Cooperative (10.0). The variance is beyond the realm of chance occurrence ($p = < 0.001$). It is also interesting to note that there was a significant inverse relationship between acreage and the rate of intercropping among farmers ($p = < 0.001$). It could not be established whether the impact of tractor utilization, extension service contact or some other factor resulted in the most productive farmers being the least likely to practice intercropping.

Among the 192 food farmers 91 per cent raised cassava, 69 per cent grew vegetables such as tomatoes, peppers, okro, garden eggs and onions, and 49 per cent raised maize. This pattern was repeated in each of the cases, except for maize which was especially popular among the Ewe. Most farmers cropped only during the first of two rainy seasons, since precipitation was irregular and normally inadequate during the second. The wisdom of this choice was supported by the rainfall and water balance data presented earlier (Figure 4). Rainfall irregularity/inadequate water supply was perceived as the most serious problem in the relatively drier State Farm and Cooperative study areas in the eastern part of the Southern Savanna.

Inadequate credit was perceived by farmers as the most serious problem in the Workers' Brigade and Research Station study areas. It of course, remained an endemic difficulty in the Southern Savanna as it does throughout Ghana. The sale of crops and accruing savings was the major source of capital in every case study. Cattle sales was only important among cattle-owning food farmers in the Research Station study area. Capital provided a means of purchasing farming inputs

and a buffer against environmental risks. Only three farmers of 192, in the State Farm case, professed no participation in the money economy.

Another way of decreasing risk was to overcome labor bottlenecks by use of the tractor and hired labor. Tractors were used by two-thirds (67 per cent) of the sample of 192 and hired labor by 83 per cent. The former was used almost exclusively for land preparation (plowing and harrowing). Hired help was sought especially during the period of cultivation for the labor intensive weeding task.

Innovation adoption rates varied significantly from innovation to innovation and from case to case. This is demonstrated in Table 67. Rates were significantly higher for adoption of the tractor (67 per cent) and fertilizer (40 per cent) than for improved seed (14 per cent) and insecticides/weedicides (11 per cent) ($p = < 0.001$). The rates of adoption of the tractor and fertilizer were higher in the Ada Cooperative and Research Station study areas than in the Workers' Brigade and State Farm study areas ($p = < 0.001$).

In sum, one is struck by the regional diversity in patterns of production and innovation despite regional similarity in patterns of farmer characteristics, crops and perception of problems in the Southern Savanna.

TABLE 67.--Innovation Adoption Rates

Case Study	Use of Tractor ^a	Use of Fertilizer ^b	Use of Improved Seed ^c	Use of Insecticide/weedicide ^d
	Percentages			
Afife-Weta State Farm (N=50)	46	18	22	2
Somanya Workers' Brigade Farm (N=50)	30	20	12	10
Nungua Agricultural Research Station (N=42)	95	55	12	7
Ada Cooperative Food Farmers' Union (N=50)	100	70	10	24
Average (N=192) ^e	67	40	14	11

^a $\chi^2 = 55.0$, $df = 3$, $p = <0.001$.

^b $\chi^2 = 70.2$, $df = 3$, $p = <0.001$.

^c $\chi^2 = 6.3$, $df = 3$, $p = <0.05$ (not significant).

^d $\chi^2 = 10.4$, $df = 3$, $p = <0.02$.

^e $\chi^2 = 33.6$, $df = 3$, $p = <0.001$.

CHAPTER VII--FOOTNOTES

¹Productivity, for purposes of this study, was measured in terms of acreage planted in food crops, not in terms of yield. Acreage and yield may be directly related, however, whether this is so or not is not important here since both require farmer investment in time, labor and money. In point of fact, increasing acreage is probably practiced as much to create a buffer against environmental risk as to maximize profits.

CHAPTER VIII

CONCLUSIONS

During the 1960's Ghana attempted to accelerate agricultural development by establishing large-scale agricultural schemes. Though the economy was largely dependent on the agricultural sector, with 60 per cent of the labor force, 50 per cent of gross domestic product, and 70 per cent of value of exports, food crop production did not even keep pace with the rate of population increase of 2.5 per cent - 3.0 per cent per annum. About 99 per cent of all food crops were produced on peasant farms averaging two to three acres in size.

