

**AN ASSESSMENT OF THE IMPACT OF THE
AGRICULTURAL EXTENSION PROGRAMME OF THE
VOLTA REGIONAL AGRICULTURAL DEVELOPMENT
PROJECT (VORADEP)**



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DECLARATION

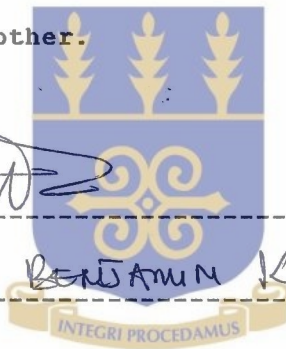
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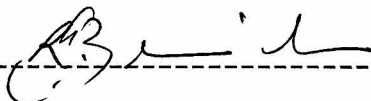


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KOBINA ASIEDU

DEDICATION

..... With love, to all parents,
expecially mine, whose toil, dedication and
immense efforts have laid the foundations of
my life and education;
To my wife and children, for their patience
and endurance during my long stay of absence,
that our dreams come true.



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I am left here to mention that the encouragement, useful comments and suggestions from my colleagues - Messrs Willie Abaka-Barnes and Francis Adjei had made possible the compilation and presentation of this essay. I gratefully acknowledge the valuable services of Miss Peace Enyonam Ama Ntummy of the Soil Science Department of the Faculty of Agriculture, University of Ghana, Legon, who took the arduous task of getting the manuscript typed. Lastly, to all those who know that I am aware of their invaluable contributions, I say, have my earnest thanks.

However, the responsibility of all that is left, done or undone is, of course, my own.

H.B.K. KWASI.

ABSTRACT

This paper reports an investigation into the impact of the extension programme of the volta Regional Agricultural Development Project (VORADEP) on the farming behaviours of the farm families in the Volta Region of Ghana. The scope of the study covered:

- the level of awareness of the major innovations extended under the programme;
- the rate and level of adoption of those innovations;
- the continuity and or discontinuance of adoption;
- major determinants of the adoption or otherwise of the innovations; and
- the market orientation of the farmers since their contact with the programme.

The adoption of new technologies related to cultivation of maize was used for the study and measurements were made on three major categories of innovations extended by the programme. These were improved maize seeds, agro-chemicals (fertilisers, pesticides and weedicides/herbicides), and planting and farm management techniques. Generally, the attempt was to estimate the extent to which the farmers in the project area were making use of improved methods, techniques and ideas of cultivating maize so as to be self sufficient in the production of maize both for consumption and for local markets.

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The research was conducted using a survey method of the descriptive type and in the interview and questionnaire forms. The sample study was selected at random in a multi-stage sampling design from three agricultural districts in the Volta Region. And, in order to ensure some appreciable measure of comparability as a means to test the effectiveness of the intervention programme, a "before-and-after" design, in which each respondent was his/her own control, was used.

The research findings have shown that VORADEP had made significant impact in the areas of:-

- creating a high level of awareness for the major technologies extended;
- generating a high degree of interest for the technologies in the farmers for them to want to use these new technologies on their farms;
- achieving a high trial and relatively low drop out rate in the adoption of the innovations;
- ensuring that all the technologies extended are still in use in the project area.

However, the rate of adoption of the technologies, in general had not been phenomenal. Although a significant proportion of the farmers had adopted the new maize seed varieties and planting in lines, the rate of adoption of the agro-chemicals and the other planting and farm management techniques was rather low. Again, an insignificant proportion of the farmers had adopted the new technologies as a package.

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The major obstacle to the adoption of the new technologies had been financial constraints in the project area. However, other factors such as complexity, marketing, transportation and availability of inputs also determined the adoption or otherwise of the innovations. Consequently, it was observed that the modest achievements made under VORADEP could be sustained and reinforced if structural and institutional changes are effected in the areas of marketing, credit and risk alleviation. When this is done, it is envisaged that the Training and Visit (T & V) system of extension of VORADEP will be made more effective to the extent of achieving:-

- an increased use of improved maize seed varieties, fertilisers and preservative chemicals;
- relatively new attitude to use of weedicides/herbicides;
- a full-scale adoption of the technologies; and the
- spread of the benefits of the programme to the small scale farmers.

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CHAPTER ONE

INTRODUCTION

1.1 THE CONTEXT OF THE PROBLEM

In a report published in March, 1989, UNESCO identified a number of problems it considered as global dilemma. Included in the UNESCO findings were the alarming rate of illiteracy, in all its ramifications, especially among adults and its relationship with rural and sub-urban poverty. In recent times, these and other related problems have been the concern of many researchers and state functionaries throughout the World. The concern in all these circles has been what efforts and measures are needed to most effectively reduce to the barest minimum, if not completely eradicate, those factors that militate against the total humanisation, self-fulfillment and development of mankind.

Significantly, these pressing problems have become standing items of discussion on the agendas of the United Nations General Assembly and its numerous specialised agencies. The culminating effects of these discussions were the many resolutions adopted at the various United Nations Conferences, such as, the World Population Conference of Mexico City in 1984; the World Conference of the UN decade for Women held in Copenhagen in 1980; and the World Food Conference of 1975. The United Nations has also earmarked the year Two thousand (2000 A.D) as the dateline for the total eradication of all or some of these pressing global problems, especially in the areas of food, shelter, health and ignorance.

The international world further appreciates the fact, that these problems are manifest more in the rural areas, especially, of the developing countries where a vast majority of the people are rural dwellers. Indeed, statistics for almost all the countries of Africa, for example, show that at present more than eighty percent of the population are rural and some seventy per cent of the total population of about five hundred million for Africa are small-scale farmers who produce about ninety percent of national food requirements. For Ghana, it is estimated that at least ninety-five per cent of the farmers can best be described as small-scale farmers (Albin Korem, 1987).

The fact is that for most developing countries almost all the agricultural and food products are produced by peasants, a large proportion of whom are illiterate and whose education, if they have received any at all, hardly goes beyond the primary level.

Again, for most developing countries, agriculture remains and may continue to remain the mainstay of their economies. In Ghana, for example, the distribution of the labour force by the major industrial activity from the 1984 Population Census results indicates that some fifty-seven per cent is engaged in agriculture (Boateng, 1992). In 1975 alone, internal agricultural production contributed about sixty per cent of the industrial raw materials for the country's agro-based industries, and generated as much as sixty-two per-cent of the country's foreign exchange earnings. (Ghana, 1977) Thus, whilst providing the bulk of personal incomes, the agricultural sector also generates much of government revenues, especially foreign exchange much needed for development. Undoubtedly, therefore, in developing countries, agriculture is a

source of subsistence, a producer of raw materials for industrialization and a tool for enhancing purchasing power in the country-side. And, to the extent that agriculture is dependent on institutions outside the farm inputs, markets, policies and many others, it is a vehicle for forging interdependent links between different sectors of society. This facet is closely related to the first, because, at least rhetorically, strategies to increase productivity are purportedly aimed at subsistence farmers.

Thus, for countries such as Ghana that are basically agricultural, the land and its potentials for development are their most important single asset. The development of the agricultural sectors of these economies, thus becomes an indispensable and a crucial element in the overall national development efforts. A document prepared by the Ministry of Agriculture of Ghana in 1992 observes that:

While the rate of economic growth in most Third World countries may vary widely, all the available evidence point overwhelmingly to the conclusion that the rate of economic growth in developing countries is closely associated with the rate of growth in agriculture.

Again, the document stated conclusively that:

Without an agenda for sustained agricultural Growth and Development, the problems of the 1970's and 1980's will pale against those of the 1990's in the face of a rapid population growth.

And, as Wilson(1974) aptly puts it;

...it might be said, in many instances that the steady and sustained improvement of agricultural productivity represents the essential basis for many other forms of development including that of local industries and commerce.

The question of producing more food to feed the growing populations of developing countries has engaged the attention of many governments, intergovernmental organizations and non-governmental organisations all over the world in recent times. Commenting on the issue Dadson (1988) observes that:

For some time now Ghana has faced increasing difficulties in feeding its growing population. During the period 1971 to 1973, the country was virtually self-sufficient in the production of maize, cassava, cocoyam and plantain. In 1981-1983, the demand for all these crops except cassava far exceeded production. From 1969 to 1983, annual total agricultural production declined by almost one per cent. Food supply per person dropped almost thirty per cent.

He, accordingly concludes that:

Unless substantial increase in agricultural production are achieved quickly, food shortages may become more persistent, reduced food intake and malnutrition more widespread and the need for food import and food aid more pressing.

Again, reviewing the performance of the agricultural sector of Ghana, Asenso Okyere (1992) observes that one of the major causes of the 0.5 per cent per annum decline in Gross Domestic Product (GDP) experienced in 1970 and 1980 was the fall in domestic agricultural production.

According to him, within the period under review, output of food and cash crops declined at a rate of 0.3 per cent per annum and cereal production, which exceeded domestic demand by some 200,000 metric tones in 1971/73, registered a deficit of over 300,000 metric tones in 1981/83. Per capita food availability in 1981/83 was, therefore, thirty per cent lower than in 1975. With a population growth rate estimated at an average of three percent per annum, the country could not meet the short fall in domestic food production, and which meant a shortfall in the nutritional status of the people. The situation was described as "precarious" because the government could not supplement domestic food production with imports since real export earnings declined as much as fifty-two per cent, falling from twelve per cent of GDP in 1970 to four per cent in 1982.

Asenso Okyere was not alone in his observations, for, the document of the Ministry of Agriculture quoted earlier stated explicitly that the result of the great disparity between population growth in Ghana (which increased from 6.7 million in 1960 to about 12.2 million in 1984) and agricultural growth was a twenty-eight per cent decline in food production per capita between 1970 and 1982 and a very weak economy.

Thus, the lagging economic situation in almost all third world countries has been blamed on the poor performance of their agricultural sector. In fact, Timbergen, Leontief and others went further to intimate that the lagging economic progress of the developing countries is the principal threat to global peace and security for present and future generations. (Inozemtsev, 1984). The implications of all these is that, for most developing

countries in both the medium and long run, the key to a more rapid growth, swifter alleviation of rural poverty, the reduction of urban-rural income differentials and a more robust basis for structural transformation of their economies lies with increasing production in the rural economies.

Yet paradoxically, the agricultural sector of most developing countries is the least developed and dominated by their rural population. Albin Korem (1987) observes rather well that these small-scale farmers who produce the bulk of the country's food requirements are the most neglected, exploited, the least understood, the least influential people in their community and often with the least security in land tenure. Low producer prices, over dependence on traditional farming techniques and unreliable weather condition, lack of appropriate inputs, labour shortages and transport and marketing facilities are considered as the major constraints to the development of the agricultural sector of the Third World economies. This unfortunate situation, nonetheless, continues to contribute to low productive status of the small-scale farmers, rural poverty, rural underdevelopment and great inequalities between rural and urban areas.

The World Food Crisis (1972-1974), in no uncertain terms, goaded the World Bank Officials and others into a rather belated recognition of the centrality of agriculture in Third World development and international stability. Consequently, the Bank came out with what has become known as its "new strategies" for development. According to Stryker (1979), the Bank's main challenge has since been to reach the impoverished rural masses and increase their productivity. Within this context, it is held, that



rapid progress in small-holder agriculture throughout the developing world is the key to achieving long term stable economic growth and significantly reducing the levels of absolute rural poverty. This involves the concentration of resources and policies in favour of small - holder agriculture. This is because it is believed that small-holder agriculture offers the best opportunities for transforming abundant resources of land and labour into, productive gains while economising on scarce factors of capital and foreign exchange (Acharya, 1981).

To stimulate the transformation of the subsistence economy of the developing world, education for rural development has been advocated as a major tool for empowering the rural people to be able to raise their productive capabilities. Education and training for the rural and agricultural population of the Third World has been intensified in recent years when the United Nations pioneered a series of worldwide declarations and efforts directed at eliminating rural poverty. At the international level, these efforts led to the World Conference on Agrarian Reforms and Rural Development (WCARD) held in Rome in 1979. The thrust of these declarations is to help the rural people to increase their output in order to generate the substantial surplus and to help raise their income levels for their development.

For many generations, educational efforts aimed at the transformation of the rural economies, involved the diffusion of "modern" technologies or agricultural innovations that would help raise the productivity of resources for food production. The assumption is that the human resources of the rural areas are their greatest potential assets and education should be one important

element in their motivation and training for the service of development.

According to Zandstra and his contemporaries (1979) the earliest efforts to disseminate new agricultural technology were based on community development and extension programmes. This was based on the assumption that rural communities were inefficient in their use of existing resources and that although better technology was available it was not known to and used by them. Accordingly, as Zandstra and others put it:

... communication and education programs were promoted to stimulate rural people to improve their factor productivities and the philosophy of the era was "to help the (rural) people to help themselves" or "show the backward peasant how to use modern inputs".

Consequently, until the 1980's the structure of agricultural extension services were patterned after systems developed in the United States of America or elsewhere, in social, cultural and educational or even political and economic environments entirely different from those obtaining in almost all the developing world. Approaches to farmer education included farm visits in which a traditional extension officer visited his farmers once in weeks or more often months and disseminated agricultural information to his clients through lectures, demonstrations and open fora. A typical American version of extension devised for many developing countries was the "Focus and Concentrate System". In this system, a given package of agricultural inputs were directed towards certain individual farmers in the community. It was assumed that the

results of these farmers would influence their neighbour to adopt the new methods.

One other approach to farmer education was the organisation of agricultural shows with emphasis on cooperative efforts in agricultural production. Cooperative movements were established with the aim to:

...introduce more business-like methods among peasants by utilizing the African's natural mode of communal working, and endeavouring to develop the spirit of independence, self-help, and neighbourly assistance so essential to the maintenance of an active and virile population. In addition, the machinery of the movement provided facilities for stimulating thrift and for the profitable utilization of such savings (Anyane, 1963).

The mass media were also used as an informal educational strategy. This was based on the realization that traditional extension agencies could reach only a small fraction of the rural population, so that the mass media as well as lower cost communication technologies could be a better means for channeling information on a much wider basis than before. Rural radio forums emerged as a consequence and were aimed at farmers seeking advice on how to improve the yields of their crops and the general quality of village life. There were also farmers' magazines and newsletters, and columns in the national dailies and weekly newspapers were devoted to farmers. In all cases, in the view of Hornik and others (1974), the media had customarily acted as "surrogate extension agents" and had relayed the "identical messages that human extension agents" had been carrying to the rural areas over the years.

It is significant to note, however, that although systematic agricultural research and extension work has flourished in Ghana and the Third World since the colonial period, the impact of agricultural services on the small-scale traditional system of crop and animal production continues to be minimal. According to Twum-Barimah (1977) the failure of extension work to make any significant impact on agricultural production is due to the fact that:

.... extension systems were developed with the least consideration that educated and literate farmers living in the developed or industrialised world and enjoying a high standard of life would need a set of tools in the educational process relatively different from tools required for relatively unsophisticated and largely illiterate rural communities (of the Third World).

Consequently, little attempt has so far been made to improve domestic technology available and in use in the traditional agricultural sector towards increased food production. Instead, emphasis has been put on the wholesale importation of foreign (modern) technologies. Yet growth in food production continues to depend heavily on expanded farms as a means to offset declining yields. Most food production still takes place in the subsistence sector and cultivation practices are land intensive so that rotation and various elaborate cropping patterns are major ways of managing the natural environment and maintaining soil fertility. African agriculture in general, and food production in particular, depends largely on human labour using simple hand tools and the use of machines remains minimal. With little water control and few ways of dramatically increasing the amount of work which can be done in a short time, food production is most vulnerable to changes

in weather and variations in the timing of key seasonal activities. This vulnerability, nonetheless, is reflected in large variations in yields and in total production over the seasons.

Thus, in spite of the various approaches to extension work in the developing world, traditional cultivation methods and practices have not been easily transformed. It has not been easy to achieve a major transformation of the subsistence economy because the various approaches to farmer education have proved futile and not as effective as they were presumed to be. Yet it is becoming increasingly clear that the traditional cultivation techniques developed by African food producers to adapt to existing natural environment are beginning to reach their limits. Consequently, there seems to be a growing need to make a transition from land-intensive cultivation to capital intensive cultivation which can use appropriate inputs to enhance soil fertility and can increase the efficiency of labour as a means to raising the level of food production.

Briefly stated, although agricultural extension services are meant to educate farmers to acquire new skills and knowledge that will lead to increased productivity, extension services in many developing countries have failed to achieve the desired impact. It is in recognition of this defect in the existing extension systems that the World Bank, as part of its "new strategies" for Third World development, introduced the Training and Visit (T & V) system of extension for developing countries to improve the effectiveness of their extension services. The system was at the heart of the extension programmes of the Volta Regional Agricultural Development Project (VORADEP). It is currently the basis of the extension

programme for the Agricultural Services Rehabilitation Project (ASRP) and the new National Agricultural Extension Project (NAEP).

The T & V System of extension was the brain child of an Israeli agricultural agronomist and extension service agent, Daniel Benor and was further developed by J.Q. Harrison and Michael Baxtor. According to Benor, et.al. (1984) the contribution of this system to agricultural extension and development is not that it is a new extension methodology. Instead, it is "an effective management system that enables the efficient implementation of known extension principles". They emphasize that the T & V system of extension:

... provides an organizational structure and detailed mode of operation that ensures that extension agents visit farmers regularly and transmit messages relevant to production needs, problems faced by farmers are quickly fed back to specialists and research for solution on further investigation; and extension staff receive the regular training required continuously to upgrade their professional ability so that they may serve the technological demand of farmers.

Under the T & V System of extension, the cropping cycle is broken into two-week or fortnightly periods. The first day of every cycle is spent training the Village Extension Workers (VEW) in the messages they are expected to pass on to farmers during the rest of the cycle. Messages are topical and are known as impact points, for example, the extension agents are taught about improved varieties of seeds before it is time to sow. The messages are passed on to farmers by a rigid system of visit to eight groups of constant farmers. Each target farmer is then expected to pass the same message on to ten follower farmers.

The other features of the T & V system of extension are stated by Benor and others as follows:-

- establishment of a single, direct line of technical support and administrative control;
- a clearly defined single - purpose role of extension rather than the multi - purpose role;
- improving mobility by providing appropriate transport to each worker to visit his or her contact farmers;
- improving coverage by limiting the number of farm families or households that an extension worker is expected to visit; and
- reduction in duplication of service that occurs when extension is fragmented among different ministries or organizations.

For all intents and purposes, VORADEP'S agricultural extension programmes were designed to provide a professional system of extension based on frequently updated training of extension workers and regular field visits; and with the ultimate goal of increasing agricultural production in the Volta Region of Ghana. The Volta Regional Agricultural Development Project (VORADEP) inaugurated in 1981 as a Rural Integrated Agricultural Development Project, was meant to reach the small-scale farmers within the project area with innovative agricultural technology through the T & V system of extension. The main component of the project is the crop development programme and it is expected that the extension of relevant and modern agricultural technological packages would eventually be diffused to all the farm families in all the nine

districts of the Volta Region. The main areas of VORADEP's extension work include:-

- the introduction of improved maize seeds, improved cowpeas of the IT varieties, improve cassava clones from ITTA, and yam miniset technology;
- the introduction of modern planting techniques, the application of recommended agro-chemicals, and post-harvest management techniques;
- extension services in the areas of nutrition and diet improvement, vegetable gardening, processing and home management; and
- the introduction of developed energy saving stoves for housewives in the rural areas.

1.II PURPOSE OF THE STUDY

The main purpose of this study is to measure the impact of VORADEP's agricultural extension programmes, more specifically, the "Training and Visit" (T & V) System of extension, on the farm practices, techniques and methods of the small-scale farmers within the project area. In more specific terms, the study attempts to find out the extent to which the farmers in the project area are-

- making use of the effective innovative agricultural technology extended by the project;
- able to change their productive patterns and are growing more crops for the market and less for subsistence.

The study, therefore, attempts to measure the following variables that reflect the project objectives;

- Use of farm inputs;

- adoption of new planting and farm management techniques;
and
- market orientation and innovativeness.

Basically, the research seeks to determine and seek explanation for the rate and level of the adoption of the major innovations extended by the project through the T & V system of extension and the changes that had occurred in the patterns of production as well as in the practices, methods and techniques of crop production in the project area.

1.III STATEMENT OF THE PROBLEM

Although systematic agricultural research and extension works have flourished in Ghana since the colonial period, the impact of Ghana's agricultural services on small-scale traditional systems of production has remained minimal. Accordingly, this research sought to find answers to the following questions:

- (i) What impact has VORADEP's agricultural extension programme made on the farming practices, techniques and methods of the small-scale farmers within the project area?
- (ii) To what extent can the T & V system of extension be considered as an effective method for the diffusion of the agricultural innovations extended under the project?

And, to be able to resolve these issues, the research was focused on the following broad questions:-

1. What level of awareness was created, among the participants in the programme, for the major innovations extended?

2. What proportion of the farmers exposed to the programme adopted the project innovations and what proportion rejected them?
3. Which of the technologies introduced was totally rejected and why? What proportion of the technologies was totally rejected?
4. What proportion of farmers who had earlier adopted the new technologies still practise them and what proportion had discontinued their adoption?
5. What specific technologies are still in use in the project area?
6. What proportion of the technologies which were earlier adopted have been discontinued at the moment?
7. Had there been a total adoption of any of the innovations introduced?
8. What proportion of the farmers had adopted the technologies as a package?
9. What relationships exist in the rates and levels of adoption of the various innovations?
10. What factors determined the adoption or otherwise of the innovative technologies extended under VORADEP?
11. What relationships exist between the variables - extent of extension contact, level of awareness and the farmers' desire and decision to adopt the innovations?
12. Are the farmers now producing more for the market and less for subsistence?
13. How innovative have the participants in the programme become since their contact with VORADEP?

1.IV HYPOTHESES

The research was directed towards the testing of the following hypotheses:-

1. A high level of awareness was created, among the participants in the programme, for the major innovative technologies introduced under the project.
2. The adoption rate of the new technologies extended by the programme was very high.
3. The level of adoption of the new technologies was very high.
4. There were significant changes in the farming practices, techniques and methods of the farmers in the project area.
5. There were significant differences in the rates and levels of adoption of the various innovations extended.
6. There was a positive correlation between the extent of extension contact, level of awareness and the adoption of the innovations.
7. Farmers within the project area now produce more food for the market and less for subsistence.

1.V SIGNIFICANCE OF THE STUDY

This study is significant because the researcher considers it as an opportunity to clarify his thoughts on and increase his understanding of certain theories and principles on adult learning and behaviour. It has also become possible for the researcher, to assess the applicability and universality of such theories within the context of the particular communities being studied.

Again, the research is seen to be significant because it sets out to investigate the validity of the claim that the T & V system of extension is about the best approach to farmer education. It also becomes possible for the problems associated with the design and implementation of the extension programme of VORADEP and those problems created in the individual communities by the project to be identified for some solutions to be suggested and recommendations made with the view to increasing the effectiveness of the T & V system of extension.

And, as a corollary, the researcher was provided the opportunity to estimate the replicability of VORADEP's agricultural extension programme elsewhere.

1.VI LIMITATION AND DELIMITATION OF THE STUDY

It was not possible to dwell on the new approaches to the cultivation of all the major staples extended by the programme - maize, cassava, yams, cowpeas, sorghum and vegetables - in the study area. Thus, the diffusion and adoption of new technologies in maize cultivation was selected for this study. This is to make the measurements as envisaged for this research possible since the pilot study had shown that unlike the other staples, maize was cultivated by all the participants in VORADEP'S agricultural extension programme.

In general terms, the purpose of this study was to find out the extent to which the programme had affected the farming behaviours of the target population. Essentially, the aim was to find out how much learning had taken place, that is, the extent to

which the farmers in the project area had adopted the major innovative technologies extended by the programme.

Consequently, the research did not seek to determine changes in levels of production, that is, changes in yields per acre since contact with the programme. Similarly, questions relating to the cost effectiveness of the programme, costs of production and changes in income levels as well as standard of living of the target population were considered to be beyond the purview of this research. Again, the research sought to solicit information from only farmers who had had direct contact with the programme. Therefore, it was not considered relevant to this study to explore the issue of how strong the multiplier effect of their intervention has been on the non-participants in VORADEP's agricultural extension programme.

It can easily be argued, that an ideal design for a study such as I have attempted should offer the analyst one pair of observations for comparison, that is, the farming behaviours and attitudes of participants versus the farming behaviours and attitudes of non-participants in the programme. However, since it became difficult to get towns and villages which were completely cut out of the programme, it seemed preferable by far to base a comparison on a carefully compiled data obtained from a "before and after design". In such a design each person was used as his or her own control, so that, measurements were in the strength of nominal and ordinal scales calling for non-parametric statistical tests.

Another limitation of this study is that I had to rely on the farmers' memory of how they performed over the past ten or so

years. It was obvious that I could not get around this for most of the farmers because they had not got records to refer to.

1. VII ORGANIZATION OF THE STUDY

The first chapter of this work constitutes a general introduction in which the context of the problem was stated, the research problem itself identified, the purpose and significance of the study stated, and a provision made for the limitations and delimitations of the study and the hypotheses tested.

Chapter two contains the Methodology of the study. In this chapter the project area was defined and the research design, population, sampling design, techniques of data collection and the method of data analysis provided. In the third chapter the related literature was reviewed.

In Chapter Four an attempt was made to provide an exposition on the Volta Regional Agricultural Development Project (VORADEP). Under this chapter, the policy framework for the establishment of the project was explored. The chapter also includes the project definition and design, the organization and management of the project, the agricultural extension programme of the project, the extension activities under the T & V system and the sustainability of the project.

Chapter Five presents an analysis of data and Chapter Six concentrates on the discussion of the major research findings. The last chapter contains conclusions, suggestions and recommendations for further research.

CHAPTER TWO

VOLTA REGION - THE PROJECT AREA

The Volta Regional Agricultural Development Project was designed, primarily, for the Volta Region of Ghana. Thus, the project area is that which lies between latitude 5 degrees, 45 minutes and latitude 8 degrees 45 minutes North of the Equator. It is bordered to the West by the Volta River, to the North by the Oti River, to the East by the Republic of Togo and to the South by the Atlantic Ocean. The total area coverage for the project is about 20,500 square kilometers, just about nine per cent of the total area of Ghana, with a population density of about 58 persons per square kilometer.

According to the 1984 Population Census Report, the number of people resident in the region is about 1,211,907 and of this not less than 69.5 per cent are Ewes. It is clear, therefore, that the Volta Region is occupied by, predominantly, the Ewes. The second largest ethnic group is the Buems. However, with the Ewes and the Buems live a number of minor ethnic groups, mostly of the Guan extraction. These minor groups include the Akpafu, Santrokofi, Nkonya, Bowiri, Logba, Avatime, and the Tafi peoples. The major Ewe groups include the Agave, Mafi (Tongus), Anlo, Asogli, Peki (Gbi-South), Gbi North (Hohoe) and the Akpini people.

According to a typology developed by Benneh and Dickson (1988), the Volta Region falls within two broad geographical

The South-Eastern Coastal Plains

This region, according to them, is roughly triangular in shape, the base of which is formed by the stretch of coastline between Accra and Aflao, and to the apex is Kpetoe. One part of the triangle between Accra and near Kpetoe consists of the Togo-Atakora mountains. Thus, by definition, this region stretches from Ada (the mouth of the Volta River) to Aflao along the coast; along the Volta River to the Ewe-Buém mountains to the North and the Ghana-Togo border to the East.

What distinguishes this region from the other region is that the land is remarkably flat and is only dotted here and there with inselbergs. The drainage system is also relatively simple, the principal river being the Volta which after breaking through the Togo-Atakora mountains in a narrow gorge, travels south, then east and finally south-east to enter the sea at Ada.