Under the Presidency of Dr. Kwame Nkrumah an attempt was made to take away control of food production from peasant farmers and place it in state-run, large-scale schemes. Some 123 Soviet-style State Farms and 40 Israeli-inspired Workers' Brigades were primary among the schemes formed by 1965. Unfortunately, their collective impact on food production was marginal.

Implicit in Nkrumah's agricultural revolution was the assumption that illiterate food farmers were too unproductive and too traditional in their ways to provide the basis for national agricultural development. Schemes were viewed as an alternative to increase production and at the same time demonstrate modern farming to local farmers

The purposes of this research were (a) to measure the differential impact of four schemes on small-acreage farmers, (b) to define the traditional farmer in terms of domestic and productivity factors, (c) to determine what factors influence the most innovative and productive farmers, and (d) to assess whether illiteracy inhibits innovation and production. Four hypotheses based on these purposes are tested in each case study and collectively.

Data were collected in a spatially discrete region: the Southern Savanna of Ghana (Figure 1). The study was based on a sample of 192 food farmers on and around four different types of agricultural development schemes: (a) the Afife-Weta State Farm, (b) the Somanya Workers' Brigade Farm, (c) the Nungua Agricultural Research Station of the University of Ghana, and (d) the Ada Cooperative Food Farmers Union.

Conclusions

The following conclusions are based on the survey data:

Scheme Impact

Scheme impact was measured using the Impact Index, based on local farmer perception of and participation in scheme activities. As hypothesized there was no inverse relationship between scheme impact and distance between farmer and scheme. Thus, there appeared to be limited "neighborhood effect" of schemes on local farmers. Scheme impact generally was less important in influencing innovation among food farmers than extension services and secondary farmer sources. Farmers most influenced by the schemes were the most innovative, had the largest households and

were more advanced in age, though only 24 per cent of variance was explained by these factors in regression analysis. Schemes appear to possess the potential for effecting agricultural development through both increased production and demonstration effect. The same can be said of extension services. Schemes studied in the Southern Savanna, with the most active extension programs, had the greatest impact. In combination, schemes and extension services might produce synergistic gains.

The Traditional Farmer

Factor analysis of case study data reinforces the view that the traditional farmer is of advanced age, has a large household consisting of many wives and children, has many years of farming experience and residence in a single locale, and enjoys the advantages of the land tenure of his lineage. As hypothesized he is not necessarily unproductive nor uninnovative. In the Southern Savanna, it was observed that the traditional farmer, so defined, was on the contrary, productive and innovative.

The Innovative Farmer

Reasonably strong positive correlations were found between innovation and productivity, in terms of acres planted ($r = .377$), and susceptibility to scheme influences ($r = .444$), as hypothesized. The innovative farmer also tended to have more travel experience, greater access to radio communication and a higher rate of extension service contact. However, in regression analysis, acreage, scheme impact,

travel and radio factors explained only 33 per cent of variance. Innovation and production appear to covary and do not share a casual relationship. This fact might suggest a basis for determination of a target population for extension services.

From case to case, farmer domestic characteristics, crops, and perceived problems varied little, but adoption rates and per farmer acreages showed significant variations. Innovation rates and acreage averages were lowest around the Workers' Brigade and State Farm. These case study areas were probably more reflective of conditions found in Ghana as a whole, averaging 2.0 and 3.1 acres planted per farmer. These medians contrasted with those found around the Research Station (7.0) and the Ada Cooperative (10.0). There was also an inverse correlation between acreage and intercropping; but the reasons for this were not clear.

The major problems perceived by the farmers were rainfall irregularity/water supply and lack of credit. The first of these was most important in the drier areas of the savanna. Credit was an endemic problem. The major source of capital in each case study was the sale of crops and accruing savings. Money was seen as a buffer against environmental risks. Another means of decreasing risk among farmers was to overcome labor bottlenecks by use of the tractor for land preparation (67 per cent of 192 farmers) and use of hired labor for weeding (83 per cent).

Formal Education

On the basis of the evidence it would appear that formal education is not a necessary condition for agricultural innovation and production. There was little variance in innovation by level of formal education. The exceptions were those farmers with specialized agricultural training. Innovation is not necessarily the domain of the young and educated; in fact, the older illiterate farmers were the most innovative among the sample.

Policy Implications

It would be inappropriate to draw policy implications solely on the basis of this research. Within Ghana agricultural conditions vary spatially to a considerable degree. Neither the Southern Savanna region nor the sample of farmers may necessarily be typical of the country as a whole. If any generalization seems apropos it is that agricultural development depends very much on understanding the details of the individual case. However, a number of implications seem to emerge from the case studies for purposes of structuring further research or in formulating policy:

- (1) Large-scale agricultural schemes in Ghana seem to have had an unexploited potential for promoting agricultural development. The notable relationship between innovation and both scheme impact and extension service contact, might suggest consideration of joint scheme-extension programs for farmers. Schemes can be vehicles for extension.
- (2) Planners must not lose sight of the need for integrating schemes with the localities to maximize their utility for overall agricultural development. The externally-funded schemes focussed on in this research unfortunately did not initially do this.

- (3) Since the most productive farmers are likely to be the most innovative and the most susceptible to scheme influences, development programs should be targeted on these farmers.
- (4) In the micro-spatial context, scheme-based extension programs will not be limited in impact to the close-in farmers.
- (5) The traditional farmer is not necessarily conservative, subsistence-oriented, uninnovative or unproductive, and thus should be considered a major element in an agricultural development program.
- (6) Since a majority of the farming population are mature and illiterate, agricultural development programs should not skew emphasis to the younger, educated farmers.
- (7) If formal education is not a necessary condition for agricultural development, there is little reason to avoid illiterate farmers in agricultural training and extension programs.
- (8) The substantial variance in innovation and production within a region of similar farmer characteristics, crops and problems, may suggest that the major difficulty facing agricultural development in Ghana is not getting farmers to produce and innovate, but providing the proper inputs, credit and infrastructural support.
- (9) Planners should not be distracted from the fundamental tasks of overcoming risk factors in the farming environment, such as scarcity of credit and inputs and inadequate irrigation facilities.

Further research on rural environments should be integrated with the government decision-making process. Government should take an active rather than a passive role. In this connection the work of the type carried on by the Institute of Statistical, Social and Economic Research (ISSER) at the University of Ghana is to be commended. Further research is needed on the impact of risk reduction, the influence of differential credit among farmers, the utility of adult education and/or agricultural training for farmers, and reasons for cooperative

success and failure. Useful research in combination with capable leadership among those making decisions will provide important keys to rural development in Ghana.

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APPENDIX A

QUESTIONNAIRE FOR FARMERS

APPENDIX A
QUESTIONNAIRE FOR FARMERS

INTERVIEW CHARACTERISTICS

1. Code Number _____
2. Place of Interview _____
3. Language of Interview _____
4. Interview Distractions (if any) _____
5. Date _____

FARMER CHARACTERISTICS

6. How many years old are you? _____
7. What is your first language? _____
8. What is your hometown? _____
9. When were you last in your hometown? _____
10. When do you normally return to your hometown? _____
11. Where do you live now? _____
12. How many years/months have you lived where you live now? _____
13. How many years/months have you farmed in this area? _____
14. How far (in miles, etc.) is your present homre from the "scheme" (State Farm, etc.)? _____
15. Do you live in your own room, house, or compound? _____
16. Of what is you house constructed? _____
17. How many people live in your household at present?
 - (a) Total? _____
 - (b) Wives? _____
 - (c) Children? _____
 - (d) Grandchildren? _____
 - (e) Other? _____
18. How many of your children have gone or are going to school?