The South-Eastern Coastal Plains generally has the Dry Equatorial Climate type with two rainfall maxima and a marked dry season sandwiched by the rainfall season. The mean annual rainfall is between 74-89 centimetres. The highest mean monthly temperature is 30° Centigrade which occurs between March and April and the lowest is about 26° Centigrade in August. The highest average monthly relative humidity does not exceed 76 percent and the lowest is about 60 per cent. The rainfall regime is equatorial, and the vegetation type is Guinea Savannah - short grass with small clumps of bush and with a few trees. This type of vegetation, however, changes in nature and texture as one travels towards the north to the Ewe - Buém mountain region.

The human geography of this region demonstrates several unusual characteristics. The pattern of population distribution shows concentrations on the coastline, around the lagoons, along the Volta, around the foothills of the Togo-Atakora mountains and close to the border with Togo. Benneh and Dickson (1988) describe the population distribution as peripheral stating, further, that the interior of the plains has a rather low population density. According to them, the characteristic rural settlement are peculiar to the region, for the rural settlements are a "mixture of several elements often associated with other parts of the county". In their explanation, Benneh and Dickson (ibid) intimate that:

Nucleated and dispersed rural settlements exist side by side; there are isolated houses as well as compound households; the buildings may be rectangular with gable roofs, as in the closed forest, or circular with conical thatched roofs as in several parts of northern Ghana.

The main primary occupations are farming, livestock rearing, fishing and salt-making although a significant number of the people in this region are also found in the informal sector of the economy.

Farming is about the most widespread of the primary occupations. Two systems of farming can be identified and these are bush fallowing which produces mainly food crops for home consumption or for the market; and permanent cultivation which produces crops mainly for sale. The principal food crops produced by the bush fallow system include cassava, maize, yam, okro, groundnuts, sweet potatoes, and in the forested areas around the foothills of the Togo-Atakora mountains, plantains and cocoyam. The permanent cultivation system is practised both on state farms

and on peasant farms. The chief crops produced with the aid of fertilizers and irrigation on the state farms are maize and rice, and to a small extent, cotton and tobacco. On the peasant farms, permanent cultivation involves the production of three groups of cash crops. In the first group are shallots, maize, sugar cane and tomatoes; in the second groups are lettuce, cabbage and other vegetables; and in the third group are oil palm and coconuts.

Shallots, maize, sugar-cane and tomatoes are produced around the mouth of the Volta to the east of it. In the case of tomatoes and shallots, beds are specially prepared in the shallow valleys and carefully manured and irrigated. Maize and sugarcane are not cultivated with the same degree of care. Lettuce, cabbage and the other vegetables are cultivated with the aid of manuring and irrigation but in market gardens close to the towns in whose markets and shops they are sold. The permanent tree crops in group three are generally cultivated without manuring or irrigation, except around Keta where animal dung is sometimes added to the soil. Also some of the oil palm and coconut trees grow wild. The cultivation of tobacco seems to hold the greatest promise for the region. This is because cultivation has increased a little since the Pioneer Tobacco Company decided to purchase the leaf for the manufacture of cigarettes and cigars. The crop is mainly cultivated around Wute.

The major towns in this region, in terms of their being administrative, commercial, medical and educational centres for settlements both within and outside their districts are Keta (25,000 people), Anloga (19,100 people), Aflao (20,800 people),

Dzodze (14,200 people), Denu (2000 people) and Sogakope (2,000 people).

The Ewe-Buem Mountains

This region extends from Ho in the South to Pampawia in the North and is covered entirely by the Togo fold mountains which consist of elongated ridges and valleys running from the South-West to the South-east, parallel to one another. These mountains form, primarily, the basis for distinguishing this region from the other. Except at its northern end where the Buem live, the region is the home of the Ewe who may have been living here for at least 400 years. It is in this region that the large number of small ethnic groups who are predominantly of the Guan extraction can be found.

The population is mostly rural with settlements include flat earth roofs, similar to those on the coast near Cape Coast, and a few circular compound houses with round huts which are normally found in northern Ghana. Benneh and Dickson (1988) reason, that this mixture of different houses depict the presence of different tribal and ethnic groups in the area, since the different tribal groups built different styles of houses. Urban settlements are correspondingly few and do not exhibit any special or peculiar characteristics in structure or appearance. The major towns in these regions are Ho (population - 37,200), Hohoe (population - 21,000), Kpando (population - 7,500), and Worawora (population - 5,100).

The climate of the Ewe-Buem Mountain region is the Wet Semi-Equatorial type and the vegetation is the Moist Semi-Deciduous forest type, with two rainfall maxima. The mean annual rainfall is

between about 125-200 centimetres. The first rainy season occurs between May and June with the highest in June, and the second rainy season is between September and October. Unlike those in the Dry Equatorial belt, the dry seasons are quite sharp or pronounced. The highest mean monthly temperature is 30° Centigrade which occurs between March and April and the lowest is 20° Centigrade in August. The average monthly relative humidity (based on figures recorded each day at 12 noon) are 75-80% as the highest which occur during the two rainy seasons and the lowest 70-80% during the rest of the year.

The systems of cultivation do not differ, any remarkably, from those obtaining in the other parts of the country. Cultivation for export is important for the region and particularly in the Buem settlement areas. The Germans, who formerly administered the region as part of their colony of Togoland, according to Benneh and Dickson (1988), must be given credit for helping lay a firm foundation for it. According to them, it was an important part of the German colonial policy to develop and supervise all their overseas territories, the production of raw materials for export to Germany to be transformed into manufactured goods. The Germans were successful with this policy in the forest lands of the Volta Region where they compelled farmers to receive instructions on improved methods of cultivation of coffee, cotton, the oil palm trees and rubber on extensive scale. As a result of the care with which the Germans organised all farming operations, from planting to harvesting, the preparation of the crops for export remarkably superior to those of the British elsewhere. Benneh and Dickson (1988) accordingly reason that it was from this experience that the

inhabitants of the region readily took to the cultivation of cocoa which became popular shortly before the beginning of the first World War.

The other major occupation in the region is iron-smelting in the Akpafu and Alavanyo areas. The growing importance of this industry is based on the fact that neighbouring areas depended solely on it for supplies of iron tools and implements for farming. Traditionally, the metal is extracted from ironstones mined from the local laterite and the smelting furnaces were built of earth and fuelled with firewood. However, the industry is now of a minor significance because of the greater popularity of imported iron goods.

Characteristics of Agriculture in the Region

The general characteristics of agriculture in the Volta Region do not differ much from what pertains elsewhere in Ghana. Perhaps, the most striking feature is that for most of the farmers, agriculture is part of a way of life rather than simply an occupation, and an integral part of complex, traditional cultures involving religion, kinship and the whole fabric of rural society (Dickenson, et.al., 1983). Significantly, traditional agrarian societies in the Volta Region, like elsewhere in the Third World, have evolved agricultural systems with a limited technology which seeks to balance on the one hand, their needs for subsistence and for exchange, and on the other hand, their need to conserve the environment in such a way as to preserve the possibilities for future production. However, in recent times, these traditional ecological and agricultural systems in the rural sector are almost

everywhere challenged and being modified by the impact of modern pressures to produce more for the market and to supply for rapidly growing populations.

In order to appreciate the distinctiveness of this type of agriculture, this section seeks to assert that cultivation of the land is dominated by peasant farmers, practising shifting agriculture, with complex cropping systems, rain-fed agriculture, using simple and mostly hand tools and achieving low productivity and low yields.

Peasant Farming and Rural Societies

As stated earlier, the Volta Region is mostly made up of rural communities occupied by peasant farmers. The concept of peasants is defined in various ways, but the essential features of these definitions would seem to be that a peasant has access to land as a means of production - he may own it, or be a tenant working on the land and paying rent, but he cannot be simply a wage-paid labourer; that he works the land to which he has access, primarily, by his own or his family's labour; that the land is his primary source of income and or his subsistence; and that he participates in a cash economy, usually in a subordinate status, and therefore, is part of a wider society. A few observations may, however be made. First, peasant farming is not necessarily associated with subsistence farming only, but with both subsistence and commercial production. It may be, and often is, strongly oriented to production for the market. Second, it may not necessarily be associated with low technology, though this is often the case in the Third World, but rather with small-scale technology - the hand

cultivator rather than the tractor. Finally, the peasant most often than not have limited access to land enough to support themselves at a satisfactory level of living in the light of local expectations. It is often this fact, and the lack of economic opportunities, that is responsible for low productivity, and not an intrinsic lack of capability among peasant farmers (Dickenson, et. al., 1983).

Land acquisition, thus, becomes crucial in the life of the peasant farmer. Traditionally, the legal roots of virtually all rights in land is the allodial title vested in the traditional communities, principally families, stools and skins (Woodman, 1976). Thus, the individual member of the community or family, by customary law is entitled to cultivate an "unoccupied land" in which the community or family holds the allodial title and acquire thereby a usufruct or customary freehold, until he abandons it, but (he) is subject to obligation of loyalty to his family or community (Woodman, *ibid*). The communal ownership of land, nonetheless, has some inherent flexibilities which allows for the use of land for whatever purpose; and "use thereof the fruits of the soils". (Asante, 1975). Similarly, by the fact that "all citizens of the chiefdom" in the past and at present "were under an equal obligation to fight to preserve the lands" meant an existence of the "common public rights in the use" of the land (Kludze, 1973). To the extent that the worst to be obtained by a member of a community to use the land of another family was a gratuitous tenancy.

However, with the introduction of commercial agriculture, usufructuary titles are reinterpreted into valuable rights, whereby

it, (land) recently, has acquired a clear market value by becoming easily alienable or the grant of tenancies to land. By tenancy, Kludze (1973) declared, the "occupation and use of another land is allowed in the customary law, on condition that part of the proceeds shall be paid to the landlord" not necessarily in terms of monetary payment but as "part of the proceeds of the land". To the extent, that to acquire the benefits of rent and the flexibility of the communal ownership to allow for individual freehold and alienability of land has resulted in individual's acquisition of extensive rights in agricultural land, amounting to significant quantities of wealth accumulation by certain classes of persons. This has created a landlord - peasant relationship, that is, a kind of hierarchical relationship of power and wealth and a consequent exploitation of the peasants and increased peasantization (Kwasi, 1984). Such a historical process has, nevertheless, created a situation in which there is a declining control of the producer over his products. And, within the spectrum of the cash economy, this declining control over the disposal of the peasant's own products is in terms of his exchange value on the one hand, and it involves an incorporation of the producer into a wider network of complex structures of political and economic relations in which he is controlled and subordinated both nationally and internationally. (Kwasi, Ibid).

Thus, while some farmers in the Volta Region may acquire land as usufruct or customary freehold, most of the farmers would acquire land either by purchase or tenancy for which they pay parts of the proceeds of the land to the landlord either in cash or kind.

Shifting Cultivation and Cropping Systems

The terms "shifting cultivation (agriculture)", bush fallowing, "swidden agriculture" or "slash-and-burn" are used interchangeably to mean one and the same thing. The essential feature is the temporary cultivation of clearings, which are then allowed to revert to secondary bush for a substantial period, while new clearings are successfully opened. There are a great deal of regional or local variations, ranging from ad hoc and irregular movement of individual farmers from one clearing to another to complex arrangements of clearing and fallow in long period cycles which may last up to 80 years. However, under normal circumstances a farmer may cultivate two years of crop on a field, allow for fallowing and revisit the plot after 5-10 or more years, for the rain forest region and 6-12 or more years, for the dry forest and the savannah grasslands.

Cropping systems are often complex, and the initial impressions may be one of chaos with crops apparently planted quite haphazardly but are, in fact, very carefully sited. Intercropping of different species is normal, and sites are chosen with precise eye for differences in the levels or drainage conditions on the cleared land. The variety of crops cultivated on the same farm fulfils a number of functions. Firstly, it ensures a varied diet and a phasing through the year of harvests and of labour demands. Secondly, it helps to reduce risks from pests and diseases. Thirdly, it ensures a complete ground cover at various levels of height in such a way as to reduce the impact of rainfall and to reduce the risk of soil erosion and unreliable rainfall. Generally, crops such as cassava, yams, cocoyams, sweet potatoes;

grain crops such as maize, millet, hillside rice or even padi; and pulses and fruits such as bananas and plantains are grown. It is significant to know that crops for subsistence are usually combined with some production for sale, sometimes of vegetables and fruits for urban consumption, sometimes tree crops producing cocoa, coffee, and oil palm trees for a wider market.

CHAPTER THREE

M E T H O L O G Y

3.I RESEARCH DESIGN

The study is intended, primarily, to find out the extent to which VORADEP's agricultural extension programme has affected the farming behaviours of the small-scale farmers within the project area. The researcher considers this effort as basically a fact finding exercise and, therefore decided to use the survey research method of the descriptive type which, however, involved some relational analysis.

In order to test the effectiveness of VORADEP's intervention and to ensure some appreciable measure of comparability of such behaviours, however, a "before-and-after" design, in which each respondent served as his or her own control was used. Undoubtedly, this design was preferable by far to base a comparison, such as I have attempted, on a carefully compiled data and provided the opportunity to test the significance of any changes that must have occurred in the farming behaviours of the farmers since their contact with the programme.

3.II POPULATION AND SAMPLING DESIGN

The target population for this study was the farm families which have had direct contact with the programme. According to the project design the farming population of the Volta Region is estimated at about 180,000 farm families and the project was meant to reach approximately 90,000 of them. This research, therefore,

sought to cover the 90,000 farm families reached by the project thereby making the population easily identifiable and then, invariably, simplifying the field work.

A multi-stage sampling approach was used because the population was large and spread over an equally large geographical area. And, in order to overcome costs and other practical limitations, a sample size of 150 was used. The respondents were made up of 120 farmers - who were interviewed - and 30 field extension officers - who filled in questionnaire forms.

By the project design, the area was divided into three agro-ecological zones, each made up of three administrative districts headed by District Agricultural Extension Officers ((DAEOS). Each DEAO has a number of Field Extension Officers (FEOs) working under him. Each district was also divided into agricultural extension areas headed by the FEOs, each of whom worked directly with eight groups of ten contact farmers each. Each contact farmer was then supposed to pass on information to ten other follower farmers. For this research, the contact farmers and the follower farmers constitute the impact points for assessment.

The first stage was to choose, by a simple random method, one district from each of the agro-ecological zones, and the Jasikan, Ho and Sogakope districts were accordingly chosen to represent the Northern, Central and Southern zones respectively. The second stage was to choose, randomly, ten field extension offices from each of the three districts, from lists obtained from the DAEOS. Each FEO representing an extension area meant that information was obtained from as much as 30 agricultural extension areas,

representing at least 30 per cent of the area chosen from the total project area. Each FEO chosen filled in questionnaire forms.

In the field, however, I worked directly within 15 agricultural extension areas, that is, five from each of the sample districts. To achieve this, therefore, the third stage was to choose at random five extension officers from the ten chosen earlier from each of the three sample districts. Each of the 15 field extension officers provided lists of the farmers who have had direct contact with the programme within their respective areas and eight farmers were then chosen randomly from each of the lists provided. The table below shows the distribution of respondents according to their extension areas, towns and villages.

**TABLE I: DISTRIBUTION OF RESPONDENTS ACCORDING TO
EXTENSION AREAS, TOWNS AND VILLAGES**

DISTRICT	EXTENSION AREA	TOWN/VILLAGE	NO. OF RESPONDENTS
JASIKAN (NORTHERN ZONE)	KONSUOVI I	Okadjakrom	4
		Akaa	2
		Atonkor	2
	WORAWORA	Kudje	6
		Worawora	2
	TAPA I	Abotoase	8
	JASIKAN	Jasikan	3
		Teteman	5
	KADJEBI	Kadjebi	4
		Asato	4
HO (CENTRAL ZONE)	ANYIRAWASE	Avenui	3
		Avenui-camp	3
		Anyirawase	2
	TSITO	Tsito	4
		Dededo	4
	ZIAVI	Ziavi-Lume	5
		Ziavi-Dzogbe	3
	HO I	Lokoe	4
		Hoviefe	4
	SOKODE	Ando	3
		Bagble	3
		Akrofu-Xeriofe	2
SOGAKOPE (SOUTHERN ZONE)	SOGAKOPE	Sokpoe	3
		Agbagorme	5
	MAFI	Kumasi	8
	ADIDOME	Dodogbe	1
		Alavanyo	3
		Agbakpeame	4
	DABALA	Dabala	3
		Dabala-Junction	5
	AGAVE	Ashidowui	3
		Agbeve	3
		Djetorkwe	2
		TOTAL	120

In all, forty farmers were interviewed from each district and the research covered at least 33 towns and villages which were well spread over the three sample districts. The large sample size chosen by random sampling at each stage and the well spread coverage were meant to considerably minimise any errors arising from biases in selection and for all significant characteristics of the farming population to be represented in the sample.

3.III TECHNIQUES OF DATA COLLECTION

In order to elicit the desired response, I decided to interview the farmers and to administer questionnaires to the field extension officers. Although, the interviews were expensive in terms of time and money, it was preferred to other techniques because the primary face-to-face encounter with the respondents enabled me to ask for clarifications on some issues from the farmers. Similarly, I had the opportunity to tap and record extra information provided by the respondents or observed by me during the exercise. Such extra information and observations could not have been ascertained by questionnaires. The field agricultural extension officers were trained to assist me conduct the interviews. For both the interviews and the questionnaires, a 100 per cent response was achieved.

The interview schedules and the questionnaires were self-designed to reflect on the major issues raised in the research questions. Consequently, the questions asked covered such broad areas as the demographic characteristics of the respondents,

extension contact, cropping patterns; use of equipment and other recommended inputs, planting and management techniques, finance, marketing and consumption patterns of the respondents. The schedules contained twenty-three pre-coded and twenty-seven open-ended questions and the questionnaires consisted of eleven preceded and fifteen open ended questions. The Likert scale was used to measure attitudes and opinions on the major innovative technologies extended by the programme.

3.IV METHOD OF DATA ANALYSIS

Both the computerised and manual approaches were used for data analysis. Some of the responses were represented on graphs, pie charts, tables and histograms after frequencies had been worked out and percentages determined. Relational analysis were made by cross tabulation and the Chi-square (X^2) was used to test the significance of the research findings. In some cases, the arithmetic mean and the median of scores were computed to provide the basis for judgement, and in other cases, the Spearman's Rank Correlation Coefficient (Spearman Rho) was used.

CHAPTER FOUR

REVIEW OF RELATED LITERATURE

4.1. DIFFUSION AND ADOPTION OF INNOVATIONS

"The human-service professions, in general, and the area of community organization," says Rothman (1974), "are characterised as change oriented fields". In view of this, the study of the impact of VORADEP's agricultural extension programme on the small-scale farmers in the project area, was done within the framework of the broad scholarly endeavour referred to as the "Diffusion and Adoption of Innovations".

Rothman treats the subject of the diffusion of innovations from two perspectives, that is, diffusion among community population groups and diffusion in organizations. For the purpose of this study, however, the first seems more appropriate because as he puts it;

... it is more centrally located within the traditions of diffusion studies; how new agricultural practices are learned by farmers, ... how new public health techniques are introduced by community development workers to villages in underdeveloped nations.

More important than these reasons, however, is the fact that most human-service fields such as agricultural extension and adult education are familiar with and have actively incorporated elements of the diffusion tradition as popularised by Everett Rogers (1962/1971/1976/1983), Hagerstrand (1952), Barnett (1953) and the others.

The available literature is replete with a variety of definitions for the concept of innovations. Barnett (1953), for example, sees an innovation as any "thought, behaviour, or thing that is new because it is qualitatively different from existing forms". According to Rothman, (1974), an innovation may be seen as any idea so perceived by a population group or organisation. In the view of Jones (1970) and Van den Ban, et. al. (1988), although an innovation is any idea, method or object which is regarded as new by an individual, it needs not always be the result of a recent research but as Jones emphatically puts it, it is important that;

... the form in which it is perceived or in which
it is made available is (relatively) new to the
farmers of the present generation.

Basically, therefore, improved practices, ideas and techniques may be regarded as innovations in so-far-as they are modified in form or have new functions. To this extent, what ideas, practices and techniques VORADEP sought to introduce into the project area can be considered as innovations.

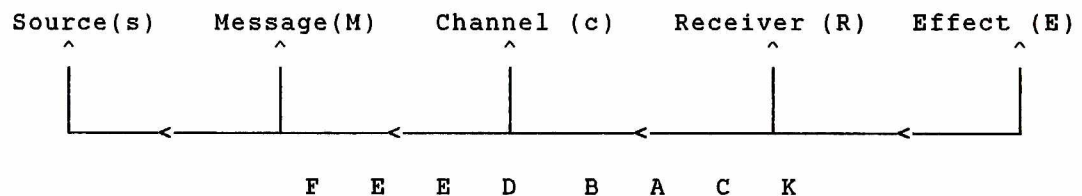
Everett Rogers' "Diffusion of Innovations" (1962) is generally considered as classic in its field simply because his constructs exist as the basis for most, if not all, the theoretical formulations on the concept of innovations. Rogers provides four basic elements in the diffusion process. These are that:

- a new idea is developed;
- an individual 'A' who has knowledge of the new idea;
- an individual 'B' who is yet to be aware of the new idea;
and

- some sort of communication channel connecting the two individuals.

The diffusion process is, therefore, the extension of new ideas, practices, techniques and methods.

Central to all theories of diffusion, according to Hagerstrand (1952) is the important role of communication which is defined by Van den Ban, et. al. (1988) as "a process of sending and receiving messages through channels which establish common meanings between a source and a receiver". Van den Ban and others (Ibid) demonstrate the diffusion process with what has become known as the "SMCRE model" thus:-



The diffusion process, according to them, may be analysed to identify the principal factors that influence the situation and this analysis takes into account the source variables, message variables, channel variables and receiver variables. The source variables include the knowledge, attitudes, communication skills and social status of the agent which influences his effectiveness as a communicator. The message variables are the code or language of the message, as well as its contents and structure which influence the effect. The channel variables include the extent of interpersonal and intergroup contacts, Fuse of prints, radio,

television and a combination of other means of communication. In much the same way as the source, the receivers' communication skills, attitudes, knowledge and social background influence how he/she receives and interpretes messages.

The dynamics of the communication process from the perspective of the "SMCRE" model is defined by Van den Ban and others (ibid) as follows:-

An idea is changed into a message made up of codes; the source or transmitter sends the message through a channel to a receiver; the receiver decodes the message and develops an idea in his mind which he may or may not use. ... and the source observes this effect and uses it to evaluate the impact of the message (feedback).

Diffusion research has empirically shown that new ideas, once introduced into a social system, spread within that system from one decision making unit (individuals, groups, households and other collectivities) to another over time. It is also generally accepted that unless an innovation is widely adopted it will fail to make any effective social and cultural impact. Diffusion, thus, becomes more often than not the automatic multiplier of a social intervention's effect and the success of any diffusion method depends, almost invariably, on the extent of human interactions in which one person communicates a new idea to one or several other persons (Roling Neils, 1988).

The adoption process itself is conceptualised by Hagerstrand (1952) as being primarily the result of a learning process and learning is perceived as the process of acquiring or improving the ability to perform a behavioural pattern through experience and practice. Information sources and information flow are generally considered as important stimuli to the individual in the adoption

process. The traditional stages in the adoption process are stated by Rogers (1962) as awareness, interest, evaluation, trial and adoption and this corresponds with the normative decision-making model later developed by Van den Ban and others (1988). However, research has shown that the adoption process does not always follow this sequence in practice and that there is insufficient evidence to prove that these stages actually exist (Roling Neils, 1988). It is held that decisions in practice may often be made in a much less rational and systematic manner as shown by the traditional theorists.

In response to this, in the latest edition of his work, Rogers (1983) proposes a different set of stages as knowledge, persuasion (forming and changing attitudes), decision (adoption or rejection_, implementation and confirmation. Rothmans (1974), however, intimates that in any of these cases the specific behaviours associated with the stages in the adoption process are:-

... exposure to innovations, increased interest and information gathering, decision whether or not to try innovations, trial of the innovation and decision as to further continuation.

In his view, the three mental processes that take place during those stages are desire, conviction and satisfaction. The adoption of a new idea, according to Hassinger (1959) varies directly with exposure to the new idea. Jones (1970) agrees with Hassinger but goes further to emphasise that:

Information about new ideas often does not create awareness, even though the individual may be exposed to this information, unless the individual has a problem or a need that the innovation promises to solve.

This assertion is re-echoed by Van den Ban and others (1988) when they intimate that the most important basic law of learning - that of the "law of effect" seems applicable to the adoption process. They explain the law thus:

An action that leads to a desirable outcome
is likely to be repeated in similar circumstances.

There is, however, much evidence to show that different sources of information are important for first hearing about an innovation and for making the final decision to adopt or reject it.

Motivation, thus, becomes crucial to the adoption process. Maunder (1972) suggests that education for information to motivate participants requires unbiased presentation of all facts pertinent to the decision to accept or reject the new idea or practice. Education, according to him, persuades or motivates people to want technical knowledge, to use it, and to adopt a progressive attitude toward change. Taiwo Williams, et. al. (1974) categorised the factors that motivate people to accept new ideas and practices into psychological, sociological, economic and satisfaction of learning.

In their view, the psychological essentials include a desire for a new experience, a recognition of his achievements or his contribution to the welfare of the group, job security, more leisure time, better life for children, greater efficiency and the satisfaction of emergency needs. The sociological considerations include the perception of higher social status, greater prestige, role expectancy and sociability. Economically, the individual would want to adopt an innovation with the expectation that it will result in raised income level and provide for their welfare and, for that matter, raise their standard of living. The individual

gains satisfaction of learning because one set of skills, when learned will help motivate the learner to tackle more difficult skills.

Rogers (1971) intimates that the cognitive or "knowing" component of behaviour plays a major role in generating interest. Similarly, the individuals personality and values as well as the norms of his social system may affect where he seeks information and how he interpretes information about the innovation. Evaluation produces a reinforcement effect on the person, to the extent, that the individual becomes convinced that his thinking is on the right path.

Perhaps, the most striking discovery in the diffusion and adoption literatures is that all target systems do not adopt innovations at the same time. This is because the decision to adopt an innovation is, invariably, dependent on certain perceived characteristics of the innovation. Rogers (1962) categorised these perceived characteristics as the relative advantage of the innovation, its compatibility, complexity, divisibility and communicability. In his view, these characteristics as a totality determine the rate and level at which both the diffusion and adoption of the new idea or practice would proceed.

Explaining these, Rogers posits that an innovation has a relative advantage to the extent that it is perceived as better than what it supersedes. This is measured in both economic (initial costs, operating and maintenance costs, rate of recovery of investments, and net effect on farm income), and social prestige factors such as convenience and satisfaction. Compatibility is a cultural attribute and refers to the degree which the innovation is

perceived as being consistent with existing norms, values and past experiences. The rate at which an innovation is diffused is also a function of the existence of an appropriate media of communication which inform potential users of its availability and characteristics and which advocates its acceptance assimilate into the existing range of practices which a farmer uses, its adoption may be more rapid than otherwise.

On complexity, Rogers intimates that it is degree to which an innovation is perceived as difficult to understand and use. Complexity becomes a critical issue when the description and demonstration a new practice among specific groups of farmers, and dependent on the groups cultural values, mental ability, educational status, conceptual skill and opinion leadership. Generally, it is observed, that those new ideas requiring little additional learning investment on the part of receivers will be adopted more rapidly than those requiring new skills. The degree to which the results of an innovation are visible to others enhances its rate of diffusion and adoption. This is because, the easier it is for an individual to see the results of an innovation, the more likely he is to adopt it.

The conclusion of the adoption process is either the adoption or rejection of the idea or practice. The results can, therefore, be ordered in a continuum ranging from continued adoption, later adoption, discontinuance and continued non-adoption.