	Past	Present
(a) Secondary school	_____	_____
(b) Middle school	_____	_____
(c) Primary school	_____	_____
(d) No schooling	_____	_____
19. What is/are your religion(s)? _____

FARMER PRODUCTION, DISTRIBUTION AND CONSUMPTION

20. Do you work for the "Scheme"?

No _____ (If no, skip to Question 24.)
 Yes _____

21. What is your job title? _____
22. How many years/months have you worked for the "scheme"? _____
23. Do you plan to continue working for the "Scheme in the future?" _____
24. Do you have a farm/farms of your own? _____
 No _____ (If no, skip to Question 50.)
 Yes _____
25. Where is/are your farm(s) located?
 (1) _____ (2) _____
 (3) _____ (4) _____
26. What do you raise on your farm(s)?
- | Product | Acres
(this year) | Yield
(last year) | Prices
(last year) | Comments |
|------------|----------------------|----------------------|-----------------------|----------|
| Cassava | _____ | _____ | _____ | _____ |
| Rice | _____ | _____ | _____ | _____ |
| Maize | _____ | _____ | _____ | _____ |
| Sugar Cane | _____ | _____ | _____ | _____ |
| Groundnuts | _____ | _____ | _____ | _____ |
| Cattle | _____ | _____ | _____ | _____ |
| Other | _____ | _____ | _____ | _____ |
| Livestock | _____ | _____ | _____ | _____ |
| Vegetables | _____ | _____ | _____ | _____ |
| (Specify) | _____ | _____ | _____ | _____ |
| Other | _____ | _____ | _____ | _____ |
27. When do you usually work on your farm(s) during the growing season?
 Hours: Morning _____ Afternoon _____
 Days: Mon _____ Tue _____ Wed _____ Thurs _____ Fri _____ Sat _____ Sun _____
28. When do you plant (p) and harvest (h) your crops?
 (Abbreviations: Cassava (C), Maize (M), etc.)
 Jan _____ Feb _____ Mar _____ Apr _____ May _____ June _____ July _____ Aug _____ Sep _____
 Oct _____ Nov _____ Dec _____
29. How did you obtain the use of you land? _____
 Stole land (no permission needed)1
 Chief gave permission2
 Family owns the land.....3
 Land rented/hired.....4
 Other.....5
30. If you were to divide your total production into ten parts, what part of the total would you estimate is consumed by your household?
 (If 100%, skip to Question 35.) _____ %
31. What part would you estimate you sell? _____ %
32. What part is lost through spillage/infestation or remains unharvested?
 Spoilage/infestation _____ %
 Unharvested _____ %

33. Where do you market your products?

Market	Crops	Comment
_____	_____	_____
_____	_____	_____
_____	_____	_____

34. What form of transport do you use? (Specify season.)

Foot _____ Lorry _____ Tractor _____
Other _____

35. Where do you get the money you need to do your farming (specify) _____

Sale of crops/savings.....1 _____
Family/friends.....2 _____
Cooperative Society.....3 _____
Bank.....4 _____
Other.....5 _____

36. Have you ever had experience using agricultural credit?

No _____ (If no, skip to Question 39.)

Yes _____

37. Do you plan to continue using this same source of credit? (State reason.)

No _____

Yes _____

38. Name the source(s) of your credit _____

39. What and how many people work for you on your farm(s)?

	Number	Task	Total
(a) Yourself	0 or 1	_____	_____
(b) Hired Labor	_____	_____	_____
(c) Wives	_____	_____	_____
(d) Children	_____	_____	_____
(e) Others	_____	_____	_____

40. If you employ hired labor, on what basis do you select them (ethnicity, rate, rate, etc.)? _____

41. What levels of education have you completed?

(Specify school(s) Highest Level _____
Special Course/University....1 _____
Secondary School.....2 _____
Middle School.....3 _____
Primary School.....4 _____
None.....5 _____