4.II THE CONCEPT OF EXTENSION

The concept, the term and usage of extension, according to Roling Neils (1988), is "unhandy and imprecise". This is partly

because extension is, in fact, a field of human endeavour beset with intellectual confusion and partly because a great many activities are covered by it. This assertion is well supported by Van den Ban (1988) when he states that in the United Kingdom, Germany and the Scandinavia, for example, the focus is on advisory work, that is, on solving specific problems of clients. In contrast, in the American tradition, the term "extension education" is used to emphasise that they are dealing with an educational activity which seeks to teach people to solve problems by "extending information".

This semantic confusion in the use of the concept of extension, perhaps, derives from its historical development. Historically, extension science began as a specialisation within rural sociology, whose focus on "change" popularised the term extension as an instrument of change. Thus, studying "change agents" such as extension workers and their agencies, invariably, became an acceptable sociological preoccupation. Consequently, one of the earliest extension research paradigms - "diffusion and adoption of innovations" - arose within, and was consolidated as a tradition of rural sociology by Herbert Lionberger (1960) and Everett Rogers (1962) in the United States of America and Van den Ban (1963) in the Netherlands. This, nonetheless provided a comfortable abode for what is to become extension science.

Yet, current thinking on the concept suggests that extension does not necessarily involve as much theories of change as of changing. Thus, eventually, extension became decision-oriented and divorced itself from rural sociology, becoming more and more concerned with utilizing social psychology and communication and

borrowing heavily from related fields of education, marketing and advertising (Neils, 1988). In the process, the focus shifted to the micro-level and to extension methods, interpersonal communication processes and the adoption of technology by the individual. Today, however, the focus is on information and knowledge systems, on the interfaces between systems components and between the information system and other systems and the consequences of technology-propelled development.

The fluidity of the field of extension makes the concept to attract a variety of meanings and can, therefore, be best understood in the socio-cultural context in which it is used. For the purpose of this study, and to focus attention on a more limited perspective, the term "agricultural extension" will be used.

In a rather systematic manner, Van den Ban and Hawkins (1988) contend that agricultural extension is:

... a process which helps farmers to analyse their present and expected future situation; ... to become aware of problems that arise in such an analysis; increases knowledge and develops insight into problems; and helps to structure farmers' existing knowledge, helps farmers acquire specific knowledge related to certain problem solution and their consequences so they can act on possible alternatives; helps farmers to make a responsible choice which, in their opinion, is optimal for their situation; increases farmers' motivation to implement their choices; and helps farmers to evaluate and improve their own opinion-forming and decision-making skills.

Thus, to them, extension is a purposeful assistance to decision-making and opinion formation. They explain, that extension involves the conscious use of communication of information to help people form sound opinions and make good decisions. In the process:-

Extension agents supply information about agricultural policies and the reasons for them and endeavour to stimulate certain developments considered to be desirable. (It is therefore) a process of helping people make decisions by choosing from alternatives solutions to their problems.

Roling Neils (1988), however, presents a critique for the assertion of Van den Ban and others that extension is a purposeful assistance to decision-making and opinion-formation. According to Neils, this definition does not specify whether the "assistance" to farmers is a normative choice or an inherent characteristic of using communication as one's instrument for inducing change. To him, the assistance to farmers "is infant a characteristic inherent in the logic of extension". Whereas Neils accepts that extension is a premeditated, planned, activity, he goes further to state, that any extension effort is an intervention. According to him, anyone who intervenes through communication can be effective only to the extent that voluntary change can be induced. He explains, that extension is not an instrument which can force people to do things against their will however much one would want to do so. He points out that one of the intriguing aspects of extension is its contradictory nature:-

It is an instrument of premeditated, deliberate intervention to achieve the intervener's goals; which can only be effective by inducing voluntary change. ... Extension operates at the

interface of these two types of internationalities and the hallmark of extension professionalism and of its strategic deployment lies in handling the contradiction.

Neil sees an intervention as:

... a systematic effort to strategically apply resources to manipulate seemingly causal elements in an ongoing social process, so as to permanently re-orient that process in directions deemed desirable by the intervening party.

Within this context, he defines a voluntary behaviour as one that:

... is enacted in the absence of surveillance and incentive structures cannot be charged with decree. It requires persuasion, the transfer of information and other communication leading to changes in knowledge, awareness, motivation, understanding or feedback which allow target clients to decide that behaviour change is in their interest.

According to this view, therefore, extension effectiveness depends on the willingness of the people to be persuaded or on the extent to which they see extension as serving their own interests and benefits.

Paulo Freire (1974), the celebrated Brazilian educationist has a rather radical view of the concept of extension. In a comprehensive exposition on the educational task of the agronomist (which Freire considers to be mistitled an "extension agent"), Freire provides a profound synthesis of the role he attributes to education in its true perspective, that of "humanising man through his conscious action to transform the world". Freire's essay, in no uncertain terms, exposes the poverty of the concept of agricultural extension which has prevailed over the years, and as Jacques Chonchol (1974) puts it:

... in spite of the generosity and goodwill of those who have dedicated their lives to this work.

Freire prefers the use of the term communication to that of extension because, the concept of extension relates "semantically with the concept of cultural invasion".

Explaining his position, Freire intimates that the concept of extension is pregnant with the notion that the peasant is not educated and is thus treated as a depository for propaganda from an alien cultural world, containing the things which the technicians (who are "modern" and therefore superior) think the peasant ought to know in order to become modern also. he succinctly states:

There is in the concept of extension an unquestionably mechanistic connotation, in as much as the term implies an action of taking, of transferring, of handing-over and of depositing something in someone ... if their (agronomists') action is merely that of extending elaborated "knowledge" to those who do not possess it, they kill in them the critical capacity for possessing it.

Freire contends that peasant attitudes toward phenomena like planting, harvest, erosion and reforestation are intricately related to their attitudes toward nature, their religious beliefs, their values and others. As a structure, this cultural totality cannot be affected in any parts without an automatic reflex occurring in the other dimensions. He suggests, therefore, that for the agronomist-educator to successfully change peasant attitudes in regard to a particular aspect of life, then he must know their view and confront it in its totality.

According to him, in most cases the presence of new objects in a community, of a new method of a different way of acting, produces mistrust, total or partial rejection or acceptance. He opined:

Without communication human knowledge could not be propagated ... without a relationship of

communication between subjects that know, with reference to a knowable object, the act of knowing would disappear.

Such a process of communication, in his considered view, is not the exclusive transfer or transmission of knowledge from one subject to another, but rather his co-participation in the act of comprehending the object. It implies that "comprehension of intercommunicating subjects" of the content with reference to which the relationship of communication is established.

Paulo Freire is not alone in his thinking, for a similar vein, Hawkins and others (1984), observe that farmers' opinions and decisions are based on their image of reality in which they live and on their expectations of the consequences of their actions in this reality. These expectations may not always be correct because their image of reality often conflicts with reality itself. In their view, therefore, for the actions of farmers to have the desired consequences more frequently so that they are able to have a more control over their own lives, it is for extension to help farmers come to terms with reality. They include that the opinions and decisions of farmers which are based on their values and which are hardly perceived by them are to be clarified by extension.

As to why most extension efforts fail to make the desired and lasting impact, Freire contends that it is due to the fact that extension agents have naive view of the farmers' reality. According to him, it is also due to the marked attitude of superiority and domination which the technicians confronted the peasant within a traditional agrarian structure. Setsoafia (1993) on the other hand attributes the failure of most extension efforts

to the delivery system employed. According to him the delivery of agricultural messages in top-down manner can be traced to the principles and practices of the "diffusion of innovations model as popularised by communication scientists such as Everett Rogers (1962/71). According to Setsoafia, such delivery methods, apart from being paternalistic, only favoured the easy transfer of information and other technologies from outside and paid little or no attention to the enormous variances among the farm families. They fail because, contrary to expectations, messages in rural areas do not necessarily trickle down but rather they flow laterally among farmers with similar accessibilities to resources.

4.III THE ROLE OF EXTENSION IN AGRICULTURAL DEVELOPMENT

Hawkins and others (1984) hold that the important role of agricultural extension is to:

... help farmers form sound opinions and to make good decisions by communicating with them and providing them with information they need.

They reasoned, that farmers are to be helped with their decision-making on their pathway towards knowledge as well as that of choice. They contend, that the pathway towards knowledge generally receives much attention from the agents, but information they provide for this pathway is effective only if farmers realize that it helps them on their pathway towards choice. According to them, people acquire their images of reality in which they live by learning from their own experiences; observing other people's experiences; talking with other people about their experiences and research findings; and thinking about information they had gained

in these ways. Extension is, therefore, to promote and complement these learning processes.

A further discussion on the role and functions of agricultural extension is provided by Maunder (1972). According to him, it is the role of agricultural extension to take to rural people that form of educational assistance best suited for their agricultural needs. In a more specific terms, Maunder points out that agricultural extension:

Is a system a service which assists farm people, through education procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living, and lifting the social and educational standards of rural life.

Generally, therefore, agricultural extension aims at introducing farmers to improved agricultural methods and practices for higher agricultural yields at a very low cost with the ultimate goal of improving the well-being of farm families.

In an attempt to distinguish it from other forms of advisory service, Savile (1965) believes that agricultural extension:

...is an evolution of the Advisory Service which can be regarded as a form of community development with an agricultural bias and an educational approach to the problem of rural communities.

As an educational approach to rural problems, the success of any agricultural extension programme depends considerably on the extent of farmer motivation and the ability to induce permanent behavioural changes within the target farming population. This view is firmly established by Wayo Seini (1992) when he intimates that:

Extension programmes should, therefore, be designed with the objective of changing attitudes towards

modernisation; technical proficiency in agricultural production; and effectiveness in allocating available resources.

According to him, a major thrust of extension efforts in traditional rural societies should be directed towards motivating peasants to take advantage of the economic opportunities available to them such as access to credit, harnessing of water resources for irrigation and the provision of rural infrastructure. This position of Wayo Seini seems to agree with earlier assertions by Hayami and Ruttan (1971) that:

It seems clear that farmers in traditional agriculture are poor not because they are irrational but because they have few opportunities to improve their situation.

A major impact of extension a farming population is, that as an educational process, it enhances the ability of the producer to acquire and or decode information about productive characteristics of new inputs, promotes the adoption of new farming practices, techniques and methods and, as a corollary, increases their productivity and level of production towards improving their general well being. Thus, one cannot but agree more with Dreyfus (1982) when he states, among other things, that:

The development of an effective system of disseminating information and providing production education to agricultural producers is generally accorded a high priority among the prerequisites for agricultural development.

This is because, according to Dreyfus, the development of skills in decision-making is one of the most important objectives of education and this, nonetheless, forms the focus for the evaluation of extension impact of agricultural development programmes.

Earlier in 1963, a United Nations Source observed that agricultural extension is not solely concerned with teaching and securing the adoption of a particular improved practices, but should concern itself with:

...changing the outlook of the farmer and encouraging his initiative in improving his farm and home. The effectiveness of extension is measured by its ability to change the static situation which prevails in rural areas into a dynamic one.

For economically less developed countries with high ratio of illiterates in the total population, Maunder (1972) suggests that:

Any sharp and continuing acceleration of agricultural productivity requires the breaking away from traditional attitudes towards change.

In his view, the development of human resources through educational endeavours offers not only one of the greatest possibilities for economic advancement but is a prerequisite for the application of the technology required to increase agricultural productivity. Rapidly advancing technology requires continuing education for rural adults regardless of their level of formal education. Extension service should, thus, be considered as a lifelong educational process designed to promote the productive capabilities of the farming population.

Generally, the role of extension services in agricultural development should be seen as, primarily, catalytic, to the extent that they enhance the diffusion and adoption process and with the ultimate goal of achieving increased productivity among farming populations.

4.IV PREREQUISITES OF AN EFFECTIVE AGRICULTURAL EXTENSION SYSTEM

Uma Lele (1975) points out, that the mere intensification of extension services may be futile unless conscious simultaneous efforts are made to:-

- impart the technological package that is sufficiently profitable at the farm level to provide an incentive for the farmer to adopt innovations;
- train the extension staff to solve the specific but diverse farm-level constraints faced by the cultivator;
- develop an incentive system to encourage the extension service to perform its task efficiently. This means not only rapid growth in production but also broad participation in the adoption of innovations;
- and enlist the active support and participation of the farmers themselves.

David Benor and others (1984) also provide a synthesis of what they consider to be an effective extension system. According to them, an extension system is effective, to the extent, that it is, in the first place, able to expose "attractive production options" are largely those that enable farmers to use their land, labour and capital in a better way. They hold the view, that agricultural research and extension services play a central role in facilitating this exposure through "the development of appropriate production recommendations and the transfer of new technology to farmers".

In the second place, extension effectiveness depends on the extent to which it is able to assist farmers to understand the new technology being extended to them:

It is for extension to explain new technology to farmers and teach them how to adapt and adopt improved production practices under their own individual farming and resource conditions so as to increase their production and income.

The greatest constraint to technology adoption is the farmers' perception that the new technologies are complex. An innovation is said to be complex if it is difficult for farmers to understand and use it. (Adams, 1982). An effective extension service should be able to help farmers to know " what kinds to use, how much to use and how to use" the new technologies being extended to them.

Lastly, an effective extension system should be able to perform the required feedback function- "that which facilitates the continuous reorientation of research towards the priority needs of farmers and the early resolution of important technological constraints".

An effective extension system, according to Benor and the others, therefore,

...helps farmers take advantage of research findings and technological advances, quickly adjust to seasonal and economic conditions and effectively use support services to increase their production and income.

Generally, therefore, an effective agricultural extension system should be able to "educate" farmers to acquire new skills and knowledge that will lead to increase productivity.

4.V THE IMPACT OF AGRICULTURAL DEVELOPMENT PROJECTS IMPLEMENTED IN THIRD WORLD COUNTRIES.

A World Bank publication of 1989 sought to review the Bank's efforts at achieving sustainable economic growth in the Third World over the past three decades. In initiating these programmes, the World Bank officials clung boldly to the dictum that the transformation of the agricultural sector and expanding its productive capacity is " the prerequisite for improving living standards" in Sub-Saharan Africa and indeed, in the Third World as a whole. The target was to raise output growth from two percent achieved since 1960 to four per cent by 1980- the level that would be needed to achieve food security and to raise per capita incomes to about two per cent. The Bank recognised that such an achievement would by itself require an annual increase in labour productivity of about 1.5 percent. And, since the area under cultivation could not be expanded by more than one per cent a year without adverse environmental consequences, the Bank stated that the productivity of cultivated land must rise by around three per cent a year.

The recipe for the attainment of these laudable estimations was the inducement of technological change. This would involve a more intensive use of chemical and organic inputs; the introduction of new higher value crops; better irrigation methods; hand tools and crop storage techniques and improved animal and crop husbandry. The policy environments of the Third World would be improved considerably to make these changes profitable to farmers. The

theoretical basis for these considerations are summed up by the Bank as follows:

Africans have, over centuries, developed ways to manage their agro-environments... With rapid population growth, the land and resource base has not been adequate in most of Africa to maintain these traditional extensive farming and livestock systems. Pressure on the land is resulting in declines in crop yields... Vegetative cover is weakening, erosion accelerating. Hence more productive technologies must be developed and adapted to respond to the special needs of African farmers and to the needs of their environment.

Indeed, since the end of the Second World War, agricultural progress all over the world, has mainly taken the form of improvement of plant and animal species, the discovery of high-yielding varieties, fertilizer technology, plant protection and water technology. And, throughout the 1960s and the 1970s, the Third World economies witnessed a massive proliferation of "Modern" technologies planned for cereals and other crops based on higher-yielding varieties, fertilizers, chemical pests and disease control and in some cases mechanization. According to Malassis (1969). this "new technology syndrome "forms the basis of what has become known as the Green Revolution in the Third World Countries.

Describing the process as agricultural modernization, Freebairn (1973) observes, that it is the progress in agriculture that has come about through biological improvements in the approach to plant breeding which as opened up enormous possibilities for "increasing the production of crops through greater efficiency in the transformation of water, fertilizers and chemicals by these

plants". According to him such progress goes further to include the:

... creation of favourable conditions for multiple cropping, increased irrigation facilities, large fertilizers and chemical inputs All these call for a much larger flow of investment capital and production credit, strengthening of research and extension services, seed multiplication and processing, improved marketing arrangements for production requisites as well as products, stable prices and incentives and the necessary institutional support for all these.

There is sufficient evidence to show that the application of the new technological package always leads to increased production and net gains per hectare several fold over the traditional technology. the research work undertaken in Mexico by the International Maize and Wheat Centre and in the Phillipines by the International Rice Research Institute, for example, demonstrate remarkable achievements in this direction. The several approaches adopted for these projects and aimed at promoting agricultural development were in the form of extension services. According to Malassis (1969), average what yields increased from 0.94 tons per hectare in 1949, to about 2.64 tons in 1968 in Maxico. In the Phillipines the cultivation of new varieties achieved more than double yields. The logical consequence was, that these new varieties became widely grown in various parts of the world and particularly in India, Pakistan, Turkey and Tunisia. Between 1965 and 1970, the area cultivated with these new varieties increased from approximately 20,000 hectares to 15-20 million hectares (Yudelma, 1971).

Reviewing the performance of the Comilla Project of Bangladesh, Swadesh Bose (1974), asserts that output and yields increased rapidly in the decade since the programme got under way but was apt to point out that:

"Factors of increased production can be found in the extremely rapid expansion in the supply of inputs associated with the high yielding variety of rice at a price that reflected high subsidy".

In Kenya, it is observed that some farmers had increased maize yields up to fifty per cent as a result of a national extension system based on the "Training and Visit" (T & V) system of extension. (IBRD/World Bank, 1989). Gakou (1987) is also of the view that projects aimed at the development of small-scale farming, most often than not, succeed in making significant "increases in production yield, productivity and even acreage. According to him, rice production within the Sedhiou (Senegal) Rice Project reached 2.8 times the target by the second year, and 3.1 times the target by the third year. On the part of the Segou (Mali) Rice operation, he states that while performances were less spectacular, they were nonetheless good. However, Gakou emphasised that:

While increase in production are generally achieved, in no way does this fact make it possible to conclude that the food requirements of the peasant producers are satisfied (completely).

In spite of these observations on the achievements made so far with the introduction of new technologies through extension programmes, research has shown that full-scale adoption of new technologies by small-scale farmers had never occurred. The World Bank publication referred to earlier confirms this by stating emphatically that "attempts to introduce new technology... in the past thirty years

have been disappointing " in spite of the massive investments in community development efforts that "this off the shelf technology" planned and injected into the developing economies, ``was frequently a failure". Similarly, it became abundantly clear that the generation and infusion of new technology alone could not provide a complete solution for the problems of the Third World economies and neither did it help the rural poor to achieve higher levels of living nor for bringing about a major impact on national economic growth. The reason being that:

The constraints on adaptation and the intricacies of adoption appeared to be much more complex than was originally hypothesized (Zandstra, et.all; 1979).

Attempts have been made by many researchers to find out the problems that inhibit the adoption of improved technology designed to increase productivity in the rural communities. The immediate reaction of Western enrocentric theorists was to locate the problems in the structures within the rural communities. It was, thus advanced that a range of considerations which cover areas of "ethics," "taboos," "religion," and the like and which collectively constitute a "cultural blockage," "incomprehension," but which have in their totality a direct bearing on the development challenge, affect the rural farmers and their rationality (Prah,1991). To such theorists, therefore, extension services fail to make the desired impact because in rural societies there are certain structures that make change a most difficult phenomenon. Foster (1962) puts it more clearly thus:-

Some cultures value positive novelty and change for their own sake. The fact that something is new and different is sufficient reason to examine it and perhaps try it. Americans, we know, are attracted

by the new ... In contrast in most non-industrial parts of the world, novelty and change have less positive appeal. In present society conservation appears generally to be culturally sanctioned.

Raymond Frost (1961) presents one of the most catchy expressions of this theory. He ventured thus:-

In advanced countries, progress continues in a more or less routine manner from year to year. Why then, should it require some exceptional effort in the backward countries? The reason lies in the prevalence of a great inertia in backward societies. Their tendency is to reject changes of any kind, however, beneficial its economic consequences may be.

Frost's thesis is that the rural communities in the Third World are static and impervious to change. In his view, the "in as far as their irrelevant purpose has been to reproduce themselves unchanged from generation to generation. The logic in Frost's argument perpetuates itself:

The routines of backward societies are customary and traditional. Their members - hundreds of millions of them are craftsmen, traders, money-millions of petty craftsmen, traders, money lenders and peasants - are dedicated to doing what their fathers did before them and doing it the same way.

In general terms, therefore, the reasons why rural small-scale farmers in the Third World reject improved technology despite its benefits in terms of yields and income returns has been explained off simply in terms of ignorance, passivity, innate conservation and similar relative characteristics (Sand, 1987). Indeed, change agents were very easily inclined to charge the farmers for stubbornness and even stupidity if they do not succeed in motivating them to take over certain recommended innovations (Kotter, 1972).

However, recent research results seem to suggest that the myth that the structures that exist within rural communities alone are factors that inhibit development and the adoption of innovations does not stand up against universal evidence. Indeed, the image of Africa and the Third World in the Western mind and the existential realities of the small-scale farmers perceived, from sources within it, are structurally dissimilar (Prah, 1991).

The question of acceptance of new agricultural technology may as well be summarised by quoting from a report of a conference sponsored by the Rockefeller Foundation on Agricultural Development held in Bellagio, Italy, 1970, as follows:

The problem seems not to be the farmer. The focus of attention must be on the productive sureness of the preferred technological package, on its profitability, on the infrastructure of market and other rural decisions for progress and in national ethos of development.

A further explanation can be sought from a research which reported that the United States efforts to build agricultural extension institutions in twelve countries of Central and South America achieved neither the institutional security nor the production impact that were included among the original project design. The researchers remarked that there were gross misconceptions about the role of extension in rural development and other factors related to unsuspected faults in the services device used to administer the technical assistance programme. According to one of the researchers John Higgs (1976), extension programmes were successful in the United States because:

They were created to answer the problems and aspirations of numerous small farmers who already had access to land, social status, political power,

alternative employment and the possibilities of economic advancement.

They argued that when such a scheme is transported to totally different conditions, there was no reason to suppose that they would succeed. They reasoned, that there were relative failures in the application of the scheme elsewhere because the training, organization and methodology was largely irrelevant to the other social systems and should have been greatly modified for application. They continued:

... much greater drive is required to attack all aspects of rural development, and that reliance on extension alone is not enough. In the absence of motivation of the people, of a carefully created desire for change within the social order, without change in the land systems, credit, markets, and all the other necessary inputs, any serious advance is unlikely.

Rolling Neils (1988) agrees with these observations and goes further to explain, that it is difficult to improve a farming system that has evolved over and survived many generations unless varieties of input availability have changed, it would be "arrogant to assume that one could improve upon generations of human intelligence".

The views of Magid Rahmena (1987) seem to be consistent with those of Sands, Higgs and Neils. In a study to measure the correlation between subsistence societies and their immunization systems, Magid Rahmena reasoned out that:

...for any specific culture, the lesson of its own experience are the ones that count, and the ones on which its members should rely more than any other to improve the quality of their lives.

He observed that the problem with most developmentalist is that they have not understood that what is real and important to people is their own experience of reality and the perceptions they have gained in that reality. He continued:-

To try to transform, or reform another culture on the basis of one's model or experience is both mistaken and misleading. To try to force the other to become like one is indeed worse. It amounts to an aggression which is counter-purposive, always unethical.

In general terms, therefore, for any extension effort to be effective, the types of technological innovations being extended and the form of change being required must be intricately identified with what persists in the receiving society.

Research has also shown that one other major problem that inhibits the adoption of agricultural innovations is, that in most cases, the new technology usually requires a much higher level of purchased inputs, and low-income farmers often needed to go heavily in debt to acquire such inputs. For example, to be able to achieve the desired yield from improved seeds, the farmer necessarily has to apply fertilizer, manage water resources and apply pesticides and other agro-chemicals, which require additional financial resources to purchase.

A study conducted by Zandstra, et.al (1979) that compared traditional corn production methods with those recommended by the Caqueza Project makes the picture clear. The report reveals that the recommended technology required tripling the traditional value of inputs with nearly all of this increase in the form of cash outlays. Related to this increase in cash costs was the fact that

returns to cash spent for purchased inputs were reduced from \$3.75 to \$2.44 per dollar invested. Commenting on these and other revelations, Zandstra and the others conclusively stated that:-

A combination of a reduction in returns to cash coupled with greatly increased cash requirements suggested that one possible explanation for farmers' rejection of the recommended practices was related to the cash constraints in the project area.

Thus, although there is a higher probability of obtaining higher yields with the recommended production methods than with the traditional area farmers always consider the possibility of losing the substantial amount of cash that was required for the recommended inputs.

One consequence of this "new technology syndrome" is that it seems to favour large farmers more than the smaller ones. Explaining this position, Keith Griffin (1972) points out that:

The generation of this new technology has been shown to be heavily reliant on institutional changes in areas such as credit and marketing. Without such changes the primary beneficiaries ... appear to be those who already have superior endowments of land, social status, and indeed, in some areas, the Green Revolution appears to have exacerbated existing social imbalances and economic disparities.

This point is buttressed by Donald Freebain (1973) when he studied cases in India, Pakistan and the Philippines in the 1970s. Freebain observed that large and medium-sized farmers and landowners were the early adopters of the new technology. Explaining this, he points out that their privileged position viz-a-viz information networks, their contact with research and extension services and often their ascribed role as "model farmers" or "farm leaders" had helped them get an early start. They also had the opportunity to cash in, with

a larger output, on initially very high prices of grains and the much higher prices of seeds. This category of farmers also had command over the financial resources, either owned or borrowed, necessary for investment and for the purchase of current inputs of seed, fertilizer and pesticides. Increase profile allowed them to buy or hire tractors and mechanize through eviction of tenants or purchase of land.

Freebain might have carried his observations too far, but was not alone in this line of thought, for in a separate study Malassis (1976) observes that those who had benefited from the new technology extended in Mexico and Phillipine were the "large farmers", probably because:-

Larger farmers are often more receptive to technical innovations, more educated and up to date; they benefit most from the extension service, which single them out for special attention for that reason, they have capital, access to credit.... The new technology, therefore, tends to emphasize the heterogeneity and in particular the dualistic nature of agricultural economy: large productive farms thrive and the small farmers mark time.

In a study to find out the problems that limited the adoption of improved oil palm production technologies in the Imo State of Nideria, Jude Njoka (1991) remarked that the greatest constraint was the high cost of labour, insecticides and other inputs especially for farmers who have a low capital base and limited access to publicity supported credit. In the Caqueza Project area, it was observed that technology adoption in corn without credit or supervision was minimal. According to Zandstra, et.al. (1979), the weighed average of thye partial adoption rates of the specific components of the recommended package in programmes without formal

credit or supervision reached only 15 per cent in 1975. Examining the 1975 practices of farmers without formal credit, they concluded that few of them used improved seeds, nitrogen and pesticides. To explain this it is worth recounting the observations made in an IBRD/World Bank publication (1989) on the impact of technology transfer to Sub-Saharan Africa since the 1960s. The report states succinctly that the use of the new inputs required money which was hard to acquire for most African farmers operating at or near subsistence level. The farmers often lacked labour, capital or land necessary to use the technology properly. And, within the Caqueza Project area, it was the:

... continuing problems of obtaining credit in time to use for purchasing seed, and fertilizer for the corn crop and unsuccessful efforts to obtain insecticides and fertilizer packages in quantities small enough for use by the farmers with one hectare or less.

The available literary sources also remarked that government price and marketing policies often made it impossible to use the technologies profitably. The much recommended inputs have always been in short supply because of ineffective and inefficient government procurement and distribution agencies, poor transport systems, limited foreign exchange and restrictions on private sector marketing of the agricultural inputs. Indeed experience from the Caqueza Project area sufficiently shows that if low-income producers are given credit and technical assistance, as well as, security that they will not become liable for their losses, most of them will not hesitate to increase their production. The evidence overwhelmingly suggest that the security of capital often limits adoption rates.

The International Centre of Insect Physiology and Ecology (ICIPE) Nairobi, Kenya was mandated in 1989 to develop integrated pest management packages and strategies for the resource-poor farmers in the tropical world. The Centre was to ensure that the pest control measures were environmentally safe, viable and economically sustainable. In its work with the peasants in Oyugis and Kendu Bay (South Nyanza, Kenya), the Social Science Interface Research Unit of the Centre had found out that:

- farmers were selective in their choice of components of the pest management packages offered by the centre.
- they were cautious in their approach to the adoption of pest management technologies, and spread their risks very carefully in the process.
- they showed openness in their assimilation of cultural practices affecting production and would resist being into any schemes or the adoption of technologies for which they have doubts and the risks involved, too high. (Prah, 1991)

The evidence from the available sources overwhelmingly suggest that the security of capital does limit adoption rates.

To conclude, the available evidence sufficiently suggests that the seemingly conservative and revolution tendencies of small-scale farmers in the Third World are dependent on the extent to which their auto-perception of emerging social changes and trends are practically beneficial and emancipatory in a social and economic sense. Indeed, the very nature of the Green Revolution provided that increased yields also reflected much higher inputs of the production factors. The success of this new technology cannot in anyway be disputed but it is also abundantly clear, it raises serious socio-economic problems which often accentuates the old

ones of peristent poverty and skewed distribution of income in the project area.

The conclusion reached after a series of studies conducted by the ICIPE in Western Kenya in the late 1980s, perhaps, summaries the discussions held so far. The report emphasised that the resource poor farmer is by definition a person who operates a "diversifies system of production in which food security and cash incomes are key". The family supplies most of the labour. Therefore, their labour investment into new activity or technological innovation and indeed, their evaluation of innovations requiring changes in normal practice is judged in terms of what they expect for that additional labour invested. Thus, their perception of profitability within the household of innovations is key in evaluating prospects for the adoption of new or improved technologies. (Prah, 1991).

CHAPTER FIVE

THE VOLTA REGIONAL AGRICULTURAL DEVELOPMENT PROJECT (VORADEP)

5.1 INTRODUCTION

The history of Ghana since independence has not been without conscious and concerted efforts at developing the agricultural sector of the economy, as a means to improving living conditions in the rural areas and promoting national development. In most instances, the ultimate goal was to increase the productive capacity of the rural population through the provision of factors of production, basic social amenities and other infrastructural services.

The task of this chapter is to examine, from a historical perspective, what kinds of agricultural development strategies and policies were already tried in Ghana since independence and then attempt to discuss the lessons that could be learnt from these earlier policy initiatives. It is hoped that this attempt will provide us with the philosophical basis and the policy framework within which VORADEP was established and at the same time enable us to appreciate the import of the agricultural extension programme of the Volta Regional Agricultural Development Project (VORADEP).

Three major policy frameworks which defined strategies for agricultural development efforts made in Ghana since independence have been identified for consideration. These are:

- Agriculture and Import-Substitution Industrialization;
- Large-scale Mechanized Agriculture; and
- Integrated Agricultural Development.

Agriculture and Import - Substitution Industrialization.

In the early 1960s, planning for development in Ghana, as in most developing countries, emphasized industrialization on the premises that;

The industrial sector was the one with the highest marginal productivity for invested capital and therefore the one in which investment would lead to the greatest acceleration of national growth, which in turn, would lead to a general rise in incomes (Zandstra, et al; 1979).

Thus, it was assumed that industrialization, through its generation of capital and employment, would automatically stimulate agricultural growth. And, despite the fact that the majority of export earnings came from the agricultural sector, planning scenario in the first decade just after independence hardly gave farmers the attention they deserved. Richards (1985) contends that this neglect was quite deliberate, for:

Since peasant farmers had continued to "deliver the goods" under a degree of colonial benign neglect, they might be left to continue. The main road to modernization was thought to be through industrialization.

As much as possible, therefore, development capital was reserved for the urban-industrial sector. The main strategy was import-substitution industrialization: the concentration of manufactured goods prominent on the import list. In most cases, the government depended on large foreign reserves accumulated by the export produce marketing boards in the good years of 1945-1960s to support the import-substitution industrialization strategy (Forrest, 1981)

The period also saw active state intervention in food and agriculture in a purposeful way through a mechanism of state production units. The focus was the expansion of the production of export and industrial crops to feed the local industries.

However, by the mid-1960s it became abundantly clear that this strategy failed woefully to stimulate the expected industrial revolution. The legacy of this failure, so a number of authorities now argue, is a high level of poverty and unemployment in the rural and sub-urban areas, while the agricultural sector has been dangerously weakened by lack of investment and by tax pressure (Bates, 1981; Forrest, 1981 and Williams, 1981).

Large-Scale Mechanized Agriculture.

With the failure of the early initiatives to develop the agricultural sector, Ghana as from the mid-1960s adopted the rather structuralist approach to agricultural development (Acharya, 1981). In this approach, state intervention in agriculture was at the level of production and involved the concentration of scarce public capital and trained manpower on a few, large-scale schemes and state-sponsored organizations in the rural sector. The plan was to:

... transform agricultural production from small-scale peasant production units to large-scale mechanized farms relying on heavy (subsidized) inputs like fertilizers and treated and improved seed varieties (Hansen, 1987)

For all intents and purposes, Hansen continues:

... the transformation of the agricultural sector was not to come about through a change within the peasant mode of production. The peasant mode of production was to be supplanted by large-scale mechanized farming organized on a collectivist basis by the state.

As a result of this policy, Ghana during the period experienced a massive proliferation of newly established and mechanized state farms which received the bulk of agricultural development funds under the aegis of the State Farms Corporation.

The government of the Second Republic did not in any way reverse the existing policy for transforming the agricultural sector but, on the contrary, the transformation was to be achieved through large-scale commercial farming with private entrepreneurs. To encourage the petty-bourgeoisie in the bureaucracy, in commerce and industry, and in the professions to go into farming, the state was to provide them with incentives in the form of agricultural credit and inputs like fertilizers, high-yielding seeds and weed-killers. The attempt was undoubtedly, to seek to transform the form of agriculture. (Hansen,1987).

In both circumstances, the small-scale farmers, who produced the bulk of the country's food needs were neglected. The emphasis, in spite of stated declarations, has been on export industrial crops to feed the local industries to the neglect of food crop production. Consequently, these policies apart from being a product of vague ambition hardly made any impact on food production. At best, the strategies adopted became too expensive to manage and produced a deterioration of extension services for small-scale farmers, the polarization of credit allocations and the antagonization of the peasantry. The bulk of the population earning a livelihood from traditional rain-fed agriculture were marginalised in the agricultural development effort.

Integrated Agricultural Development

The experiences of the 1960s seem to be threefold. In the first place, the expected Urban-based industrial revolution became merely a figment of imagination and there were all indications that it might not occur, at least in the near future, with the policies being pursued and the strategies adopted. One consideration, therefore, was to try to reduce rates of urban migration by improving the attractiveness of economic opportunities in the rural areas. In the second place, the results of large-scale mechanized agriculture were very disappointing, and that thirdly, the bulk of both agricultural exports and food supplies still derived from the peasant sector. As a result of these, policy makers as from the early 1970s onwards began to accept the fact that much more attention would need to be paid to the agricultural sector and the focus should be on the small-scale producers. (Richards, 1985).

The reaction of the international community to these new initiatives in rural development was overwhelming. International aid agencies moved in to lend their support and small-farmer projects became a dominant emphasis in World Bank lending policies for African countries. The most significant aspect was that the International Development Association (IDA), an affiliate of the World Bank, set up to assist long-term development objectives in poor countries with low-interest funding (World Bank, 1975). These small-farmer projects emphasized the diffusion of what has become known as "biological package" of fertilizer and "improved" higher yielding crop varieties. The idea behind the biological package approach was that the benefits could be accessible to a broader range of farmers.

The governments of the time (the National Redemption Council and later the Supreme Military Council) launched the Operation Feed Yourself Programme (OFY) as a major policy drive for the promotion of agricultural development. The aim of the programme was to increase food production and increase national self-reliance. As a crash programme, it was to be run in three phases, that is firstly, to increase food production for domestic consumption. Secondly, it was to concentrate on the production of raw materials for local industries, and thirdly, it was to diversify and increase production for export as a source of earning foreign exchange.

As part of the programme, the period also saw the establishment of Regional Development Corporations as centres for economic development in every region of the country. Basically, these Regional Development Corporations were to organize agricultural programmes for the production of food and industrial raw materials for the local industries. According to Hansen (1987), the most important of these agricultural programmes from the point of view of investment, scope of participation, and range of activities was the Upper Regional Agricultural Development Project (URADEP). By its definition and design. URADEP was meant to be:

an "integrated" agricultural development project funded by the World Bank, the United Kingdom and the Government of Ghana. It was meant to be an integrated rural development project to increase food and agricultural production, raise incomes, provide amenities and raise general standard of living and the quality of life. (Hansen, 1987).

In the pursuit of these broad objectives, the project sought to supply small-scale farmers with seed or seedlings, fertilizers, credit to purchase the input package and extension advice. It also had the responsibility for solving some of the most urgent infrastructure and social welfare constraints on increased agricultural production in the project area. For that matter, the project built farm access roads, improved village water supply and took some interest in health delivery systems and nutrition matters (Kudiabor, 1974; Brown, 1986)

It was envisaged that depending on the success of URADEP, a similar project would be set up in other areas and in the Volta Region of Ghana in particular. Thus, it can be asserted rather confidently, that the dream for the establishment of the Volta Regional Agricultural Development Project (VORADEP) was rooted in the URADEP.

Indeed, the Operation Feed Yourself programme, should be regarded as significant in itself in many respects. To the extent that it had been the most ambitious and purposeful attempt so far to respond to the domestic food and agricultural needs of the country, both in programmatic and institutional terms. Not only did it mark a clear departure from previous food and agricultural policies but that the programme chalked some success at least for a brief period. It is on record that cultivated acreage of maize rose from 997 thousand acres in 1970 to 1,050,000 acres in 1974; and production increased from 378 thousand to 478 thousand long tons within the same period. Rice production also increased from 48 thousand to 72 thousand long tons between 1970 and 1974 (Ghana: Five Years Development Plan, 1975 to 1980).

These achievements had been short-lived though, for after 1975 production of food started to decline, to the extent, that Ghana had to appeal for international food aid the following year. (Hansen, 1987). A report of the Central Bureau of Statistics of Ghana (1981) reveals, that for example, staples production fell sharply from 890 thousand tons in 1974 to about 540 thousand tons in 1978. Similarly, with an estimated food requirement of about 800 thousand tons of maize and 200 thousand tons of rice, only about 221 thousand tons of maize and 20 thousand tons of rice could be obtained by 1980. The result was that about 10.7 million cedis worth of staple alone were imported in 1978 to supplement domestic food production, and this showed an increasing tendency over the years. The situation could be said to be precarious for a country like Ghana since the situation posed serious problems of food security and for economic development in the face of serious external payment difficulties.

These observations and the evidence from a range of evaluation studies of the many integrated agricultural development programmes across the country showed convincingly that the results had been disappointing. It has become self-evident that there was hardly any sign of a thing in Ghana equivalent to the Green Revolution in Asia in the 1960s. Even the URADEP failed to be capable of gaining and sustaining the interest of dedicated farmers, and the drop-out rate was very high.

A considerable number of explanations have been advanced for the apparent failure of the efforts made so far to stimulate a self-sustaining agricultural growth and development. These theories range from state interventionism, to the inappropriateness

of the input packages on offer. Commenting on the URADEP specifically, Shepherd (1981) had this to say:

Whereas ... (tried) to propagate "appropriate" innovations, (it) has not allowed for sufficient research, nor planning and implementation to be confident of what APPROPRIATE INNOVATIONS might be.

In the view of Biggs (1984) elaborated in the work of Richards (1985) the projects sought to "insulate" themselves from the very contacts they should be fostering-with the farmers themselves. Richard argues that the failure of the projects was due to the fact that "feedback" even in projects committed on paper to "problem-solving" approaches had been often minimal. This is because the projects had no mechanisms through which "extension workers could report farmers' views, needs, and reactions, and experts were not accountable for the recommendations they made".

Evaluating URADEP. Mohammed Chambas (1980) observes, among other things, that:

It is clear that the aims of the project have not been met on some of its most important dimensions. ...there is now a clear danger that as the project fails to have impact on the productivity of the mass of peasantry, food shortages will strike more frequently, causing the more able members of the rural community to migrate to the south as usual...

Mohammed Chambas was convinced, beyond all doubts, that the main beneficiaries of the project had been the donor countries, the international supplier of capital, the local and national petty-bourgeoisie in the agricultural bureaucracy, business, commerce and the service sector. For the majority of the peasants in food and

subsistence agriculture, he states; "URADEP" brought no visible benefits to relieve them of the drudgery of work, or improve rural incomes or provide social amenities".

He laments in a rather pessimistic manner that:

...what is most surprising is that with such a record of poor performance a second project, the Volta Regional Agricultural Development Project (VORADEP) was initiated along the same lines.

Perhaps, what Chambers should have added was that the only new thing about VORADEP is that its Crop development phase hinged on the "Training and Visit (T&V)" System of extension instead of the "focus and concentrate" system used for URADEP.

That, the small-scale farmers for whom the projects were designed could not reap their full benefits could, perhaps, be explained in terms of the socio-economic milieu in which the World Bank's "new strategies" for development in the Third World emerged. Historically, the World Bank's new agricultural priority for lending coincided with a renewed discovery of the Third World agricultural potentials by the great capitalist agribusiness firms. From this perspective, therefore, the moral and intellectual claims of the Bank officials are a sham, and the food deficit situation in the developing world more of an opportunity than a crisis. For, the Bank's new attention for agricultural development in the Third World was stimulated by, and by itself stimulating, to an unprecedented degree, a multitude of processing industries of modern inputs into primary production. These spreading forward and backward linkages, according to Burki and Goering (1977) had created a "new clientele for multi-national products and services".



Accordingly, overseas sales of farm equipment, seeds, fertilizers, pesticides and insecticides have boomed, along with supporting services of international consultants, technical assistants, advertisers, sales personnel and engineers.

Undoubtedly, the role of the World Bank in this "agribusiness" penetrating the Third World has been spectacular and multidimensional. Firstly, the bank emerged as the leading multinational provider of the requisite rural infrastructure (irrigation facilities, dams, feeder roads and agricultural credits). Secondly, the Bank provides large scale direct assistance to crop and livestock production and to related industries. The third, and perhaps most significantly, the Bank coordinates the Consultative Group on International Research (OGIAR), an umbrella agency grouping of a dozen research and training institutions engaged in improving and propagating the new high-yielding varieties at the core of the so called Green Revolution.

Thus, as Burki and Goering (1977) rightly concludes, the World Bank can be viewed as:

... a vanguard of the latest phase of capitalist expansion in which the resource-rich Third World is fully incorporated into the Capitalist World.

Indeed, Ernest Feder (1977) considers the whole episode in the drama of the World Bank's "new strategies" as "capitalism's last ditch effort to save underdeveloped agriculture". Yet, he opined further, that the current emphasis on reaching small-scale farmers can be explained as an effort "to make capitalist-style

entrepreneurs of the peasant producers". In short, the major purpose of deeping extension work is to:

Demonstrate to farmers the economic benefits of improved technology which quickly generates demand for a greater variety of increasingly sophisticated production inputs and services. (Burki and Goering, 1977).

Invariably, the ultimate goal of all these strategies was to ensure a continuous existence and further expansion of capitalist agribusiness firms.

In whatever way the phenomena is perceived, what is clear is that by 1980 all the conscious and concerted efforts at producing more food to feed the nation's ever-growing population and the local industries had failed. Neither an industrial nor an agricultural revolution had taken place. And, in particular, the small-scale subsistence agricultural economy has not been transformed the least. The declaration of Colonel Benasko, a trained agriculturist and one time Commissioner of Agriculture, and quoted extensively by Hansen (1977) seems to make the peculiarity of Ghana's agrarian situation much clearer. According to him:

Since Ghana achieved independence we have struggled over food problems. By and large it can be said that in spite of the stupendous efforts of the past we have not brought the food problem under control... It appeared every successive government had been embarrassed at one time or the other by the chronic food shortage.

Perhaps, the warning of Robert Mc Namara in his often quoted address to the Board of Governors of the World Bank in Nairobi,

Kenya in September, 1973, is worth considering at this stage.

According to him:

Disparities in income will simply widen unless action is taken which will directly benefit the poor... (There is no viable alternative to increasing the productivity of small-scale agriculture if any significant advance is to be made in solving the problems of absolute poverty in rural areas... Without rapid progress in small-holder agriculture throughout the developing world, there is little hope either of achieving long term stable economic growth or of significantly reducing the levels of absolute poverty. (Quoted in Stryker, 1979).

There is, in no uncertain terms, the greatest need in our times to transform the agricultural economy of Ghana to provide for the domestic food requirements for a rapidly growing population and to form the basis for an overall structural national growth and development. But, as Hansen (1987) rightly intimates, this transformation can only be done by "appropriate" policies and by the "class" currently located in the agricultural sector and not by a 'rentier' class. It is from this perspective that one would want to appreciate fully the import of the agricultural extension programme of the Volta Regional Agricultural Development Project (VORADEP).

5.II PROJECT DEFINITION AND DESIGN

The Volta Regional Agricultural Development Project (VORADEP) was inaugurated in March, 1981 and became operational in June of that year. However, the calendar year of 1982 was officially recognised as the project year. Basically VORADEP was conceived as a Rural Integrated Agricultural Development Project initiated by the World Bank and cofinanced by the International Fund for

Agricultural Development, (IFAD). The project was meant to increase agricultural production, farm incomes, welfare and standards of living of the farming population, particularly, small - holders in the Volta Region; by introducing and diffusing improved farming technology, supported by increased supply of fertilizers and other inputs; improved extension and other farm support services; and the development of rural infrastructure. The project would also strengthen the Ministry of Agriculture's capabilities by providing training to extension and technical staff, and streamlining existing institutions in the project area.

As a rural intergrated agricultural development project, VORADEP was designed to consist of two components, that it the Agricultural Development and the Rural Development Component. The agricultural development components involves the innovative extension programme known as the "Training and Visit" (T & V) Extension System; the supporting services for the T & V system including Home Extension, Rural Health Education, Adaptive Research, Vertinary, Animal Husbandry, Fisheries and Plant Quarantine. The rural development component aspect includes Civil Engineering, Mechanical Engineering, Irrigation/Hydrology and Water Survey, Resources Planning and Communications. These departments have specific roles in housing and roads development, equipment and vehicle maintenance and repair services, small dams rehabilitation, bore-holes development, establishment of pilot irrigation schemes and the collection and collation of hydrological data, the planning of the region's resource base and the establishment of an effective and efficient accommodation system.

The core component of the project is the crop development programme which was expected to generate all the project benefits. The crop development programme was designed as the first phase of a programme for agricultural development in the Volta Region which would concentrate on the development of major food crops and related support services. Emphasis is directed to simple crops production methods which would not require major changes in the existing cropping patterns, farm sizes and land tenure systems. And, the programme would be implemented mainly by existing institutions and only the distribution of inputs that would be undertaken by a new organization. Essentially, therefore, the crop development programme was designed to improve farming practices, techniques and methods via an effective extension system and provision of farm inputs;; to establish on-farm trials and research; and to initiate low cost small irrigation schemes.

The main target group for the crop development programme was specified by the World Bank Staff Appraisal Report (SAR) in March, 1980 as "small-holder farmers who grow crops predominantly to meet subsistence needs". By definition, the small holder farmers are those cultivating on average 2.1 hectares of land and would be those to benefit directly from the project. Following a major project review carried out by the World Bank and IFAD in 1984, it was estimated that about 90 thousand out of the 180 thousand farm families of the farming population of the Volta Region would be reached directly by the project.

Again, the major behavioural changes expected in the farmers as a result of participation in the programme would include:-

- the adoption of new and improved, high-yielding varieties of maize, cassava, cowpeas, rice and sorghum;
- the adoption of yam "mini-set" propagation techniques to overcome the shortage of planting materials;
- the Adoption of improved planting and management techniques such as spacing and line-planting according to specifications to ensure recommended, plant density and populations on the fields, thinning out and use of agro-chemicals; and
- the adoption of improved storage techniques.

Furthermore, it was envisaged that the principal direct benefits of the project, at full development from the seventh year onwards, would be the additional annual production of maize (30,000tons); cassava (84,000 tons); yams (12,800 tons); rice (1,700 tons); groundnuts (500 tons);sorghum (300 tons); and vegetables (6,600 tons).

It is significant to note, that the ideas that were fed into the concept of VORADEP derived from the thoughts that had crystallized on Third World agricultural and rural development since the 1970s. The main challenge of the time was to make agriculture central to all development efforts in the developing world. At the international level, the conception of VORADEP corresponded with the World Bank's agricultural priority for lending. At the national level, VORADEP fitted well into the policies of successive governments for food and agricultural development.

Indeed, the policy of the Liman administration, at the time of the inauguration of the project, did not differ in any way from the earlier ones. Rather, added importance was given to this policy of

seeking to attract transnational corporations in agriculture in the new government's new Investment Code which widened the scope and area of transnational corporations and foreign capitals investment in food and agriculture (Hansen, 1987). The main policy document in agriculture, "Action Programme for Agricultural Production, 1980-81," nonetheless, repeated what previous policy-makers had already said. Among other things, it stressed;

- the need to produce not "merely adequate staple food-stuff to satisfy our domestic needs but eventually surpluses for export; and
- a commitment to "utilise the private small-scale producers, the private commercial or corporate farmers and the parastatal organizations".

It can be said, therefore, that at the time of its inauguration, VORADEP had the right international and domestic environment for its implementation. At the same time, except for its innovating extension system VORADEP did not seek to accomplish anything different from what URADEP and other similar rural intergrated agricultural development projects, that had preceded it, had tried to do.

5.III. THE ORGANIZATION AND MANAGEMENT OF THE PROJECT

By the World Bank Staff Appraisal Report (SAR), the following organizational and management structure was designed for VORADEP:-

The Ministry of Agriculture, via its regional office in Ho, would have overall responsibility for project implementation. However, in line with the government's policies of decentralization, all operational responsibilities and financial, administrative and policy matters would be delegated to the Regional level. Yet, at the same time, the Regional Administration

was expected to liaise with the Ministry of Agriculture in Accra on matters of national agricultural policies and priorities. Within this broad framework, the project organization would consist of Volta Regional Agricultural Committee (VORADEC), a restructured Regional Ministry Agriculture (RMOA); and a Farmers' Services Company (FASCOM).

VORADEC functioned to determine project policy; exercise budgetary and financial control; approve work programmes; ensure coordination with various sectoral and national institutions and to liaise closely with the Ministry of Agriculture in Accra on matters affecting national priorities and policies. The Regional Agricultural Office was to be headed by a Regional Agricultural Coordinator (later Regional Director of Agriculture), and would have the primary responsibility for coordinating all project activities and would also act as the Project Manager. Generally, this organizational and management structure was designed for VORADEC to ensure the necessary adaptation and streamlining of the Regional MOA to organize and coordinate the project components.

Basically, there was to be a three-tier structure comprising:

- Central Support Services; Administration and Personnel; Finance and Procurement; the Planning, Monitoring and Evaluation - to provide the necessary administrative and planning support to the Regional Director and or the Project Manager.
- Technical Support Services was under the coordination of a Chief of Field Operations (CFO) to implement all project activities in the field; and
- Field Operations- organised and coordinated along Zonal and District lines.

While this was the intended organizational and management structure, a number of changes were made at various times to

facilitate more appropriate implementation of project activities. These changes included the merger of training with extension; the establishment of Hydrology and Rural Water Supplies Department; and the separation of Civil from Mechanical engineering activities, though both came under a single Chief Engineer. A number of functional revisions were also made. The most important being the incorporation of all extension services - Animal Husbandry; Plant Protection; Home Extension and Agro-Forestry- into an enlarged Extension and Training Department under the general operation of the Training and Visit (T & V) System of Extension.

The total cost of VORADEP's operational activities was US \$49.80 million. This amount would cover the range of local and foreign costs which would be incurred and would be financed from three main sources. The International Fund for Agricultural Development (IFAD) provided an amount of US \$12.5 million and the International Development agency (IDA) invested an amount of \$29.5 million in the project. The commitment of the Government of Ghana to the project was to the tune of US \$7.8 million (VORADEP,1980). According to the World Bank Staff Appraisal Report of March, 1980, the loan commitment of the International Fund for Agricultural Development (IFAD) was highly concessional, being effective as from the 8th of January, 1981 and closed in December, 1988. The disbursement of the loan was to be to the tune of SDR 9.55 million (100 per cent)

The project fund as expended by the main components of the project is shown below:-

**TABLE 2. APPROXIMATE PROJECT EXPENDITURE BY
 COMPONENTS, 1982 - 1989**

COMPONENT/OUTPUT	PER CENT
Administration (Accounts, Communications, Management, etc)	19
Research	4
Extension (crops, Home, Animal Husbandry)	14
Vertinary and Fisheries	7
Irrigation/Rural Water Supply	7
Land Use Planning	1
Civil and Mechanical Engineering Services	26
Plant Quarantine	1
F A S C O M	21
TOTAL	100

SOURCE : VORADEP: Project Completion Report (1981-1990)
World Bank Report Number 8765, June, 1990
(Washington, D.C.)

The component activities of VORADEP, designed to deliver key services to the farmers and to the communities as a whole, had also been mediated through a number of appropriate and potentially sustainable institutions. The most important of this support services was extension. The most important institutional characteristic of extension service in the Region had been the Training and Visit (T & V) System with an operational capability of bringing extension within the reach of the farming population of the Region. The programme to train extension staff to impart all

(or most) of the knowledge required by farmer with several interests shows flexibility of approach and a drive towards optimum utilization of field staff.

Other important support services were extended by the Farmers Services Company (FASCOM) which had established a considerable number of centres all over the region. Its task was to procure and deliver farm inputs - fertilizers, tools, tractors, improved seeds weed killers, pesticides and other agro-chemicals. As much as possible, it was envisaged that these inputs would be located within easy reach of the farmers to purchase and use on their farms.

5.IV THE AGRICULTURAL EXTENSION PROGRAMME UNDER VORADEP

The Training and Visit (T & V) System of extension was adopted in 1982 for VORADEP, following the recommendations of the staff Appraisal Report (SAR) of the World Bank. The reason was that the SAR saw the extension component as the key instrument in the crop Development Programme of the Project and envisaged that the T & V system would intensify Ministry of Agriculture's extension services in the region.

As noted earlier, the T & V system of extension has been one of the most significant extension organizational developments in recent years. Much investments have been made in this system by the International Bank for Reconstruction and Development (IBRD) - the World Bank - since 1975. Since then, the system has been

diffused very rapidly; especially in South and South-East Asia, where it has been shown to:

Increase the effectiveness of agricultural extension in a number of countries, thus contributing to rapid increase in food productions (Van dan Ban, et.al, 1988).