42. Have you had any specialized training in agriculture?

Yes _____ No _____ Specify _____

43. Have you recently adopted any new techniques or new ideas in agriculture? (If no, skip to Question 46.)

No _____ Yes _____

44. Describe these new agricultural ideas and indicate the source of influence that led you to adopt it/them.

Idea	Description	Source
Tractor	_____	_____
Fertilizer	_____	_____
Improved Seed	_____	_____
Weedicide/Insecticide	_____	_____
Dams/Irrigation	_____	_____
Tick Spray	_____	_____
New Breed/Service Bulls	_____	_____
Other	_____	_____

45. Have you discontinued using any of these new ideas after initially adopting them? Why?

No _____
 Yes _____

FARMER PERCEPTIONS OF PROBLEMS AND EXPERIENCE

46. What serious problems do you have with farming? (Record in order given and varify the most serious problem the interviewee feels he has.)

Problem	Explanation/order
Planting/Weeding/Harvesting	_____
Labor Supply	_____
Credit/Money	_____
Equipment/Tools/Machinery	_____
Transportation/Marketing	_____
Water Supply	_____
Knowledge/Training	_____
Soil Fertility	_____
Other	_____

47. Who is responsible for solving these problems? _____

"Government".....1
 Scheme Management.....2
 Extension Officers.....3
 Research/Univ. People...4
 Oneself.....5
 Others.....6 (Specify) _____

48. What should be done to solve these problems? _____

49. Do you plan to continue farming? Explain.

No _____
 Yes _____

50. Where have you traveled? (Specify places and frequency)

Places	Examples	Frequency
Outside Ghana	_____	_____
Outside Region	_____	_____
To Tamale	_____	_____
To Takeradi	_____	_____
To Kumasi	_____	_____
To Accra	_____	_____
Local Places	_____	_____

51. Why do (did) you normally travel to these places? _____
52. Do you own a radio which works? (If yes, skip to Question 54.)
No _____ Yes _____
53. Do you have access to a radio which works (If no, skip to Question 55.) No. _____ Yes _____
54. What broadcasts of interest to farmers have you heard?
(Specify subjects and language of broadcast.) _____
55. Do you believe that the work of the "Scheme" has or will
benefit you as a farmer? (Explain.)
No _____
Yes _____
56. What do you believe is the most important contribution of the
"Scheme" to you and to the people of this area? _____
57. Do you think that the "Scheme" should be continued?
No _____
Yes _____
58. Have you talked to an extension officer about your farming
activities or problems? (Specify officer, extension office,
nature of discussion.)
No _____
Yes _____
Specifics _____

FARMER ATTITUDES

(Questions under this heading were discarded after a two-week protest, primarily because "Farmer Attitudes" is a discrete subject which would have required considerably more attention, probably as a separate topic, than there was time or resources to devote to it in this survey.

APPENDIX B

VARIABLES

APPENDIX B

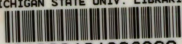
VARIABLES

Number	Code	Description
1	1/6-8	Age
2	1/9	Ga ethnic group
3	1/10	Krobo Adangbe ethnic group
4	1/11	Ewe ethnic group
5	1/12	Ada Adangbe ethnic group
6	1/13	Akan ethnic group
7	1/14	Fulani ethnic group
8	1/15	Other ethnic group
9	1/16-17	Years resident at present residence
10	1/18-19	Years experience as a farmer
11	1/20-21	Tenths of miles from scheme office to farmer home
12	1/22	Room = 1, house = 2, compound = 3 occupancy
13	1/23-24	Persons in household
14	1/25-26	Number of wives
15	1/27-28	Number of wives living in household
16	1/29-30	Number of children
17	1/31-32	Number of children living in household
18	1/33-34	Number of school age children (6 yrs. or more)
19	1/35-36	Number of Children with at least past secondary school education
20	1/37-38	Number of children now in secondary school
21	1/39-40	Number of children with at least past primary school education
22	1/41-42	Number of children now in primary or middle school
23	1/43-44	Number of school age children with no schooling
24	1/47	Employed by scheme: yes = 1, no = 0
25	1/49-50	Number of years worked for scheme
26	1/52	Number of farms run
27	1/53-54	Tenths of miles from farmer home to furthest farm
28	1/55-56	Tenths of miles from farmer home to nearest farm
29	1/57-58	Number of cattle raised
30	1/62-64	Number of forest acres farmed
31	1/65-67	Number of savanna acres farmed
32	1/68-69	Number of acres of cassava farmed
33	1/70-71	Number of maize acres farmed
34	1/72-73	Number of yams acres farmed
35	1/74-75	Number of sugar cane acres farmed
36	1/76-77	Number of tomato acres farmed
37	1/78-79	Number of other (vegetable) acres farmed
38	2/8-9	Estimated number of additional acres to be planted