Basically, the system tries to achieve changes in production technologies used by the majority of farmers through assistance from well - trained field extension officers who have close links with agricultural research (Benor, 1984). This view implies a major change of management orientation in these countries where subordinates were expected to please the superiors. Subsequently, management has four main tasks to perform. These are:-

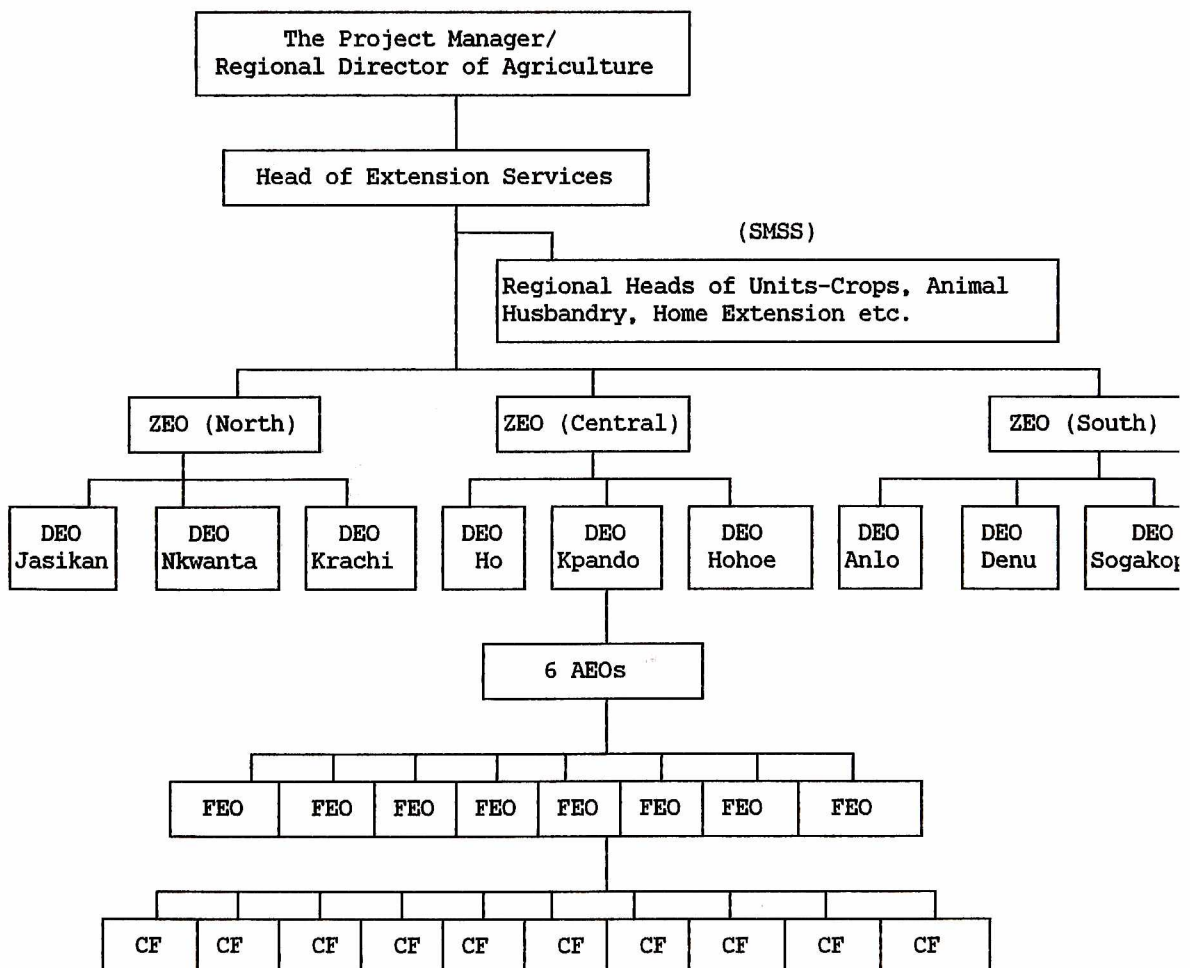
- to develop the basic framework of the extension system in which everybody knows what he or she is supposed to do;
- to organise the support necessary to enable all extension agents to do their work well,
- to supervise how well extension agents perform their task and if necessary, to help them perform their task better; and
- to coordinate the extension work with agencies outside the extension service, such as research provision of supplies and marketing.

Under VORADEP, the scope, methods and quality of the services were improved in a number of ways. These include;

- a systematic extension service through the T & V. system;
- increase in the number of field staff to reduce the extension officer - farmer ratio from 1:500;
- provision of adequate logistical support for extension, improved service conditions and adequate training; and
- provision of strong technical support and supervision from senior technical and management staff.

According to the SAR, the target of the system was a maximum number of 90,000 farm families, each extension officer operating within an area of 10 kilometers radius, centred on the officer's station. The organisational structure of the T & V System is shown in below.

FIG.1 THE ORGANIZATIONAL CHART FOR THE T & V SYSTEM



SOURCE:- VORADEP: Recommendations of IDA/IFAD In-depth Review 1984

The organizational structure of VORADEP's agricultural extension programme is hierarchical. At the head of the Extension Department is a Head of Extension Services working under and closely with the Head, are the Regional Subject Matter Specialists (SMS) who are the heads of Units of Crop Extension, Animal Husbandry and Plant Protection. The spatial structure of the system reflects Zonal and District Units of the Region.

The whole project area is divided into three agro-ecological zones each headed by a Zonal Extension Officer (ZEO). The zones are Northern, Central and Southern. Each zone is in turn divided into three districts, each under a District Extension Officer (DEO). The Northern zone is made up of Jasikan, Nkwanta and Krachi districts; the Central zone covers Ho, Kpando and Hohoe Districts, and the Southern zone consists of the Anlo, Denu and Sogakope districts. Each District Extension Officer (DEO) is responsible for Agricultural Extension Officers or Range Officers (AEO) and each is in charge of eight Field Extension Officers (FEO). Each FEO, at the beginning of the year is expected to register a minimum of eight farmer groups, each of ten contact Farmers (CF). Each group has a leader farmer, selected by the group members. A circle is manned, by mostly Technical Officers (TOs), few Senior Technical Assistant (STAS), and experienced Technical Assistants (TAs). By 1984, there were 242 FEOs; 33 AEOs; 9 DEOs; and 3 ZEOs. However, by 1987 number of Field Extension offices increased to a total of 257.

The ZEOs are responsible for coordinating the activities of the department. AEOs are responsible for the supervision of the work of the FEOs by paying regular visits to the FEO and any of

their farmer groups to give them timely advice and also help them solve some of their problems. The subject Matter Specialists (SMS) are persons who spend about a third of their time training the FEOs and AEOs at the district level; a third of their time solving problems in the field and collecting feedback; and third of their time in contacting their technical resources, that is, research stations, etc., and planning for the coming fortnight session. The table below shows the distribution of Field Extension Officers.



TABLE 3. DISTRIBUTION OF FIELD EXTENSION OFFICERS (FEOs)

ZONE	DISTRICT	FEOs	DEOs	AEOs
North	Krachi	20	9	3
	Nkwanta	19	10	3
	Jasikan	31	11	4
TOTAL		70	30	10
CENTRAL	Hohoe	34	7	4
	Kpando	26	8	4
	Ho	38	10	5
TOTAL		98	25	13
SOUTH	Anlo	15	6	2
	Sogakope	31	8	4
	Denu	43	13	5
TOTAL		89	27	11
REGIONAL	TOTAL	257	82	34

SOURCE: VORADEP-PROJECT COMPLETION REPORT
The World Bank Report No. 8765 June, 1990.

5.V. EXTENSION ACTIVITIES UNDER THE T & V SYSTEM

Having registered the minimum of eight groups, each with ten "contact" farmers at the beginning of the year, the field extension officer holds regular meetings with each group for one day. This day is previously arranged and agreed with the farmers. This arrangement was considered favourable because it would be difficult for an FEO to meet all his or her farmers regularly. Thus, about eighty farmers are selected by an FEO, who visited them every two weeks on a fixed day, preferably, in their field where other farmers can attend and join the discussion or demonstration of improved practices. The FEO is, therefore, the one officer who works directly at the impact point of the programme, and on whom the success of the programme depends. The contact farmer is also

expected to impart the knowledge received from the FEO to ten other "follower" farmers who thus receive the multiplier effect of the programme.

Thus, the contact farmer (CF) becomes a crucial part of the T & V System of extension. The criteria for the selection of a contact farmer (CF) for each group of ten "follower" farmers were as follows:-

- the Cf should be a good farmer who is well respected by the other members;
- the CF should be receptive to new ideas, willing to allow his farm to be used for demonstration purpose;
- should be able to communicate with his group members and other CFs;
- the CF's farm should be the average for the group and the farmer should be a full time farmer with no alternative source of incomes.

The CFs are supposed to be representative of the farmers of their respective villages, to the extent that they do not possess larger farms, or better educated and have more leadership positions than the other farmers of the village. Also, their problems and resources should not differ from the many other farmers. They must not hesitate to help other farmers and should not be those who would rather compete with them for land or in the market places. The contact farmer, by all indications should be an opinion leader to whom other farmers, listen (Benor, et.al; 1984).

Information boards are set up in all the target villages within the project area, showing the date of the FEOs next visits, extension poster and other information on field days. On their regular visits, the FEOs in the fields assess the adoption of recommendations, give on the spot advice and also take notes on problems of the farmers as a feedback for further research. Demonstration farms are also laid by the FEOs with the assistance

of the contact farmers; and on the farmers' fields. The purpose of these demonstration plots is to expose to farmers new recommendations on farm practices, techniques and methods and it is an effort to bring research into farmers' fields and for farmers to experience themselves, the results from the use of improved farming technologies. Each FEO is expected to lay a minimum of eight demonstrations on the main staple crops being promoted in the project area. These crops are maize, rice, cassava, cowpeas, sweet potato, groundnuts, sorghum and vegetables. Other demonstrations involve rapid yam multiplication techniques and the cultivation of plantains and bananas. Agro-forestry was a recent introduction and the alley cropping plots have been established in each district.

Each FEO is also expected to organize three field days per crop demonstrations. These are at planting time, at fertiliser application; at tasselling and harvesting and storage depending on the crop. Field days are held by the FEOs to provide a comparison of improved versus traditional practices on the farmers' fields where the demonstrations are laid and also to have the opportunity of acquiring new skills. Film shows are used, primarily, to expose farmers to the forthcoming farm operations and the general farming programme for the year. Rallies are also held to make farmers aware of the input situation. At the end of the year, similar rallies are held to evaluate performance during the year and also plan strategies to solve problems encountered.

The training of extension staff receives substantial attention in the T & V system because it is believed that well-trained extension agents are the basis for an effective and professional extension service. In this training, extension officers learn to

identify relevant recurrent costs and private contractors who were supported to undertake rural road construction and maintenance through the follow-on World Bank cum International Labour Organisation's (ILO) Project. Indeed, the Training and Visit (T & V) System of extension, still exists as the basis of the extension programme of both the Agricultural services Rehabilitation Project (ASRP) and its counterpart, the new National Agricultural Extension Project (NAEP).

These projects have made adequate provision for extension service, input supply, rehabilitation of rural roads and adoptive research. The designs of the projects have a number of innovative features aimed at strengthening the extension system. First, a major emphasis is put on organising farmers in small manageable, voluntary groups and associations to facilitate the work of extension service and input supply. During the pilot study for this research, I observed that the Field Extension Officers (FEOs) were yet to complete the formation of these farmers' groups and association. Second, two pilot lines of credit were to be introduced through the Agricultural Development Bank (ADB) and the Bank for Housing and Construction (BHC). The two lines of credit are being set to test approaches to reach poor farmers, particularly women. This second component, of the project is also yet to take off, but the necessary machinery is being set up for that purpose.

Generally, the project is to promote demand-driven extension services through village animators who help organize the farmers and facilitate communications between the project and farmers. The extension design is also to address the low management capacity of

the Ministry of Agriculture, the ineffective extension service, and research linkage and lack of proven technological packages. Finally, the project not only addresses the production aspects but also the critical issue of marketing. A pilot maize marketing and storage component in the project will permit the production technology needed by farmers, develop diagnostic skill and adopt appropriate communication techniques. Field Extension Officers receive training every two weeks from the Subject Matter Specialists (SMSs) based on analysis of their experiences in the past two weeks. Most training is given in the field where the Field Extension Officers can perform the tasks they will later have to teach the farmers. Training is also given to two or three Agricultural Extension Officers (AEOs) with their FEOs. Each AEO also meets with his FEOs every two weeks to discuss organization and administrative matters. Monthly meetings are held between the SMSs and research workers to discuss agricultural production problems for the next month, and also serve to train the SMSs. There are also regular short courses on production technology and extension methodology, during which the extension workers are relieved from their normal duties.

As stated earlier, the diffusion and adoption of new technologies as related to the cultivation of maize was selected for this study. With regard to maize cultivation, five improved varieties were to be extended by the field extension officers in the project area. The characteristics of the improved maize varieties is shown in the tables 4 and 5:-

TABLE 4: Characteristics of Improved Maize Varieties

VARIETY	COLOUR	HEIGHT	AVERAGE MATURITY	YIELDS IN BAGS/ACRE	YIELD IN TONES/HECT
Dobidi	White	205 cm	120 days	22	5.5
Okomesa	"	198 cm	120 days	22	5.5
Aburotia	"	150 cm	105 days	18	4.6
Salifa 2	"	165 cm	95 days	15	3.8
Kawanzie	Yellow	160 cm	95 days	14	3.5

SOURCE:- Ghana/CIDA Grains Development Project, 1980.

TABLE 5: Recommended Plant Spacing for Maize

VARIETIES	SPACING BETWEEN ROWS	WITHIN ROWS	PLANT POPULATION
Dobidi, okomasa	90 cm	40 cm	56,000 per/hect
Aburotia, Safita 2	80 cm	40 cm	62,000 per/hect

Each of these varieties was expected to be planted at two seeds per hill.

SOURCE: Ghana/CIDA; GDP;1990.

Generally, the farmers in the project area were to be introduced to two types of fertilizer for application. These were Compound fertilizer (15-15-15) and sulphate of Ammonia or Urea. Compound fertilizers were to be applied, in the first instance, ten days after planting, buried in the soil and about five to eight centimetres away from the hills. A second application was to be done as a side-dress later during the growth of the maize, generally about six weeks after planting - to make up for leaches. Sulphate of Ammonia was to be applied during fruiting. About 2.5 bags of both compound fertilizer and Ammonium Sulphate per hectare was required.

The other agro-chemicals extended were Cymbush 10 EC and Karate 2.5 EC meant for pest and disease control and then Actellic, Aldrim and Dieldrin were meant for use as preservatives. Gramoxone was to be used for weed and herbs control.

The main farm items extended were the traditional ones including hoes, cutlass, mattocks, axes, wellington boots, spraying machines, water pumps, raincoats and measuring tapes. Extension officers were to:-

- advise and guide on types of crops suitable for cultivation on any particular type of soil;
- assist to obtain farm tools, planting materials and agro-chemicals; and
- direct on improved methods of growing crops, that is planting in lines, correct spacing, weed control, diseases and pests control, harvesting at the appropriate time and post harvest management.

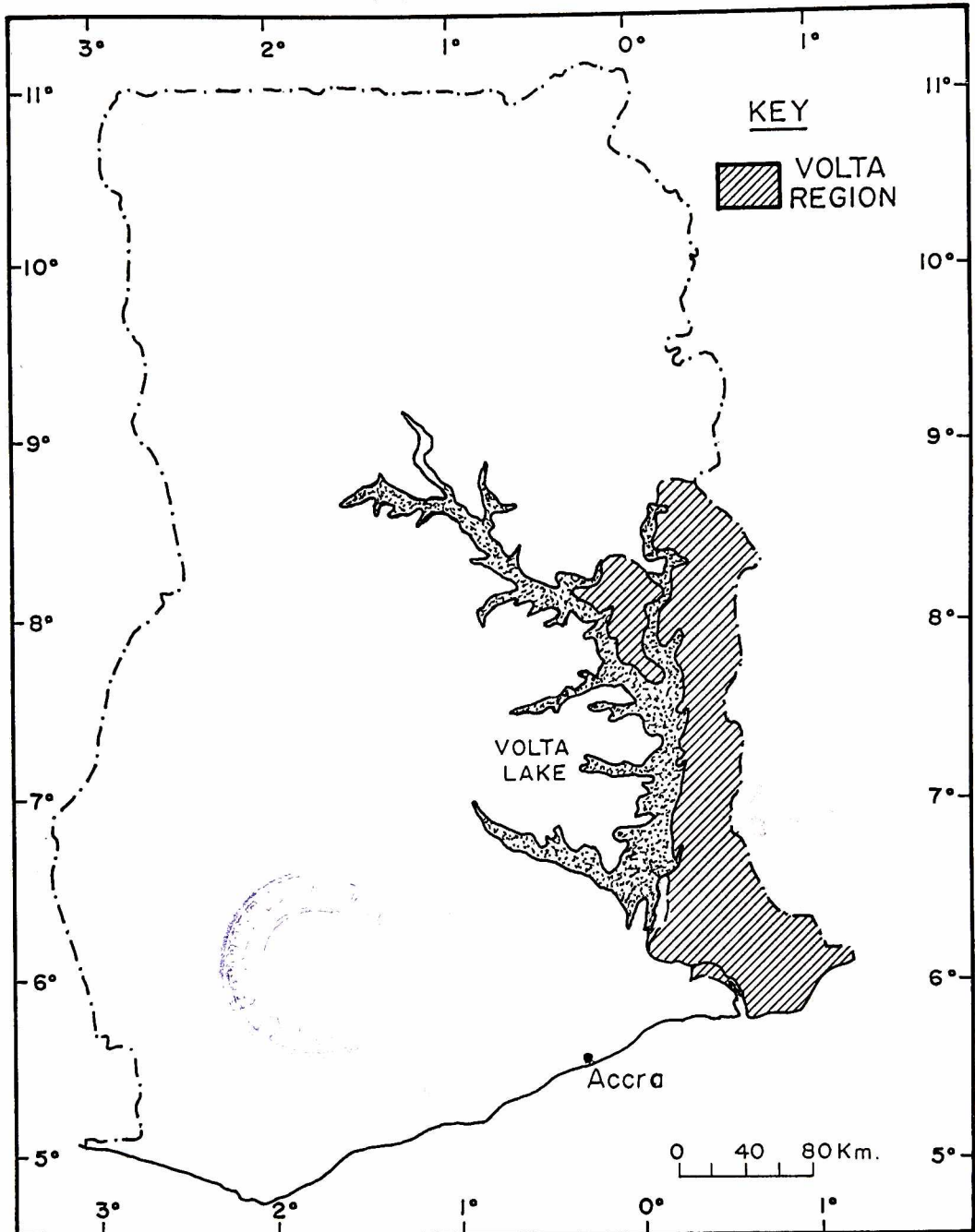
5.VI SUSTAINABILITY OF THE PROGRAMME

With the termination of the project in December, 1988, a number of structural reforms were since made to ensure the sustainability of the programme. The first of these reforms was the integration of VORADEP'S agricultural activities and institutions into the Ministry of Agriculture and the other components, such as water supply and feeder roads, were reverted to their respective line ministries. Fascom was to be privatized and farmers' groups and small traders promoted for input retailing. This approach was to ensure that the needed inputs become more accessible to the farmers. Again a follow up World Bank Project (Agricultural Services Rehabilitation Project) was introduced to provide further support to consolidate research and extension services.

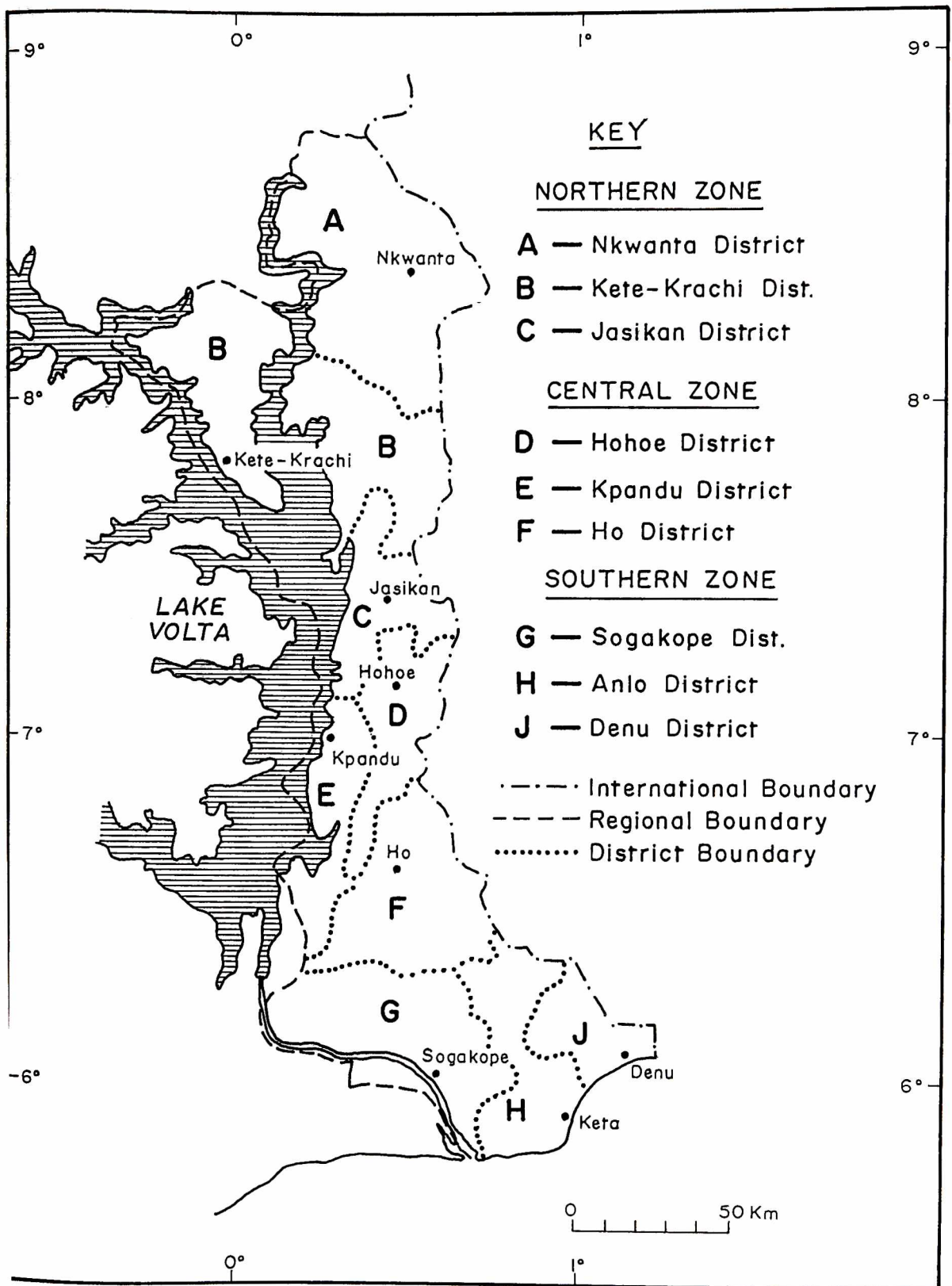
In order to reduce post harvest losses, support was to be provided for farmers to build village stores for crops storage after harvest while obtaining credit from the project against the stored produce. This would permit them to sell their crops during lean season thus enjoying a better price and also enabling them to pay back their loans.

Thus, since 1988 approaches were introduced through various efforts to promote the sustainability of VORADEP's agricultural extension programme. However, most of these innovations are yet to be effectively put in place for their full impact on the small-scale farmers in the project area to be felt.

A MAP OF GHANA SHOWING THE STUDY AREA: VOLTA REGION



VORADEP AGRICULTURAL EXTENSION ZONES



CHAPTER SIX

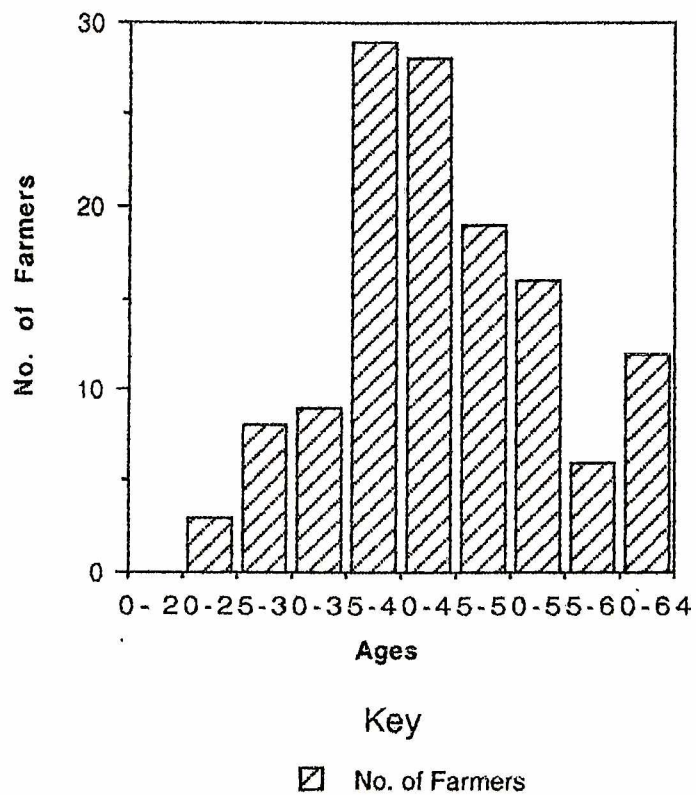
PRESENTATION AND ANALYSIS OF DATA

6.1. Background of Participants

The questionnaire on the sampled farmers elicited information concerning the sex, age, marital status, number of dependents, level of education, sources of income other than farming and relationship to land, of the participants studied in the three districts in the project area. This was based on the assumption that differences in the awareness and adoption of innovative agricultural technologies might have a lot to do with difference in the social status of the farmers. Consequently, all the social characteristics of the population in the sample as portrayed in the pilot survey were used as a control variable, so that social status might not be seen to confound the impact of the extension programme on the respondent's attitudes and behaviours.

The findings on the age distribution of the respondents is shown by the graph in figure 4. The figure shows that approximately all age groups of 20 years and above participated in VORADEP's Agricultural Extension Programme. The youngest farmer interviewed was 20 years old and the oldest was 63. The range is 43 meaning that the research had covered a very wide range of ages. There was, however, a preponderance of those who can be said to be in their middle ages - between the ages of 35 and 54 - who represented not less than 68 per cent of the farmers interviewed. Of the 120 sample farmers, 20 (16.7 per cent) were in their prime

Figure 4 : Age Distribution of Farmers



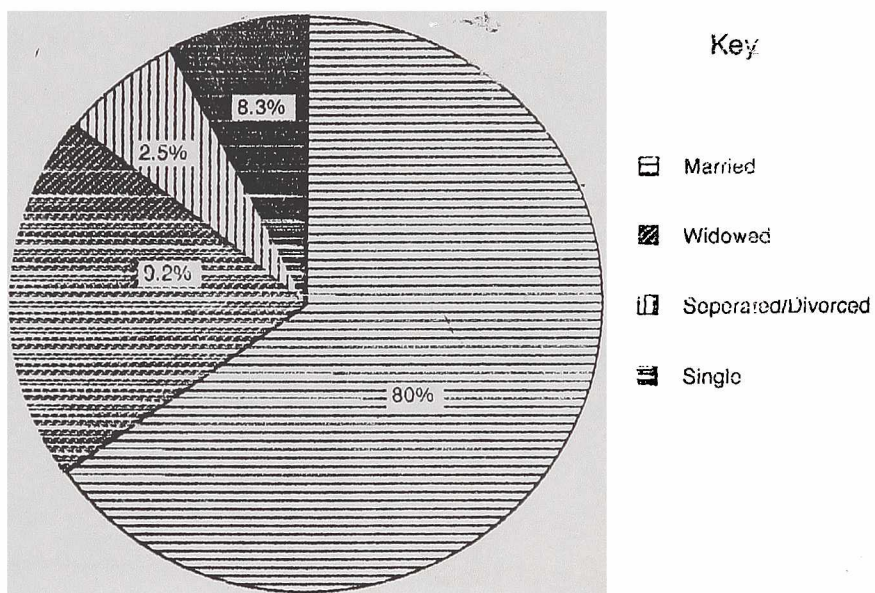
of life - between the ages of 20 and 34. About half of the farmers were either below or above the age of 43 and the mean age of the sample farmers was about 44 years, and with a standard deviation of 0.82 means that the ages of the respondents were not too dispersed from the mean. One significant thing about the study is that only twelve (less than ten per cent) of the farmers interviewed fell within the age group of above sixty. This seems to contradict the popularly held view that most farmers in the rural sector are old people who are in their late adulthood. Perhaps, the conclusion to be reached is that many active people, especially, those in their middle ages are currently engaged in agriculture.

Sex and Marital Status

According to the data, more males than females were in direct contact with the programme. With the ratio of males to females of approximately 3:1, there seems to be a clear under-representation of women in the study. One probable explanation, which seems to confirm previous assertions, is that women are not generally accorded equal opportunities as men in most education for rural development programmes.

Figure 5 represents the marital status of the respondents. The data on the marital status of the respondents show that the greatest proportion of the participants (80 per cent) were married and the least represented group was the widowed. Less than ten per cent of them were single and not more than 8.5 per cent were either separated or divorced. It seems therefore, that VORADEP'S

Figure 5 : Marital Status of Respondents



agricultural extension programme appealed more to the married than any other group of people of different marital status. Perhaps, this picture also provides an alternative explanation for the apparent male over-representation in the programme as discussed earlier. Most of the farm families were headed by men and that most women would not normally have farms, especially for staples, independent of that of the whole family. That most of the farms were family property, confirms the significance of family labour in the production efforts of the farmers, as shown by the number of dependents that the heads of the farm families have in table 6.

Table 6 Number of Dependents of Respondents

Class	Frequency	Per cent	Ranking
0 - 4	38	31.7	2
5 - 9	51	42.5	1
10 - 14	21	17.5	3
15 - 19	6	5.0	4
20 - 25	4	3.3	5
	120	100.0	

The table shows that on average a head of a typical farm family would have not less than seven dependents. Dependents as used in this context involve wife/husband, the head's own children, other children and others who are not children but benefit directly from the farm produce of the family. That the programme appealed more to the married than others seems to suggest that this category of people would have more mouths to feed than the others. The table shows further that there was a large concentration of families with between five to nine dependents, that is, about 51 of the respondents (42.5 per cent). The highest number of dependents

recorded for a family was 25 and the lowest was zero. Not more than ten per cent of the respondents had more than fifteen dependents, and about half of the respondents would have more or less than approximately seven dependents. Generally, farm families in the project area can be said to be appreciably large and this seems to confirm the view that the greater proportion of the rural population is dependent and are the main sources of a relatively cheap labour for the agricultural sector.

Level of Education

Table 7 represents the levels of education attained by the respondents.

Table 7 Level of Education of the Farmers

Highest Educational Background	Frequency	Per cent	Ranking
No Formal Education	18	15.0	2.5
Primary Education	13	10.8	3
Incomplete Middle School	10	8.3	5.5
Complete Middle School	27	22.5	1
Incomplete Secondary Education	9	7.5	6
Complete Secondary Education	4	3.3	7
Technical/Vocational (Non-formal)	18	15.0	2.5
Technical/Vocational (formal)	10	8.3	5.5
Teacher Training College	11	9.3	4
T O T A L S	120	100.0	

In the table, participants who had completed their middle school education were ranked as highest with a frequency of 27 (22.5 per cent). Just a little over ten per cent of the respondents had had some level of secondary school education and eleven of them (9.3 per cent) had trained as teachers. More than

half of respondents (56.7 per cent) can be said to be lowly educated because their level of education hardly went beyond basic education. Not more than 40 of the respondents (32.6 per cent) had had some technical/vocational and or professional training. Of this number, it is significant to note that about 15 per cent trained in the informal sector and 17.6 per cent trained in the formal sector. Thus, contrary to expectation, the majority of participants in VORADEP's agricultural extension programme were literate and had gone beyond the primary education level.

Sources of Income

An attempt was made to find out whether the respondents had depended on any capital sources other than farming in order to extend their farms and buy more of the new inputs extended by the programme. It was discovered, that only 36 of them (30 per cent) had had any previous occupations which must have provided them with their initial capital for their farming. Among this category of farmers were the victims of the government's redeployment and retrenchment policy of the 1980s and retired civil and public servants. It was also noticed that whereas as much as 109 respondents (90.8 per cent) considered farming as their major source of income or major occupation, not less than 51 per cent of the sample farmers were engaged in jobs other than farming to supplement their farm incomes, and additionally, ten per cent considered farming as a minor occupation. The farmers stated that their other jobs were mechanic fitting, trading, teaching, driving

commercial vehicles, dressmaking, other government employment, masonry and carpentry. Invariably, less than half of the farmers were full-time farmers.

It is significant to note, therefore, that VORADEP'S agricultural extension programme did not seem to cover the predominantly farming population but that it appealed more to those with additional sources of income. Similarly, the research findings seem to suggest that a significant number of farmers in the rural sector would not be completely dependent on their farm income to either expand their farms or purchase new inputs. Rather, most of them would depend on other sources to supplement their farm income. However, it can be appropriately said that the rural population of the target area of the project is predominantly agrarian, and a significant proportion of the rural dwellers would consider farming as their major occupation.

On how they normally obtained the recommended inputs, 102 of the respondents (85 per cent) claimed that they purchased the recommended farm inputs with their personal savings. In fact, only two of the respondents claimed that they had an access to bank loans and 16 of them (13.3 per cent) obtained the recommended inputs on credit basis. It seems valid, therefore, to conclude that most of the farmers in the project area depended on their own sources of income to either expand their farms or purchase the recommended agricultural inputs. Consequently, those who benefitted from the programme were those who had other sources of income to supplement their farm incomes and, therefore, with some surplus to purchase the recommended inputs of the programme. The farmers' ability to purchase the recommended inputs depended,

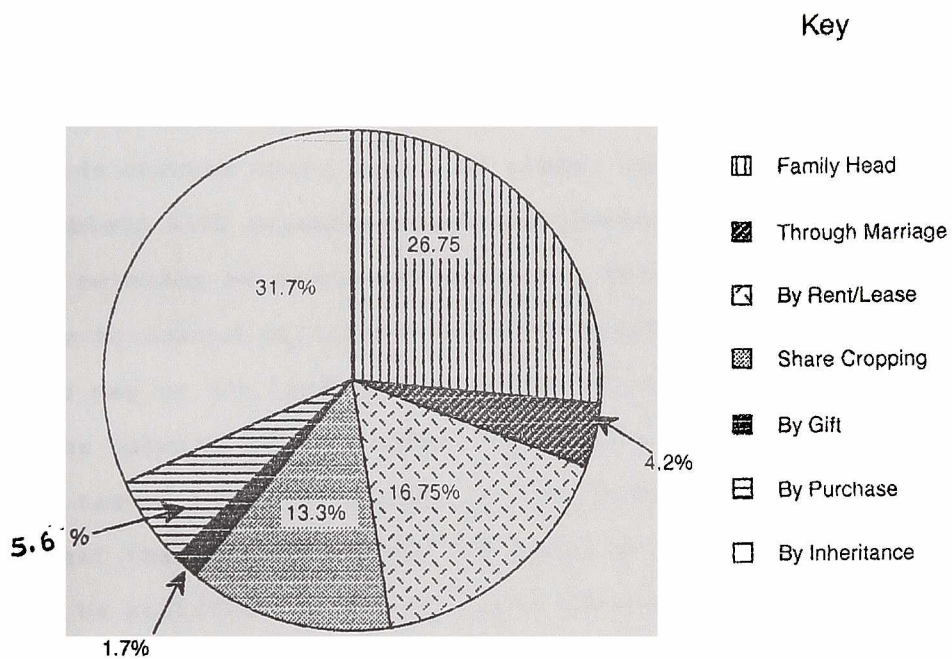
almost invariably, on the extent to which their accumulated surplus could meet the prices of the inputs extended under the programme.

Farmers' Relationship with Land

The questionnaire sought to find out from the respondents the extent to which their relationship with land either promoted or impeded further expansion of cultivated land. Figure 6 represents the findings on the different modes of land acquisition for the sample farmers.

According to the figure, only 47 of the farmers (39 per cent) owned the land that they cultivated and the rest of the sample farmers cultivated land on various tenancy terms. The figure further shows that not more than 32 of the farmers (26.7 per cent) obtained land from their family heads and must, therefore, have acquired usufruct or customary freehold and only five (4.2 per cent) obtained land by right of marriage. A most significant discovery was that some 30 per cent of the farmers cultivated land under various tenancy agreements, such as share - cropping, annual rent and or lease, and therefore existed within a landlord -tenant relationship. It was noted that except for this category of farmers, the majority of farmers - a clear 85 per cent - conceded that they would find no serious problems if they had to acquire more land to expand their farms.

Figure 6 : Mode of Land Acquisition



For those farmers who cultivated land under rental agreements, two systems were noticed. For some of them, they paid a fixed amount of money to the landlord at the beginning of the farming year for any acreage of land they wished to cultivate. For the others, they paid a fixed amount of money for each acre of land they cultivated. In both cases the fixed amount payable to the landlords changed every year. It seems, therefore, that those who had problems with expanding their cultivated land were those in the second category as discussed earlier. This is because their ability to expand cultivated land depended on how much they were able to pay to the landlords at the beginning of the farming year.

The opinion of the farmers was sought on the appropriateness of the tax on land. According to the findings 75 per cent of them felt that the tax on land was too high, 20 per cent considered the tax to be satisfactory and only five per cent said that the tax on land was low. This suggests therefore that the main obstacle to the expansion of land cultivated by tenants was the high tax on land.

Production Patterns

The study reaffirmed the position that the main food crops cultivated in the project area are maize, cassava, yams, plantain, cowpeas and vegetables. Almost all the farmers studied cultivated not less than two of the staple foods in a season. The research findings show that fourteen respondents (11.7 per cent) cultivated maize only. Out of this number, not less than 70 per cent produced maize seeds under the auspices of Seed Growers' Association. The data further show that twenty - four (20 per cent) of the farmers

grew maize, cassava and vegetables; whilst eighteen (15 per cent) produced yams, cassava and maize. It is also noted that whereas only four respondents (3.3 per cent) cultivated oil palm in addition to maize and cassava, thirteen (10.8 per cent) produced maize, cassava and cowpeas, whilst only ten (8.3 per cent) of the farmers produced yams and maize. The rest of the farmers, who represent a single majority of 37 (30.8 per cent) cultivated maize and cassava. The most significant discovery, therefore, was that maize was the most widely grown staple in the project area and that almost all the farm families produced maize..

According to the research findings, the mean annual acreage cultivated by the sample farmers was 4.4 acres, that is, less than two hectares. And, with half of the respondents cultivating less or more than three acres (1.2 hectares) meant that most of the farmers in the project area could be appropriately classified as small-scale farmers. In fact, only six (a mere five per cent) of the respondents cultivated more than ten acres of land (four hectares), and only two of the sample farmers cultivated the highest acreage of 18 acres (7.2 hectares). Again, it was discovered that twelve of them (10 per cent) cultivated only one acre in a year and the largest group made up of 80 respondents (66.7 per cent) cultivated between two to five acres of land with maize. Generally, therefore the acreage of land cultivated by the farmers, on average, was rather small.

6.II Background of Extension Officers

The sex distribution and marital status of the field extension officers did not differ much from those of the farmers. The

findings show a predominance of males who constituted about 70 per cent of the front line staff. Of the thirty officers that responded to the questionnaires twenty-eight (93 per cent) were married and the rest were single. The research further show that not less than 90 per cent of the respondents were in their prime of life, that is, between the ages of 25 and 44, only two were above the age of 45, and again only one was below 24 years. It can be said that the frontline staff were relatively young.

It was realised that eighteen (60 per cent) representing more than half of the officers were in the employment of the Ministry of Agriculture as Technical officers before the project took off fully in 1984. This suggests that most of the officers had had substantial experience as field extension officers before the era of VORADEP; and are therefore, capable of providing an appraisal of VORADEP's agricultural extension programme. Less than 40 per cent of the respondents were employed between 1985 and 1989. It is significant to learn that not less than 80 per cent of the officers participated directly in the programme as field workers; for at least five years. Thus, it can also be asserted that the field extension officers studied had all the experiences needed to provide information and express their views on the project under review.

Questionnaire on the qualifications of the staff revealed that the basic academic attainment of all the officers was General Certificate of Education at the Ordinary Level. In fact only one of them went beyond that level to obtain the General Certificate of Education at the Advanced level. Professionally, 26 of the officers (86.7 per cent) obtained certificates in General

Agriculture, only four of them had diplomas in Horticulture, Basically, therefore, all the field extension workers had the requisite academic and professional qualifications needed for an effective and efficient performance of their duties.

An attempt was also made to find out whether the field extension workers were engaged in other duties and income earning activities that could serve as a hinderance to the effective and efficient performance of their official duties. The results show that only eight (26.7 per cent) of them performed official duties other than their normal field extension work. According to them, they performed duties such as distribution of farm inputs, distribution of credit packages and loan recovery, Larger Grain Borer Survey, and audiovisual equipment operations. It is the considered view of the researcher that these activities were all agricultural extension related fields which were necessary for the success of the programme. By all indications, therefore, the field extension workers who claimed to have extra extension duties, were in fact, assigned duties that were directly related to their calling. Thus, it can be stated, that contrary to expectation, VORADEP'S field extension workers were not saddled with too much administrative and other extra-extension activities that might have restrained their efficiency and effectiveness.

On the other hand, twenty-seven of them, that is a clear 90 per cent claimed that they were engaged in farming to supplement their income. Only two of them were in trading and one officer claimed to be solely dependent on his work as an extension worker. Of those who were in farming, as much as 91 per cent produced foodcrops and seven of them kept some livestock. It is significant

to learn that not less than 87 per cent of them produced the major staples - maize, cassava and cowpeas - which VORADEP sought to promote in the project area. According to the field extension workers, their farms served as demonstration plots for their contact farmers. It became convincingly clear, that almost all the extension workers were engaged mostly in farming related activities which could promote rather than hinder their efficiency and effectiveness.

6.III Extension Contact

Questions were asked to find out the extent of interaction between the farmers on the one hand and the field extension workers on the other hand. The measurement of the variable-extent of extension contact - was considered relevant to this study because it is generally accepted that central to any diffusion process is the role of communication in motivating farmers to take advantage of the economic opportunities available to them. It is also realised that communication serves as a means to inducing positive and permanent behavioural changes among any target population (Seini, 1992). Thus, to a very large extent, the success or otherwise of virtually all diffusion methods depends on the extent of human interactions in which one person communicates a new idea or practice to one or several other persons.

The findings on the frequency of contacts between the farmers and the field extension officers is presented in tables 8 and 9.

Table 8 Farmers Seeking Information From FEOs

Item	Frequency	Per cent	Ranking
At least once a week	50	41.7	1
Once in a month	6	5.0	4
fortnightly	4	3.3	5
As often as possible	11	9.2	3
Not at all	49	40.8	2
T O T A L S	120	100.0	

Table 8 represents the findings on how often the farmers took the initiative to seek information from the field extension officers (FEOs). The findings were that the highest proportion of farmers - 50 of the respondents (41.7 per cent) - took the initiative to seek information from the field extension officers at least once in a week. The second largest percentage (40.8 per cent) never sought information from the officers by their own initiative. The thirdly ranked group of farmers, that is, eleven (9.2 per cent) of the respondents, - sought information as often as it became possible for them and ten (8.3 per cent) of the farmers would seek information at least once in a month or fortnightly. The findings can be said to be highly impressive because not less than 71 of the respondents, in fact as much as 60.2 per cent of them did seek information from the field extension officers by their own initiative.

Two possible explanations can be advanced for this phenomenal achievement. First, it could be said that sufficient interest was generated among the farmers for the innovations expended for them to want to seek further information on them. A second possible explanation was that the field extension officers were easily accessible to the farmers so that it became easy for the farmers to contact them anytime they needed information on the technologies being extended.

Table 9 provides information on how often the field extension officers visited the farms and groups of farmers, as stated by the farmers. The table shows spectacular differences in the frequency of the officers' visits to the farms on the one hand, and farmers' groups on the other hand. Whereas forty (33.3 per cent) of the respondents claimed that their farms were visited at least once in a week, a correspondingly fifty (41.7 per cent) claimed they never participated or that no farmers groups were visited. Similarly, whilst thirty-three (27.5 per cent) of them stated that their farms were visited at least once in a week, not less than twenty-two (18.3 per cent) of them claimed that their groups were visited within the same period. At the same time twenty-four (20 per cent) claimed that their farms were visited fortnightly and at the same rate twenty-five (20.8 per cent) claimed their groups were visited. Whereas fifteen (12.5 per cent) of them had their farms visited as often as it was possible, only ten (8.4 per cent) felt their groups were visited at random. A significant thing about the data is that whereas those whose farms were visited at least once a week were

Table 9. FEO's Visits to Farmers' Farms and Groups

I T E M	Farmers' Farm			Farmers' Groups		
	Frequency	Per cent	Ranking	Freq.	Per Cent	Ranking
At least once a Week	40	33.3	1	13	10.8	4
Once in a month	33	27.5	2	22	18.3	3
Fortnightly	24	20.0	3	25	20.8	2
As often as Possible	15	12.5	4	10	8.4	5
Not at all	8	6.7	5	50	41.7	1
T O T A L S	120	100.0		120	100.0	

ranked first in that category, it was ranked fourth for visits to farmers' groups. Another significant discovery is that whereas those whose farms were never visited were ranked last in that category, farmers' groups which were never visited was ranked first.

It seems, therefore, that the field extension officers visited the farm of the farmers more than they visited the farmers' groups. The evidence is that as much as 112 (93.3 per cent) respondents claimed that their farms were visited at all whilst not more than 70 (58.3 per cent) felt that their groups were visited at one point or the other. And, using Spearmans Rank Correlation Coefficient of (-0.06) meant that there is a low degree of negative relationship between the visits to farmers' farms and visits to farmers' groups by the field extension officers.

Generally, however, it can be deduced from the data available that there had been sufficient contact between the field extension officers on the one hand, and the farmers on the other hand. There

seems to be quite enough interactions between the two parties to make some impact on the farmers.

The field extension workers were asked whether they resided within their target communities and in reply as much as 21 (70 per cent) were positive. It was also discovered that 27 (a clear 90 per cent) of the officers reached their contact farmers by means of motor-cycles, only four of them (13.3 per cent) reached them by bicycles and only one of them used the public transport system. Those officers living within their target communities claimed that their target groups live within a radius of fifteen kilometres from their places of residence. On average it took between five to ninety minutes for an extension officer to reach their target groups. The following conclusions can be reached from these research findings:-

- the project had provided all the means necessary to facilitate the easy movement of the field extension officers and this, perhaps, accounts for the high frequency of visits that the officers paid to their target groups;
- Those farmers who could not by their own initiative, seek information from the officers might have been residing in places away from the residence of the officers making it difficult for them to reach the officers. This category of farmers could only meet the officers when their communities were visited;
- Since the meetings of farmers' groups were held in the evening, it was possible that the field officers met those groups which were close to their residence more frequently than the groups far away from their places of residence.

In general terms, however, it seems safe to conclude that VORADEP'S agricultural extension programme had provided for a remarkably high degree of frequent and regular contacts between the farmers on the one hand, and the field extension officer on the other hand. The "Training and Visit" (T & V) system of extension can, thus, be said to be effective to the extent that it provided for a high degree of interaction between the sources of information, on the one hand, and the receivers of the information on the other hand, as regards the major technological innovations extended by the programme.

The views of the field extension officers were arrived at by asking them whether it was an effective extension practice for them to work with and through the contact farmers in order to reach out to the other farmers. In response not less than twenty-two, that is an overwhelming majority of 73.3 per cent, considered the practice as very effective. The respondents were further asked to state their reasons for their choice of answer. As to why they considered the practice to be effective, almost all the extension officers were agreed that it was economical in terms of time, fuel and money. According to them, since it was rather impracticable to reach all the farmers in their target area at the same time the contact farmers could be relied upon to provide the multiplier effect of VORADEP'S intervention. The extension officers maintained that the system, when properly managed, made it easier for them to deal with small groups whilst at the same time helped them to achieve the desired extension contacts. Others felt that the system operated as a

not all, of the contact farmers were influential and opinion leaders, who were respected and therefore usually listened to by the farmers.

The research did not probe into how effectively the system of using the contact farmers was managed by the extension officers so as to achieve the desired extension impact. However, the reasons advanced by the otherwise minority of respondents who felt the system was not effective is worth our consideration.

According to them, contact farmers, in most cases, deliberately refused to relate information received on the new technologies to their follower farmers. Even if they did, it was realised, that they often consciously or unconsciously withheld some relevant information from their follower farmers. It was also stated that the contact farmers found it difficult to effectively communicate the message received to their follower farmers because they lacked the necessary training. Some contact farmers were said to be unable to relate well with their followers and therefore their approaches killed participation and at times led to the rejection of the new technologies. It was also observed that most farmers did not trust the contact farmers and felt reluctant to learn from an insider but would prefer an outsider like the field extension officer. Finally, a most significant discovery was that contrary to expectation, messages did not trickle down but rather flowed laterally among farmers with similar accessibilities to resources. Eventually, the field extension officer had to deal with each farmer at one time or the other.

In conclusion, it can be said that although the extension officers considered the practice of working through the contact farmers as convenient in terms of its economic value, in practice, the system was not properly managed and the desired extension impact could hardly be said to be achieved. Observations from the field work revealed to the researcher that although the extension officers were able to provide the list of their contact farmers, more than two-thirds of them could hardly provide the names of the follower farmers in the groups of their contact farmers. Similarly, most contact farmers could not give out the list of their follower farmers so that more than 80 per cent of the interviews were conducted on the contact farmers. The conclusion to be reached here is that, in most cases, farmers' groups never existed and there was hardly any multiplier effect in so far as the practice of using the contact farmers was concerned. Perhaps, this explains why as much as 41.7 per cent of the farmers claimed that the extension officers never visited their groups.

It can also be said that most of the impact made was due to the direct interaction between the extension officers and the farmers. To the extent, that the extension programme could not provide the contact farmers with the necessary training that would develop in them the leadership skills needed for them to function effectively and efficiently. It seems, therefore, that the extension officers gave more attention to individual farmers rather than adopting a group approach as envisaged under the Training and Visit System of extension adopted by the project.

If this happened, then, it seems valid to state that most of the small-scale farmers in the project area were cut off from VORADEP'S agricultural extension programme.

An attempt was also made to find out the extent of farmers' participation in extension activities. To achieve this each respondent was requested to indicate all the extension activities in which they were personally involved. As was expected multiple answers were obtained and each case of extension activity was taken on its own merit and percentages were calculated for the total number of responses. The findings are presented in table 10 below.

Table 10 Farmers' Participation in Extension Activities

I T E M	Frequency	Per cent	Ranking
Farm Visits and Demonstrations	102	45.5	1
Lectures	73	32.6	2
Field trips	33	14.7	3
Workshops	8	3.6	4
Film shows	3	1.3	6
None of these	5	2.3	5
T O T A L S	224	100.0	

As can be seen from the table, farm visits and demonstration lessons was the most popular extension activity with the farmers. Well over 45 per cent, that is, as much as 102 respondents claimed they participated in the farm visits and demonstrations. It seems, therefore, that it was the one extension method mostly adopted by the extension officers.

Perhaps, an explanation for this inclination of farmers to participate in this extension was that the extension officers visited the farms of the individual farmers to lay the demonstration plots. The evidence for this assertion is that only eight participants (6.7 per cent) claimed their farms were never visited by the extension officer. Indeed, the farms of almost all the farmers can be said to be frequently visited by the extension officers. So that the benefits that the individual farmers derived from participating in such extension activities at a relatively little or no cost, perhaps, accounted for the high rate of participation. The practice was easier for the farmers than any other because provisions were made under the project to facilitate the easy mobility of the extension officers. It seems to be of no accident that lectures were ranked second as the extension activity that the farmers participated in. Lectures were held in the villages with little or no cost to the farmers. However, it was observed, as stated earlier, that lectures were held mostly in areas that farmers' groups were well established and effective.

A most interesting discovery was that extension activities which required that farmers should travel away from their communities attracted their least participation. Thus, as can be seen from the table, field trips and workshops registered the active participation of only thirty-three (14.7 per cent) and eight (3.6 per cent) of the respondents respectively. Film shows were the least sponsored because, as it were, limited logistic support was available to facilitate its wide usage.

Nonetheless, considering the fact that only five of the responses (2.3 per cent) showed no participation in any of the extension activities meant that the level of farmers' participation in VORADEPS' agricultural extension activities was, generally, high.

6.IV Extension Impact

The questionnaire on the participants in VORADEP'S Agricultural Extension programme sought to measure how much impact the programme had made on the farming behaviours of the respondents. In order to simplify the measurement of the impact of the programme, the major innovative technologies extended were put into two broad categories. These were, first, agricultural inputs and, second, planting and farm management techniques. The variable considered as agricultural inputs include measurements on improved maize seed varieties, fertilizers and other agro-chemicals (pesticides, herbicides and weedicides). The main items considered under planting and farm management techniques include planting in lines, spacing and thinning out.

Agricultural Inputs

VORADEP introduced seven different types of improved maize seeds within the project period. These were Laposta, Toxpino, Safita II, Dobidi, Okoymasa and Abelehi. The field study had shown that these varieties of improved maize seeds were introduced at different stages of the project and that all the maize varieties were not introduced to all the farmers in all the sample areas. As a result farmers only became aware of

those varieties which were introduced into their area. It became abundantly clear that some farmers in some extension areas such as Addome and Mafi-Kumasi did not know of the existence of Safita II and Dobidi. This situation of inconsistencies in the introduction of the improved maize seed varieties had produced serious methodological problems.

In the first place, it was not easy to determine which variety of improved maize was totally rejected or mostly adopted. In the second place, there was no way one could find out the extent of continuous adoption for each of the varieties introduced. And, thirdly, it became difficult to find out the level of awareness of each of the varieties introduced. This methodological problem was heightened by the fact that some of the varieties of improved maize seed, for example, Laposta, Toxpino or Abrotia were no more available on the market, so that farmers in the project area now cultivate abelehi, Okomasa and Safita II.

In order to offset this problem a general picture of initial and continuous adoption of any variety was considered. In order to determine the level of awareness, farmers were asked to name any of the varieties of improved maize seed that they know of. Similarly, in determining the level and rate of adoption of the improved maize seed varieties, emphasis was placed on whether farmers had ever used any of them and whether they had continued using any of the varieties introduced.

On the question of the awareness of the improved maize seed varieties, it was generally agreed by both the extension officers and the farmers studied that the varieties introduced by VORADEP into the project area were relatively new. The

farmers further agreed, that before their contact with the programme, they were cultivating local varieties of maize.

In considering the level of awareness of the varieties introduced by VORADEP five main items were used. These were:

- identification of type either by name or description (colour of grain);
- Planting method (number of seeds per hill for the variety);
- Plant height at maturation;
- Average period of maturation; and
- yield per acre/hectare

Each of these items scored a point and the respondents were rated to the extent that those who scored four or five points were considered to be well informed; those who scored three points were said to be partially informed; and those who scored two or less points were considered to be not well informed. The computation is shown in table II below:

Table II Awareness of Improved Maize Seed Varieties

Item	Adequately Informed	Partially Informed	Not Well Informed	Percentage Well Informed	Ranking
Identification	63	38	19	52.5	4
Planting Method	98	15	7	81.7	1
Plant Height	42	28	50	35.0	5
Maturation	72	30	18	60.0	2
Yield	68	22	30	56.7	3
	343	133	124	57.2	

As can be seen from the table, the farmers' awareness of the method of planting (number of seeds per hill) of the improved varieties of maize seed introduced by VORADEP was ranked first. An overwhelming majority of 81.7 per cent of the respondents can be said to have adequate information about how many seeds of the improved varieties to be planted in a hill. That the farmers' knowledge about the height of the plants at maturation was ranked last meant that the farmers' were not so much interested in the height as to the time of maturation and the yields expected from their farms. As much as 60 per cent and more than 50 per cent of the farmers knew when their maize planted would mature and how much they should expect at harvest respectively. It seems that the interest of the farmers in knowing when to harvest and what to harvest is purely economical, since agricultural efforts in most rural economies are meant to satisfy both survival and maintenance needs. The data also shows that about half of them could well identify the varieties of improved maize seed introduced. However, the field study had shown that more farmers could better describe the varieties in terms of the colour of the grains than could name them. This phenomenon could be attributed to the fact, that no single variety was introduced consistently and the farmers had to learn about new varieties as VORADEP kept on changing the varieties of improved seeds over the years.