39	2/8-9	Number of additional savanna acres of cooperative farmed
40	2/11	Crop sales/savings = major source of capital: Yes = 1, no = 0
41	2/12	Animal sales = major source of capital
42	2/13	Personal/market loans = major source of capital
43	2/14	Bank loans - major source of capital
44	2/15	Job wages = major source of capital
45	2/16	Do you do food farm work yourself? yes = 1, no = 0
46	2/17	Do you use family labor?
47	2/18	Number of permanent hired laborers
48	2/19-20	Number of part-time hired laborers
49	2/21	Farm Food crops? Yes = 1, no = 0
50	2/22	Innovation Index: Number of agricultural innovations adopted
51	2/23	Education Index: Level of formal education begun? None = 0, primary = 4, middle = 7, secondary or other advanced = 9
52	2/24	Advanced specialized training in agriculture: yes = 1, no = 0.
53	2/25	Adopted use of fertilizer; yes = 1, no = 0
54	2/26	Adopted use of improved seed
55	2/27	Adopted use of insecticide/weedicide
56	2/28	Adopted use of tractor
57-60		(variables discarded)
61	2/33	Have problem with insects/rodents/other pests: yes = 1, no = 0
62	2/34	First problem is insects/rodents/other pests: yes = 1, no = 0
63	2/35	Have problem with rainfall irregularity and/or water supply
64	2/36	First problem is rainfall irregularity and/or water supply
65	2/37	Have problem with transportation/roads
66	2/38	First problem is transportation/roads
67	2/39	Have problem with animal diseases
68	2/40	First problem is animal diseases
69	2/41	Have problem with fertilizer scarcity
70	2/42	First problem is fertilizer scarcity
71	2/43	Have problem with tractor scarcity
72	2/44	First problem is tractor scarcity
73	2/45	Have problem with labor supply
74	2/46	First problem is labor supply
75	2/47	Have problem with credit/money
76	2/48	First problem is credit/money
77	2/52	Travel Index: Another region, Jumasí, Takoradi, Tamle, many other areas of Ghana and abroad = 7, another region, Kumasi, Takoradi, Tamale and many other areas of Ghana = 6, another region, Kumasi, Takoradi, and some other areas of Ghana = 5, another region, Kumasi, some other local places = 4, another region and a few other places = 3, only traveled in this region = 2, very limited travel = 1

78	2/54	Radio Index: Have own radio = 9, have access to another's radio = 5, have no access to radio = 1
79	2/55	Do you believe that the work of the scheme has or will benefit you as a farmer? yes = 1, no = 0
80	2/57	Do you believe that the scheme should continue to operate? yes = 1, no = 0
81	2/58	Have you talked with an extension officer about your farming problems? yes = 1, no = 0
82	2/59	Impact index: number of the following experienced or perceived re scheme: (1) bought food, (2) visited, (3) observed demonstration, (4) received training, (5) -eceived extension inputs, (6) been paid employee, (7) perceive innovation adoption influence, (8) perceive benefit from scheme; range 0-8
83	2/60	Mode of obtaining land: stool (family) land: yes = 1, no = 0
84	2/61	Mode of obtaining land: chief gave permission to nonstool farmer
85	2/62	Mode of obtaining land: purchased
86	2/63	Mode of obtaining land: rented
87-98		(variables discarded)

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