However, considering the fact that 57.2 per cent of the respondents were well informed about the improved maize seed varieties extended by VORADEP, and also that well over three-fourth of the respondents were either well informed or partially informed, means that the rate of awareness of the improved

varieties of maize seed introduced by VORADEP was appreciably high.

An attempt was also made to find out the level of awareness of the improved varieties introduced by the programme. The results of the findings is represented in table 12.

Table 12. Level of Awareness of Varieties of Improved Maize Seed

Number of Varieties	Frequency	Total Number of Varieties	Percent	Ranking
One	12	12	10.0	5
Two	16	32	13.3	4
Three	28	84	23.3	2
Four	30	120	25.0	1
Five	24	120	20.0	3
Six	10	60	8.4	6
	120	428	100.0	

The total number of improved varieties of maize seeds introduced by VORADEP, was seven and the table shows that the highest number that any farmer was aware of was six. The table further shows, that the highest number of respondents were aware of four of the varieties and the lowest number of respondents were aware of six varieties. To calculate the average number of maize varieties about which the respondents were aware, the total number of varieties (428) was divided by the total frequency of 120. When computed the result was approximately three-point-six. And, in order to compute the level of awareness, this average was expressed as a percentage of the total number of improved maize varieties introduced into the project area. The level of awareness was computed as 51.4 per

cent and which can be said to be fairly high. It can be said that farmers in the project area have sufficient knowledge of, on average, of at least four of the improved varieties of the maize seed introduced by VORADEP.

From the findings, the highest number of improved seeds known to the average farmer was four which represents not less than 25 per cent of the total responses. More than half, that is, a clear 68.3 per cent of the farmers claimed to have knowledge of between three and five of the improved varieties and only 23.3 per cent of the farmers had knowledge of less than three of the improved varieties extended under the programme. It seems, therefore, that much effort was expended to create sufficient awareness of the improved varieties of maize seeds extended by the programme. The Training and Visit system of extension can be said to be effective to the extent that it achieved a remarkably high rate and level of awareness of the varieties of maize seeds introduced by VORADEP among the farmers in the project area.

This brings us to our next question of the extent of the adoption of the improved maize seed varieties. The ratio of respondents who ever cultivated any of the varieties of improved maize seeds introduced by VORADEP and those who never did was 4:1. This means that more farmers had tried to cultivate at least one of the varieties than those who never did. The findings have also shown that for those who ever tried the new seeds, only twelve (12.6 per cent) had discontinued the use of the new varieties allowing for a clear majority of 87.4 per cent to continue cultivating the new seeds. To compute the rate of adoption of improved varieties of maize seeds, the total number

of farmers who continued with adoption was expressed as a percentage of the total number of survey farmers and the result was 70 per cent. It seems, therefore, that for improved varieties of maize seeds, the rate of adoption can be said to be relatively high with a low degree of discontinuance.

The sample farmers were asked to state the varieties of maize seeds that they had ever used and the results are shown in table 13 below. It is difficult to say which variety was most adopted because they were introduced at different stages in the development of the project and some of the varieties, especially Laposta and Toxpino were found to be out of the markets.

Table 13: Adoption of Improved Maize Seeds

Varieties	Okomasa	Dobidi	Toxpino	Safita II	Laposta	Abelehi
Frequency	17	49	62	17	36	28
Per cent	14.2	40.8	51.7	14.2	30	23.3

Currently, only Okomasa, Abelehi and Safita II are being cultivated by the number of farmers that had used the specific variety of improved maize seed when it was introduced into the agro-system of the project area. Three observations can, however, be made from the table:

- the adoption rate of the individual varieties when they were introduced was relatively low. In fact, except for Toxpino and Dobidi, the rest fell below 30 per cent;
- An average rejection rate of 60.8 per cent seems to be relatively high; and

- there seems to be no full-scale adoption of any of the varieties when they were introduced and the varieties were not totally rejected either.

The next stage was to find out how many of the new varieties of maize seed had the average farmer ever cultivated on his or her plot. The results are shown in table 14.

Table 14: Number of Varieties of Maize Seeds cultivated

Number of Varieties	Number of Respondents	Total Responses	Per Centage	Ranking
Zero	24	0	20.0	3
One	32	32	26.7	1
Two	26	52	21.6	2
Three	21	63	17.5	4
Four	12	48	10.0	5
Five	5	25	4.2	6
	120	220	100.0	

As can be seen from the table, about 20 per cent of the respondents had totally rejected all the varieties of maize seeds introduced and not more than five (only 4.2 per cent) of the respondents had adopted more than five of the varieties. The highest number of respondents had tried two of the varieties and this category represents only 26.7 per cent of the total number of survey farmers. On average the number of varieties of improved maize seeds cultivated by the farmers was approximately two (in fact 1.8) and half of the farmers had ever cultivated less or equal to two varieties of improved maize seeds. The level of adoption put at 25.7 per cent could be said to be relatively low; since the results seems to suggest that the

average farmer in the project area was able to try only two of the seven varieties of the improved maize seeds introduced by VORADEP. However, it is striking to note that, although the level of adoption was found to be low, the continuance rate was rather high. So that, as far as the data before us is concerned, it can be argued that most farmers in the project area continued to cultivate not less than two of the improved varieties of seeds introduced by VORADEP.

There are statistically insignificant relationships between the level of awareness on the one hand, and the level of adoption of the new varieties of maize seeds introduced under the programme. The correlation coefficient obtained was -0.78 the Rho value is -0.18 which clearly shows a high degree of negative correlation between the level of awareness and level of adoption of the new varieties of maize. It seems, therefore, that a farmer's knowledge about an improved variety of maize seed did not necessarily imply that he or she would adopt the said variety of maize. Similarly, we can conclude that the more the farmers became aware of the recommended maize seeds did not necessarily imply a correspondingly increased adoption of the new varieties of maize. Since, the statistical evidence show that the processes of awareness and adoption were in opposite directions, it seems that the adoption of the new varieties of maize seeds introduced by the programme did not depend solely on what level of awareness was created for that variety of maize seed. It is, therefore, reasoned that other factors than the level of awareness determined the level of adoption or rejection of the improved maize seeds introduced by VORADEP.

There is no clear evidence so far from our data to suggest that participants who had rejected or discontinued the cultivation of the improved varieties of maize seed were not well informed so as to motivate them to adopt the new varieties. On the contrary, the data before us show a high level of awareness, and for the fact, that well over 50 per cent of the farmers sought information on the improved farming technologies meant that sufficient interest was generated among the farmers so as to motivate them to adopt the new technologies. It is, thus, important that an explanation for the adoption or otherwise of the improved maize seeds should be sought elsewhere.

In order to determine the factors which had contributed to the adoption and continued adoption of the improved varieties of maize seeds, the respondents were asked to rate the following items in terms of the extent of their agreement with them. The results are shown in the table 15.

The table shows that the most important factor which seems to motivate the participants to adopt the new varieties of maize was that yields per acre were higher than when they cultivated the local varieties. A significant number also felt the new seeds were early yielding. The participants were also convinced that the new varieties brought in increased farm income. In fact, as much as 104 (86.7 percent), 98 (81.7 percent) and 90 (75 percent) of the respondents claimed they were motivated by increased yields per acre, early yielding of seeds and increased farm income, respectively, to adopt the new varieties of maize. Agriculture in almost all the Third World societies is both a way of life and an occupation and the pivot of the rural

economy. In societies of large family sizes and poverty, agriculture becomes an issue of survival and subsistence. It is understandable, therefore, that the decision of the farmer to risk new ventures such as adopting new varieties of seeds would be determined by the perceived economic returns. Another factor which seems to influence the farmers' willingness to adopt the new varieties of maize for cultivation was that they were drought resistant. More than half of the respondents considered it as a determining factor in the adoption process. Indeed, new seeds which are drought resistant are preferable in situations where almost all the farmers depend on unreliable rain-fed agriculture.

Table 15: Farmers' Perception of the Improved maize Seeds

Item	Agree	Uncertain	Disagree	Percent Agree	Ranking
Higher yielding	104	16	0	86.7	1
Drought Resistant	68	10	42	56.7	4
Good taste	55	35	30	45.8	5
Higher Market Demand	41	21	58	34.2	6
Increased Farm Income	90	25	5	75.2	3
Early yielding	98	20	2	81.7	2

In the intimation of the respondents the new varieties did not compare favourably in taste nor did they attract more market demand than the local varieties. The table shows that 65 of the respondents (54.2 per cent) said they did not appreciate the taste of the new varieties and 58 (a clear 65.2 per cent) felt the new varieties had low market demand.

The results obtained from the farmers compare favourably with those provided by the extension officers. In response to a question on how the farmers perceived the new seeds, as much as 90.6 per cent of the 30 officers interviewed said the new seeds had higher yields and 65.6 per cent felt the produce had a low taste. Again, 59.4 per cent stated that the produce had low market demand and 62.5 per cent stated that the cultivation of these new varieties of seeds brought in more farm income. It can, thus, be argued that the taste and market demand of the new seeds were the least considered when any decision was to be made as to an initial or continued adoption of the new varieties of maize seed introduced by VORADEP. If anything at all, this variables perhaps, prevented the farmers from adopting the new varieties.

To find out why the farmers rejected or discontinued the cultivation of the new varieties of maize seeds, the frontline staff were asked to state the complaints that the farmers made about them. The findings were that a clear majority of 88 per cent of the officers said that the farmers complained about the high cost of the new maize seeds. Further investigations show that quite apart from the increasing cost of the new maize seeds, farmers had to necessarily purchase other chemicals in order to achieve the desired results. These additional costs had exacerbated the risk element of the venture especially when there was no way the farmers could manage the rainfall pattern to achieve a favourable yield. And, for fear that the economic returns from the output might not exceed the investments made the farmers eventually decided to cultivate the local varieties in order to reduce costs and the risk involved in the

cultivation of the improved maize seeds introduced by VORADEP. Another factor which seems to prevent the farmers from adoption was that the seeds were never available when the farmers needed them for planting. According to not less than 60 per cent of the respondents, the new seeds often arrived long after the planting season had begun. Again, as VORADEP changed the varieties of maize seed almost each year, the farmers had to try new types of seeds each year, establish their efficacy and then take a final decision to adopt them. Perhaps, this consideration must have led some of them to contend with the local varieties which they had tried and were used to over the year. In addition to these farmers could not produce their own maize seeds from the past year's season for planting the next season as they used to do for the local varieties. This is because the new varieties were developed under certain control conditions which were hardly obtainable on the farmers' farms. Which means that farmers had to purchase new seeds every year that they cultivated the land in the midst of increasing high costs of the maize seeds.

One other factor that seemed to determine the unwillingness of the farmers to adopt the new varieties of maize seeds was stated by about 78.1 per cent of the officers. According to them the produce from the new varieties of seed were easily infested and that they hardly, could be stored for a long period without the use of pesticides. This also made additional costs to production. Farmers had, therefore, to sell their produce in time at relatively low market prices and granted that the produce had poor taste and consequently low market demand meant

that farmers derived less benefits from the high yields obtained from cultivating the new varieties of maize introduced by VORADEP.

Thus, although the economic value of the improved varieties of maize seeds introduced by the programme could not be underestimated, the constraints to adoption and the risks involved were quite sufficient as to be a disincentive to adoption.

Extension of Agro-Chemicals

Three main categories of agro-chemicals were extended by VORADEP. These were fertilizers (NPK, Sulphate of Ammonia and Urea); Pesticides or preservative chemicals which were in liquids, powdered or tablet forms and include Actellic, Aldrin and Dieldrin; and the herbicides and weedicides such as Primagram 500 FW, Altrazine 500 FW, Bellater and Gramoxone which were available for controlling weeds on farms.

Although as much as 92 (76.7 per cent) of the sample farmers claimed to have had knowledge about fertilizers in terms of their ability to identify the different types and their usefulness, it was clear from further investigations that just a little over 30 per cent of them were sure of the application of fertilizers before their contact with the programme. Again, just about 44, that is 36.7 per cent of the respondents reported that they were using fertilizers on their farms before their contact with the programme. Yet, for these farmers who were using fertilizers before their contact with VORADEP, less than a quarter applied fertilizers according to VORADEP's recommended timing and well below 15 per cent (an insignificant number of

18) of the respondents applied more than one and half bags of fertilizer per hectare, representing some 60 per cent less than the required quantity recommended by VORADEP.

Similarly, data on the level of awareness and the use of preservative chemicals and herbicides/weedicides before VORADEP'S intervention programme were equally negligible. In the case of pesticides just a little over fifteen per cent and eight per cent of the respondents claimed to have some knowledge and used them respectively. Again, for weedicides/herbicides, it was realised that only ten per cent of the respondents had some knowledge and only five of the respondents were actually using them as a means of weeds control on their farms.

Thus, so far as the data before us is concerned, it can be argued that a significant majority of the participants in the agricultural extension programme of VORADEP had had a limited knowledge of the investigated agro-chemicals before their contact with the programme. Another significant conclusion is that there seems to be a minimal use of agro-chemicals in the project area before VORADEP'S agricultural intervention programme. Although this research did not probe into the factors that determined this phenomena, the information available seems to suggest, that this disposition is a reflection of the fact that there were no concerted efforts at the extension of agro-chemicals to farmers on a scale comparable to what VORADEP had sought to do.

The knowledge of the respondents about the agro-chemicals extended by the programme was tested on four main items: identification either by name or description, how to apply, when to apply and the uses. In this test, the knowledge of the

respondent on at least one type of each category of agro-chemicals was taken as sufficient for consideration. The items in the test were rated in such a way that respondents who scored three or more points were considered to be well informed, those who scored two points were said to be partially informed; and those who scored one or less were regarded to be un-informed. The scores are represented in table 16. below:

Table 16. Awareness of Agro-Chemicals

Item	Well Informed	Partially	Uninformed	Per cent Well informed	Ranking
Fertilizers	78	24	18	65.0	1
Pesticides	72	28	20	60.0	2
Weedicides	61	20	39	50.0	3
	211	72	77	58.6	

From the table it can be seen that more than half of the respondents were well informed about the agro-chemicals introduced. Fertilizers and pesticides were by far more popular with the farmers than weedicides. Fertilizers ranked first with the number of respondents shown to be well informed being 78 (65.per cent). This was followed by pesticides with 72 (60 per cent) respondents and the least being weedicides with 61 (50 per cent) respondents. It can also be deduced from the table that as much as 283 responses making some 78.6 per cent of the total responses were either well informed or partially informed. It seems, therefore, that remarkable awareness had been created among the participants of the major agro-chemicals extended by the programme.

On the average, the farmers were aware of all the agro-chemicals extended by the programme but, on the contrary, the average number of agro-chemicals which were effectively being used were two and, thus, putting the level of adoption at some 66.7 per cent, and which can be considered to be relatively high. Considering our data so far, it can be argued that there was a significant and positive change in the level of awareness and the level of adoption of the agro-chemicals since the farmers had contact with VORDADEP'S agricultural extension programme.

Table 17. Shows the pattern of the adoption of the major agro-chemicals extended by the programme.

Table 17: Pattern of Adoption of Agro-Chemicals

ITEM	FERTILIZERS		PESTICIDES		WEEDICIDES/HERBICIDES	
	FREQ.	PER CENT	FREQ.	PERCENT	FREQ.	PER CENT
Ever Used	96	80.0	52	43.3	7	5.8
Total Rejection	24	20.0	68	56.7	113	94.2
Continued Adoption	52	43.3	47	39.2	7	5.8
Discontinued Adoption	44	45.8	5	9.6	0	0.0
Rate of Rejection	68	56.7	73	60.8	113	94.2

In the table, total rejection refers to respondents who had never used any of the agro-chemicals and rate of rejection is the sum of total rejection and discontinued adoption. Rate of adoption thus, refers to the number of farmers and the term "ever used" means the number of respondents who had initially adopted the agro-chemicals extended to them.



The data before us shows that fertilizers were the most initially adopted agro-chemicals and weedicides/herbicides were the least ever used agro-chemical when they were introduced. Whereas well over three-quarters of the respondents initially adopted fertilizers, less than half ever used pesticides and still an insignificant percentage of 5.8 ever used weedicides. On, the other hand, the data shows that the greatest proportion of about 94 per cent of the participants had totally rejected the use of weedicides/herbicides, more than half totally rejected pesticides, and the least proportion of just 20 per cent of the sample farmers had totally rejected the use of fertilizers. It seems, therefore, that fertilizers were the most initially adopted agro-chemicals and the least initially adopted were weedicides/herbicides since the programme began.

However, for those who initially adopted the agro-chemicals, weedicides/herbicides were the least discontinued and fertilizers were the most discontinued. That is, whereas 45.8 per cent of those who initially tried the fertilizers had discontinued its use, less than ten per cent had discontinued pesticides and absolutely no respondent who had earlier adopted the use of weedicides/herbicides had discontinued their use. Thus, the drop-out rate for fertilizers can be said to be relatively higher than for pesticides and weedicides/herbicides. With the average rate of drop-out for the agro-chemicals, in general, at 18.5 per cent, it can be said that the discontinuance of the use of agro-chemicals in the project area had neither been phenomenal nor spectacular.

A significant thing about the data is that weedicides/herbicides registered the highest rate of rejection among the agro-chemicals extended by the programme. Whereas weedicides/herbicides had a remarkable rejection rate of 94.2 per cent, pesticides registered a rate of 60.3 per cent and fertilizers had the least rate of rejection of 56.7 per cent. Conversely, it can be stated that fertilizers registered the highest rate of adoption of 43.3 per cent, followed by pesticides having a rate of 39.2 per cent and the lowest rate of adoption of only 5.8 per cent was registered by weedicides/herbicides.

The average rate of rejection of the agro-chemicals was, therefore, put at 70.4 per cent. The rate of rejection of the agro-chemicals extended by the project can be said to be very high since the result seems to suggest that, on average, about three-quarters of the respondents had completely rejected the agro-chemicals extended by VORADEP. Seen from a different perspective, the data shows that fertilizers registered the highest but a discouraging rate of adoption of 43.3 per cent, pesticides 39.2 per cent and weedicides had the least rate of adoption of 5.8 per cent. And, considering that the average rate of adoption for all the agro-chemicals was 29.4 per cent, it can be argued, that the rate of adoption of the agro-chemicals since the operations of VORADEP in the project area has been disappointing. It seems to suggest that just a little over a quarter of the respondents have completely adopted the agro-chemicals extended under the programme.

Thus, although there was some increase in the use of fertilizers and preservative chemicals, and perhaps, a less significant increase in the use of weedicides/herbicides in the project area, the information available seems to suggest, that there had not been any significant changes in the respondents' attitudes to the adoption of agro-chemicals since the programme.

The next issue is to find out the extent to which the adoption of one or more of the modern inputs introduced by VORADEP closely related with the adoption of the other input(s). The basic assumption was that there were no significant differences in the adoption rate of the various inputs extended under the programme. The variable held constant in the computations was improved varieties of maize seeds. This was in tune with the generally held view that for farmers to be able to achieve the desired yield from improved seeds, they necessarily had to apply fertilizers, pesticides and other agro-chemicals. The attempt is to find out how the adoption of the other agricultural inputs was dependent on the adoption of improved varieties of maize seed in our particular situation. This attempt will also help us to estimate the extent to which the farmers' in the project area had adopted the agricultural inputs as a package.

The scores for the rate of adoption of maize were compared and contrasted with those for fertilizers, pesticides and weedicides. Dichotomising the values for improved varieties of maize seeds and fertilizers we find the following frequencies:-

Table 18: Seed and Fertilizers

	Yes	No	
Seed	105	68	120
Fertilizer	52	15	120
	157	83	240

This gives a χ^2 value of 51.74, significant at the 0.05 confidence level with one degree of freedom since the Alpha value is 3.841. There is, therefore, a significant difference in the rate of adoption of improved varieties of Maize seed and the adoption of fertilizers. It seems, then that most farmers who adopted the improved varieties of maize seed did not necessarily adopt fertilizers; that is, it was not all those who adopted the seeds that equally adopted the fertilizers. In other words, the adoption of improved maize seeds did not determine in any way the extent of adoption of fertilizers. It seems therefore that in most cases improved maize seeds were adopted independently of fertilizers, so that most farmers who adopted the improved maize seeds did not at the same time adopt the fertilizers.

Table 19. Seeds and Pesticides

	Yes	No	
Seed	105	15	120
Pesticides	47	73	120
	152	88	240

When we dichotomise the values for improved maize seeds and pesticides the frequencies above produce a χ^2 value of 60.4 which is significant at 0.05 confidence level with one degree of freedom. Thus, the result shows that there was a significant

difference in the rate of the adoption of improved maize seeds and that of pesticides. It seems that all the farmers who adopted the improved maize seeds did not equally use pesticides as a measure for the preservation of plants and farm produce. In other words, most farmers who used the new seeds did not, at the same time, use pesticides. It can be argued, therefore, that the use of the improved maize seeds by the farmers did not lead to the adoption of pesticides.

The comparison of the rate of adoption of maize seeds and that of weedicides/herbicides produced the following frequency distribution:

Table 20 Seeds and Weedicides

	Yes	No	
Seed	105	15	120
Weedicides	7	113	120
	112	128	240

This gives a χ^2 value of 160.8, significant at 0.05 confidence level with one degree of freedom. There seems to be a statistically significant difference between the adoption of improved maize seeds and weedicides. It seems that all farmers who adopted the maize seeds did not equally adopt the weedicides and that the adoption of weedicides was not related closely to the adoption of the maize seeds.

When the values for the adoption of improved maize seeds were compared and contrasted with the adoption of the agro-chemicals in general for a χ^2 test, the following frequencies were obtained:-

Table 21 Seeds, Weedicides, Fertilizers and Pesticides

	Seeds	Weedicides	Fertilizers	Pesticides	
Yes	105	7	52	47	211
No	15	113	68	73	269
	120	120	120	120	480

The χ^2 value obtained was 369.4 which was significant at 0.05 confidence level with three degrees of freedom. There seems, therefore, to be significant differences in the rate of adoption of the improved maize seeds on the one hand, and the other agro-chemicals on the other hand. Farmers who adopted the improved maize seeds seem not to have necessarily adopted any or all of the agro-chemicals extended under the programme.

It is striking to learn, that there are statistically insignificant relationships in the rates of adoption of the major agricultural inputs extended under VORADEPS extension programme. We can conclude from the relationships established so far that the adoption of improved maize seeds was not necessarily a factor determining the adoption of one or more of the agro-chemicals. It seems clear that not all the farmers who adopted the new maize seeds equally adopted one or more of the agro-chemicals. This is not, to say that there were not situations in which some farmers adopted all of the agricultural inputs extended by the programme. On the contrary, the information before us seem to suggest that, first, most farmers in the project area did not adopt the agricultural inputs extended wholly as a package. Secondly, it can be argued that, the farmers adopted more of some of the inputs than the others and thirdly, that some of the inputs were adopted at the expense

of the others. Indeed, the data show that the improved maize seeds were the most adopted, followed by fertilizers and then pesticides. Weedicides were the least adopted.

Our next concern is to try to find out what factors determined this pattern of adoption of the agricultural inputs extended by the programme. In order to obtain this, two types of questions were asked the respondents. In the first place, the sample farmers were asked whether they would have wanted to use the agricultural inputs extended by the programme. This needless to say, was a hypothetical question intended to test the willingness of the farmers to use the inputs. The findings for this are represented in table 22. In the second place, the views of the farmers and the field extension officers were sought and represented in table 23. In the case of the sample farmers, they were asked why they either never used or why they had stopped using any of the agro-chemicals. For the field extension officers, they were asked to state what they considered to be the major problems that the farmers faced when they wanted to obtain the recommended inputs for use on their farms.

Table 22. Willingness of the Farmers to use the Recommended Agricultural Inputs

I T E M	YES	NO	PER CENT YES	RANKING
Improved Maize Seeds	21	15	58.3	2
Fertilizers	36	32	52.9	3
Weedicides	58	55	51.3	4
Pesticides	48	25	65.8	1
	163	127	56.2	

It can be seen from the table that out of a total of 73 respondents who had either totally rejected or discontinued the use of pesticides, a clear majority of 48 (65.8 per cent) would have wished to use pesticides as a preservative measure. Further investigations had revealed that not less than 70 per cent of those who did not wish to use the pesticides applied locally prepared chemicals from herbs to their produce to preserve them and the rest used the smoke to preserve their maize. Again, out of the 36 sample farmers who had either totally rejected or discontinued the use of improved maize seeds a majority of 21 (58.3 per cent) wished they could. For the 68 respondents who had rejected fertilizers and the 113 who had rejected weedicides, 36 (52.9 per cent) and 58 (51.3 per cent) wished they could use them respectively. On average, 56.2 per cent of those who had either totally rejected or discontinued the use of the agricultural inputs extended by VORADEP expressed their willingness to use them.

It seems evident, from the information gathered so far, that the farmers in the project area had developed a positive attitude towards the use of the major agricultural inputs extended under the VORADEP'S programme, and can therefore be said to be innovative. This conclusion is based on the following premises. First, not less than 51 per cent of the respondents had tried the agricultural inputs extended by the programme and second, not less than 56.2 per cent wished they could have adopted them. Thirdly, on average, of those participants who had initially adopted the new inputs at least 83 per cent had continued their adoption. And, finally the respondents' participation in the various extension activities was realised

to be at an appreciably high level. In general, it can be said that farmers were sufficiently motivated to the extent that they developed a positive tendency towards the adoption of the agricultural inputs extended by the programme. These considerations perhaps, rules out any suggestion that the total rejection and discontinued adoption of the agricultural inputs was due to the inherent conservatism of the farmers. It must be clear at this stage, that other factors than the issue of farmers' conservatism had determined the apparently high rejection rate and the discontinuance rate of the agricultural inputs extended by VORADEP'S programme.

Table 23 Respondents' Views on Total Rejection and Discontinuance of Adoption of Agro-Chemicals



I T E M	F A R M E R S ' V I E W S			O F F I C E R S ' V I E W S		
	FREQ.	PER CENT	RANKING	FREQ.	PER CENT	RANKING
High Cost	40	33.3	3	15	50.0	2
Non-Availability	48	40.0	1	21	70.0	1
Cost of Transportation	42	35.0	2	10	33.3	4
No Money	36	30.0	4	12	40.0	3
Not Needed	22	18.3	5	5	16.7	5

There is statistically significant relationship between the views expressed by the farmers on the one hand, and those of the field extension officers on the other hand. The Rho value obtained for the frequency distribution in table 23 was +0.7, which suggest a high degree of positive correlation between the views of the two parties on the reasons for the total rejection or discontinuance of the agro-chemicals extended by the programme. The items listed in the table, can thus be

considered as a genuine and valid representation of the situation emanating from independent and unbiased sources.

The significant thing about the findings is that a simple majority of farmers (40 per cent) and the majority of the extension staff interviewed considered the non-availability of the recommended inputs as the main constraint to the adoption of the agro-chemicals. A further investigation on the issue revealed, that in most instances, the Agro-Chemicals were never available on the market as and when the farmers needed them most. The farmers complained, particularly, about fertilizers which often became available to them long after the planting season had begun. It became clear that fertilizers often became abundant in the system in the period just before the start of the minor season, which the farmers claimed was, in most cases, unreliable in terms of amount of rainfall and its regularity. So that the farmers never had the opportunity to derive the maximum benefits from the use of fertilizers during the major season. And, since the farmers hardly obtained the needed inputs at the appropriate time they could not fully appreciate the usefulness of the programme.

The view that the farmers did not really need the agro-chemicals referred mostly to the use of fertilizers and weedicides and particularly for farmers cultivating the forested areas of the project. The farmers who felt they did not need fertilizers cut new bushes every season and were content with the bush fallow system and therefore claimed that their land was already (naturally) fertile. It seems, therefore, that this

category of farmers were not well oriented to appreciate the harm they cause to the ecology and the environment by their act of seasonal clearing of new bushes for farming.

One other factor which seems to prevent the farmers from adopting the agro-chemicals was the high cost of transporting the agricultural inputs from the FASCOM depots and other shops to their farms. This item was ranked second by the farmers and fourth by the field extension workers and represented the view of 42 (35per cent) of the responses of the farmers and not less than ten (33.3per cent) of the responses of the field extension officers. However, both sources of information were agreed that the inputs were located in markets far out of reach of the majority of the farmers. The main problem, it appears, was that even if the farmers could reach the source for the inputs and purchased them, they hardly found the means to transport the purchased inputs easily and cheaply to their farms.

The variables mentioned as high cost of inputs and financial constraints on adoption (no money) were almost equally ranked respectively by the farmers and the extension officers. About forty (33.3 per cent) and thirty-six (30 per cent) of the farmers expressed the view that high costs of inputs and lack of funds to purchase the inputs respectively were other factors which influenced the farmers' willingness to adopt the agro-chemicals. These variables also represent the views of not less than half, for high cost inputs, and 40 per cent, for lack of funds, of the extension officers. Table 24 shows the prices of the various agricultural inputs extended under the programme for

some specified years. The year 1986 was used as the base year because the records had shown that major changes in the prices of these inputs had occurred only in the years following 1986.

The table shows an increasing trend in the prices of the agricultural inputs since 1986. In 1986, for example, the price of compound fertilizers (NPK) was ₵800.00 per bag of 50 kilos, but increased by as much as 225 per cent in 1988 to sell at ₵2,600.00. Again, the price rose significantly by about 112 per cent on the 1988 figures to sell at ₵5,500.00 in 1992. Similarly, the price of Sulphate of Ammonia rose sharply from ₵500.00 in 1986 to ₵2,000.00 in 1988 and again to ₵4,000.00.

Table 24. Prices of Agricultural Inputs

I T E M	1986(₵)	1987(₵)	1988(₵)	1992(₵)
1. Fertilizers per bag of 50 kilos	800.00	850.00	2,000.00	5,500.00
N.P.K. (Compound)				
Ammonia Sulphate	500.00	550.00	2,000.00	4,000.00
Urea	-	-	N.A.	6,200.00
2. <u>Improved Seed Maize</u>				
Mini-bag of 45 kilos	5,000.00	6,000.00	10,000.00	18,000.00
Small package of 1 kilos	100.00	130.00	220.00	400.00
3. Pesticides				
Actellic Liquid per litre	450.00	130.00	2,500.00	6,000.00
4. <u>Herbicide/weedicides</u>				
Gramoxone per litre	350.00	N.A.	2,000.00	4,000.00
Round-up per litre	1,320.00	3,750.00	N.A.	7,000.00
Primagram per gallon	3,200.00	4,150.00	out of	stock

* In the table N.A. means that figures were not available.

Source: FASCOM Files VORADEP/Ministry of Agriculture, Ho.

in 1992 showing increases of about 700 per cent and 100 per cent on the 1986 and 1988 prices respectively. The picture for improved varieties of maize seeds was not any different. Improved seed maize sold at a low price of ₵5,000.00 per mini-bag of 45 kilos in 1986 but increased sharply by some 100 per cent in 1988 to sell at ₵10,000.00 and then rose again significantly by 80 per cent on the 1988 prices to sell at ₵18,000.00 in 1992. This means that between 1986 and 1992 the prices of improved maize seeds increased by as much as 260 per cent.

Actellic liquid was the most extended and most used preservative chemical in the project area. Its price was only ₵450.00 per litre in 1986 which increased by a wide margin of 455.6 per cent to sell at ₵2,500 in 1988. By 1992, actellic liquid was being sold at ₵6,000.00 per litre showing an increase of 140 per cent on the 1988 figures. The prices of Gramoxone and Primagram, which were to be used as weedicides/herbicides for weed control on maize farms, were fixed at ₵350.00 and ₵3,200.00 respectively in 1986. However, in 1987 the price of Primagram increased by 29.7 per cent and had since run out of stock. The price of Gramoxone increased by as much as 471 per cent to sell at ₵2,000.00 in 1988 and further increased by 100 per cent on the 1988 prices to sell at ₵4,000.00 in 1992. Between 1986 and 1992, therefore, the price of Gramoxone increased sharply by some 1042.9 per cent.

It seems clear from the data considered so far that the prices of the major agricultural inputs extended under the programme began to increase substantially after 1988 - the year the government reduced or removed most, if not all, of the

subsidies on agricultural inputs. This study did not investigate the total cost of production of maize over the years by average farmer in the project area so as to determine the additional costs that these increases in the prices of the inputs had made to the cost of production. However, the information so far gathered seems to suggest that the sharp increases in the prices of these inputs since 1988 must have led to a correspondingly high increase in the overall costs of production, and therefore, a ftax on the productive efforts of the average farmers. It is reasoned, therefore, that the majority of the farmers must have discontinued the adoption of these new inputs after 1987 when they considered the price increases as additional financial constraints on food production. There is no evidence to show whether the net farm incomes of the farmers had increased or not within the period, but it can be argued that a majority of the farmers could not take full advantage of the economic opportunities opened to them by the programme due to the rising costs of production and other financial constraints on the adoption of the new inputs introduced by VORADEP'S interventionist programme.

A hypothetical situation is considered to find out how much it will cost to cultivate on average, a hectare of land using the recommended inputs. By VORADEP'S specifications, to cultivate a hectare of land would require:-

- One and a half bags of compound fertilizer (NKP);
- One bag of Ammonia Sulphate;
- half a mini-bag of seed maize;
- one litre of Actellic liquid; and
- approximately a gallon of gramoxone.

In 1986, the farmer could procure this package of inputs for not less than only ₵5,000.00, but in 1988, the total cost of this package would have increased by 208 per cent to sell at ₵15,400.00. In 1992, the farmer would procure the same package of inputs at ₵31,250.00 showing an increase of not less than 102.9 per cent on the 1988 figures and as much as 525 per cent of the costs incurred in 1986. It needs to be stated at this stage that these costs exclude the costs of other inputs such as land use, labour, equipment - cutlass, hoes, tractors and transportation costs.

It stands to reason, that such a programme could only succeed if the farmers were provided with adequate financial support to be able to meet some, if not all, of the initial costs of production. Yet, ironically, the project design did not consider the extension of credit and loan facilities as a major and intergral part of the agricultural extension programme. In fact, it was not after 1988 that Sasakawa Global 2000 intervened to provide credit support services to the farmers in the project area. Even then credit facilities were provided for the cultivation of only one acre of land so that farmers ended up buying directly inputs for any additional acres of land that they cultivated. By 1992, the Sasakawa Global 2000 programme was a near collapse because of the low rate of the recovery of the loans extended to the farmers. The fund failed to be a revolving one from which credit facilities could be extended to farmers annually. It was also recognised that the credit facilities were not extended to a majority of the farmers in the project area, and was hijacked by the middle class.

It is not surprising, therefore, that not less than 85 per cent of the farmers interviewed, financed their farming activities with personal savings and only 15 per cent of them obtained loans and credit facilities. This situation leads one to appreciate the full impact of the sharp increases in the prices of the farm inputs on the adoption of the inputs extended by the programme.

This seems to explain why the programme was more popular with farmers with additional sources of income and therefore had the means to purchase the recommended inputs than other categories of farmers. It may be recounted that about half of the respondents were engaged in jobs other than farming and an additional ten per cent considered farming as a minor occupation. This means that only about 39 per cent of the survey farmers were engaged in farming alone. It can be equally argued that the incidence of total rejection and the discontinuance of the innovative inputs occurred mostly among farmers who were engaged in farming alone and thus considered it as their only and major occupation and who therefore had no other sources of income to enable them purchase the recommended inputs. Consequently, it seems, that the small scale farmers whose main source of income came from farming were priced out of the programme and structures were not put in place for them to take full advantage of the economic potentials of the innovations extended by the programme. A comprehensive credit system would have helped to cushion the effects of rising costs and other financial constraints on the adoption of these recommended inputs to the advantage of the small-scale farmers.

6.IV (B) PLANTING AND FARM MANAGEMENT TECHNIQUES

In this session, three main farming and farm management techniques which were extended under the programme were considered. These are spacing, planting in lines and thinning out. The attempt was to measure the extent of the respondents' awareness of these planting and management techniques and the degree to which participants were practising these techniques, according to the specifications recommended by VORADEP. And, in order to find out whether significant changes had occurred in the farm practices of the participants, the questionnaire on the sample farmers requested for their knowledge and practice of these techniques before and after their contact with VORADEP's programme.

On spacing, it was realised that VORADEP introduced different specifications, as regards the inter-row and intra row distances, for each of the improved maize varieties which were introduced into the agro-system of the project area. The sample farmers and the field extension officers studied were all agreed that these specifications were relatively new. This means that no farmer was either aware of or practised the kind of spacing introduced by VORADEP prior to their contact with the programme. This observation seems to give proof to the popularly held view that cropping systems in traditional agro-systems are often complex, and that the initial impressions may be one of chaos with crops apparently planted quite haphazardly but are, in fact, very carefully sited. However, further investigations show that some 65.8 per cent (about 79) of the respondents had previously had contact with earlier extension programmes before the era of VORADEP and therefore claimed to have some knowledge of

planting techniques. Out of this number only 26.6 per cent stated that they were spacing their plants on their plots according to some rigid agricultural practices. These rigid agricultural practices were, in all aspects different from what was introduced by VORADEP.

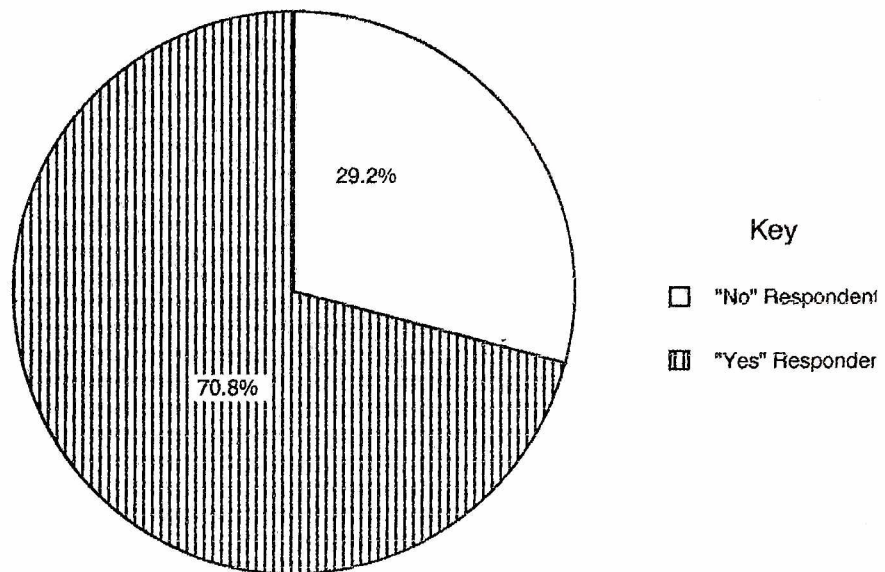
Of the total sample farmers interviewed, not less than three -quarters claimed to have knowledge about planting in lines but only about a quarter was practising it before their contact with VORADEP's programme. At the same time, not less than 71 (59.2 per cent) knew about thinning out and some 26.7 per cent of them were practising it before their contact with the programme. It seems, therefore, that apart from the spacing of plants on farms, planting in lines and thinning out were not new to the farmers in the project area before the inauguration of VORADEP. However, the average rate of practising these farm techniques which stood at some 26 per cent can be said to be very low.

The interviewed results and my own observations in the field, however, show that almost all the respondents had acquired sufficient knowledge about the main planting and farm management techniques introduced to them by the field extension workers. The knowledge of the farmers were tested with questions related to the inter and intra-row distance specifications of VORADEP, how to achieve these specifications and why they practised these techniques. In the case of spacing, the farmers had adopted lengths on their cutlasses as a means of measures for the inter-row and intra-row specifications and for planting in lines most of the farmers had procured garden lines some of which were made of plant creepers.

In the case of thinning out more than half of the farmers were not sure of the estimated plant density and population for their farms but were conscious of the number of plants per hill as recommended by VORADEP. Suffice to say that the knowledge level of the farmers on these planting and management techniques since their contact with the programme seems to be appreciably high. It can be argued, therefore, that VORADEP's extension programme had been effective to the extent that much effort was made to create the required awareness for the major planting and farm management techniques introduced among the farm families within the project area.

The ratio of respondents who had ever practised any of the planting and farm management techniques to those who never did was 17:7 as represented by the pie graph (figure 7).

**Figure 7 : Participants' Response on Whether They Ever Practiced
Planting and Farm Management Techniques**



The figure clearly shows that more than twice of those who had never practised the planting and farm management techniques ever did. In fact, a clear 85 (70.8 per cent) of the respondents stated that they ever practised the techniques. This result is significant because it shows a clear 44.8 per cent increase on the number of farmers who were practising them before their contact with the programme. It seems therefore that there had been a significant increase in the practise of modern planting and farm management techniques in the project area since the inauguration of VORADEP. The average number of planting and farm management techniques which were effectively being used by the sample farmers was two, and thus, putting the level of adoption of the techniques at 66.7 per cent. This figure can be considered as relatively high. Table 25 shows the extent of the adoption of each of the planting and farm management techniques in the project area.

Table 25. Pattern of Adoption of VORADEP'S Planting and Farm Management Techniques

I T E M	S P A C I N G		PLANTIN LINES		THINING OUT	
	FREQ.	PER CENT	FREQ.	PER CENT	FREQ.	PER CENT
Ever Practised	72	60.0	86	71.7	20	16.7
Total Rejection	48	40.0	34	28.3	100	83.3
Continued Adoption	54	75.0	69	80.2	18	90.0
Discontinued Adoption	18	25.0	17	19.8	2	10.0
Rate of Rejection	66	55.0	51	42.5	102	85.0

In the table, total rejection refers to respondents who had never practised any of the techniques and rate of rejection is the sum of total rejection and discontinued adoption.

One significant thing about the data represented in the table is that planting in lines was the most initially adopted technique and the least initially adopted technique was thinning out. Whereas 86 (71.7) of the respondents had initially adopted the technique of planting in lines, 72 (60 per cent) had tried the technique of thinning out. The next significant observation is that the technique of thinning out was the most totally rejected and the least totally rejected technique was planting in lines. As many as 100 (83.3 per cent) had totally rejected the practice of thinning out as a means of farm management, whereas only 40 per cent and 28.3 per cent had totally rejected the techniques of spacing and planting in lines respectively. This is understandable because farmers who had planted their crops according to the specifications would obtain the estimated plant density and population on their plots and would therefore not need to thin out. That is to say that farmers who had achieved the recommended seeds per hill at planting time would not need to practice the technique of thinning out.

Of those respondents who had initially adopted the practices only two (10 per cent) had discontinued the adoption of thinning out, whilst 17 (19.8 per cent) had discontinued the planting in lines and 18 (25 per cent) had discontinued the practice of spacing. It seems, therefore, that the drop out rate for planting in lines was the highest and that for thinning out was the lowest. It can be argued that although the participants would not initially want to adopt thinning out as a

technique for farm management, those who tried it hardly stopped the practice, probably because of their realisation of the economic benefits inherent in such a practice. Further inquiries had shown that most of the farmers failed to practise thinning out because they found it difficult to destroy what they considered to be already well established plants rather than that they had obtained the estimated plant density and population on their plots. But, once tried, the farmers sooner or later discovered its potential benefits as a form of management technique and therefore continued its adoption.

Another significant thing about the data is that planting in lines registered the highest rate of adoption and thinning out had the least rate of adoption. Whereas as much as 69 (57.5 per cent) of the respondents had continued adopting the practice of planting in lines 54 (45 per cent) had continued with spacing and a rather insignificant number of 18 (15 per cent) of the respondents had continued the adoption of the practice of thinning out. However, if this figures are compared with the number of respondents who had initially adopted the practices, it can be said that thinning out was the most continued practice with 90 per cent to its credit, followed by planting in lines with 80.2 per cent to its credit, and then spacing with 75 per cent. In view of the fact, that the average rate of adoption of the planting and farm management techniques extended by the programme was a mere 39.2 per cent, it can be argued that the average rate of adoption of the innovative techniques had not been any impressive. It seems, therefore, that VORADEP'S

agricultural extension programme had not made any significant impact on the planting and management techniques of the participants in the project area.

This assertion is reaffirmed by a consideration of the rate of rejection of the planting and farm management techniques. The table shows that thinning out had the highest rate of rejection of 85 per cent, followed by spacing with 55 per cent and then planting in lines had the least rate of rejection of 42.5 per cent. With an average rate of rejection for all the three techniques extended under the programme as 60.5 per cent, it can be said that more than half of the respondents had completely rejected the techniques introduced by the programme.

An attempt was also made to find out whether there were any significant differences in the rate of adoption of these innovative techniques. The purpose was to estimate the extent to which the adoption of one or more of the techniques was closely related to the adoption of the other techniques. The basic assumption was that there were no significant differences in the rate of adoption of the various techniques extended under VORADEP'S programme. Trichotomising the scores for the rate of adoption of the techniques introduced the following frequencies were obtained.

Table 26. Line Planting, Spacing and Thining Out.

	YES	NO	
Line Planting	69	51	120
Spacing	54	66	120
Thining Out	18	102	120
	141	219	360

The χ^2 value obtained was 48.057, significant at the 0.05 confidence level with two degrees of freedom. There seems, therefore, to be significant differences in the rate of adoption of the three major techniques introduced by the programme into the project area. It can be concluded, that quite an insignificant proportion of the respondents had adopted, altogether, the three techniques and a large number adopted one or two without the others.

And, when the value for the adoption of the technique of planting in lines and that of spacing were compared and contrasted the frequency distribution below was obtained.

Table 27 Planting In Lines And Spacing

	YES	NO	
Line Planting	54	66	120
Spacing	69	51	120
	123	117	240

This gives a χ^2 value of 3.754, which was not significant at the 0.05 confidence level with one degree of freedom. There seems, therefore, to be no significant differences in the rate at which the techniques of planting in lines and spacing were adopted by the sample farmers. It can be argued that farmers who adopted the practice of planting in lines were most likely to have adopted the technique of spacing too. There were however, statistically significant differences in the rates of adoption of spacing cum thinning out, and those of planting in lines cum thinning out. By comparison, the χ^2 value for the relationship between the rate of adoption of spacing and thinning

out was 25.714 and that for planting in lines cum thinning out was 46.896, which were both significant at the 0.05 confidence level with one degree freedom. We can conclude from these figures that most farmers who practised thinning out were not likely to have practised either spacing or planting in line. The information so far gathered seems to suggest that most of the farmers in the project area were more inclined to combine the practice of planting in lines with spacing than with thinning out.

In order to test the validity of the conclusions reached so far, the information gathered from the farmers were compared and contrasted with those obtained from the field extension officers. The views of the field extension officers were sought when they were requested to state which innovative agricultural technology they considered to be most adopted in their extension area, and the results are shown in table 28.

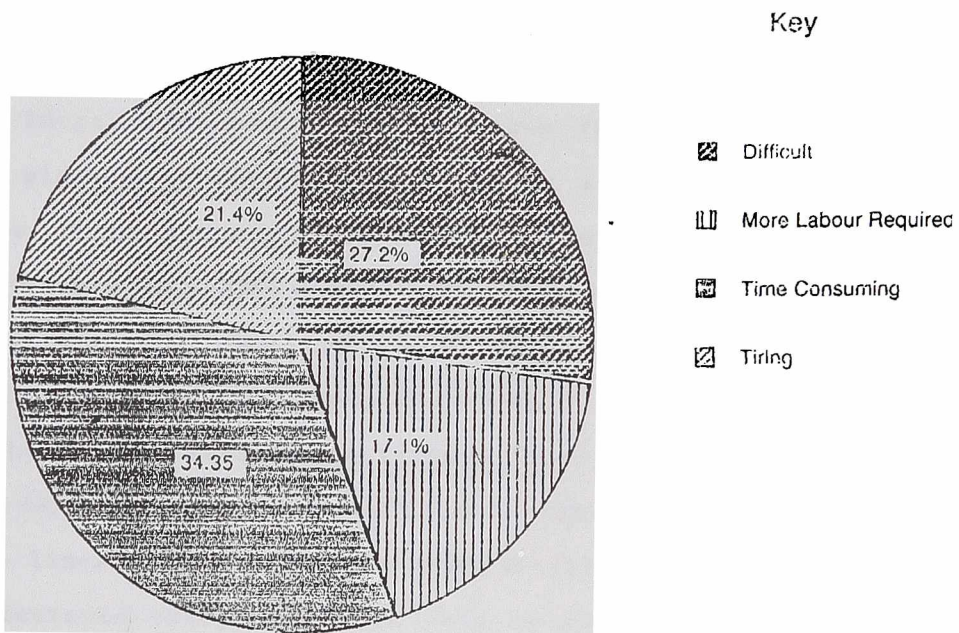
Table 28 Pattern of Adoption of the Major Technologies Introduced by VORADEP

I T E M	FARMERS' RESPONSES			FIELD EXTENSION OFFICES		
	FREQ.	PER CENT	RANKING	FREQ.	PER CENT	RANKING
Improved Maize Seed	59	49.2	2	25	83.3	1
Fertilizers	52	43.3	4	20	66.7	3
Pesticides	47	39.2	5	18	60.0	4
Weedicides	7	5.8	7	7	23.3	7
Planting in Lines	69	57.5	1	23	76.7	2
Spacing	54	45.0	3	15	50.0	5
Thinning Out	18	15.0	6	10	33.3	6

The relationship between the information provided by the farmers and the views of the field extension officers on the rate of adoption of the major technologies introduced by VORADEP shows a relatively high and significant Rho value of +0.857. This value shows a high degree of positive relationship and it can be argued that it was a fair assessment of the situation. The rates of adoption of weedicides and thinning out were equally rated for both the farmers and the field extension officers. Except for spacing which was rated third and fifth by the farmers and field extension officers respectively, it seems that the ratings for the rest of the innovative technologies extended by VORADEP'S programme had been fair. It can therefore be concluded that the conclusions reached so far on the adoption of the innovative technologies extended by the programme is valid and acceptable.

The next concern of this study was to seek some explanation for the pattern of adoption of the major planting and farm management techniques discussed earlier. To do this, the field extension officers were asked to state the main complaints that the participants in the programme made about the farming techniques introduced to them. The findings are shown by the pie graph. (figure 8).

Figure 8 : Farmers Complaints About the New Farming Practices



As can be seen from the figure, the main complaint of participants in the programme, in the view of a majority of 34.3 per cent of the extension officers was that the practices were time consuming. In order to achieve the target of plant density and population expected on a farm, the farmer had to achieve the recommended inter-row and intra-row distance specifications. This practice required measurements at various intervals, and there is no doubt that much time would have to be spent on relatively large acreage farms. In order to speed up the process of planting, VORADEP had introduced a system whereby farmers were to use pointed poles to punch holes into the earth at carefully sited distances estimated by the eye. This in turn required constant practice for the farmers to achieve the specified inter-row and intra-row distances. Observations in the field showed that most of the farmers found it difficult to achieve the targets even after many trials. The technologies of planting in lines and spacing were undoubtedly, too difficult for the farmers to practise. This view is also confirmed by eight (27.2 per cent) of the extension officers. The practices were found out to be even more difficult for farmers who could not employ much labour to assist in planting on their farms, since the practices were labour intensive and tiring. In fact, there was a near 100 per cent response from the field extension workers showing that the practice of spacing of plants on the field was about the most difficult technique to practise. Again, about 87.2 per cent claimed that planting in lines was the next difficult technology and as much as 81.3 per cent felt that thinning out was the third difficult technique to be

practised on one's farm. On average, then as much as 89.5 per cent of the field extension officers confessed that the techniques were difficult to practise.

It seems, therefore, that the major planting and farm management techniques introduced by VORADEP were complex, to the extent that the farmers in the project area found it difficult to understand and effectively practise them so as to achieve the desired results. It can be argued that it was difficult for VORADEP extension officers to simplify the technologies extended so that the farmers would take advantage of the opportunities and benefits inherent in their practice. The complexity of the technology, undoubtedly, was the main factor that limited the adoption of the planting and farm management techniques introduced by VORADEP.

6. V MARKET ORIENTATION OF FARMERS

In order to estimate the extent to which the farmers had been producing more for the market than for home consumption since their contact with the programme, the survey farmers were asked to say whether they sold more of their farm produce in the market than they consumed at home since their contact with the programme. In response, well over half, that is at least 77 (64.2 per cent) of the respondents were positive. On the other hand, 43 (35.8 per cent) considered what they consumed at home to be more than what they sold in the market since their contact with the programme.

And, when the participants were asked whether they had to buy more food from the market for home consumption in order to supplement home production since their contact with the

programme well over three-quarters, that is 95 (79.2 per cent) of them replied "No." Which means that only 25 (20. per cent) of the respondents claimed they had to buy more food in the market for home consumption in order to supplement domestic food production.

One significant observation from the data gathered was, that only 28 (23.3 per cent) of the respondents claimed, that although they did not sell more of their farm produce in the market since their contact with the programme, they did not have to buy food for home consumption either. Again, only 12 (ten per cent) of the respondents stated that they neither sold more of their farm produce in the market since their contact with the programme and were not self sufficient either. In other words, they had to buy more food in the market for home consumption to supplement home food production. It is striking to note, however, that as much as 80 (66.7 per cent) of the sample farmers were emphatic that they sold more of their farm produce in the market and at the same time did not have to buy food from the market to supplement home food production since their contact with the programme.

This study did not investigate the levels of production of the participants in the project area since their contact with the programme. However, from the information gathered so far, it can be argued, that although the farmers did not widely adopt the technological packages extended by the programme, significant impact had been made on the level of production of the participants. To the extent, that most of the participants appeared to be more market oriented and self-sufficient in food production since their contact with the programme. It seems,

therefore that more and more of the participants were producing food for the market and more still were becoming less and less dependent on the market for food for home consumption. Again it seems that for those who were not inclined to producing food for the market can be said to be self sufficient in food production, at least to support the food needs of their families.

6.VI. ASSESSMENT OF VORADEP'S AGRICUTLURAL EXTENSION PROGRAMME

The views of the Field Extension Officers were arrived at by asking them to rate the nine items on their general assessment of VORADEP'S agricultural extension programme, as either agreed, uncertain or disagreed. The nine items and their ratings have been summarised in table 28.

From the table it can be seen that item one was rated highest by 24 (80 per cent) of the respondnets. In the view of an overwhelming majority of the field extension officers, there is a growing tendency in the project area for the participants to grow more of the varieties of the maize seeds introduced by the programme.

Table 29 RESPONDENTS' RATINGS ON THEIR GENERAL ASSESSMENT OF VORADEPS AGRICULTURAL EXTENSION PROGRAMME.

I T E M	Agreed	Un-certain	Dis-agreed	% Per cent	Rank
1. Most farmers now grow more of the varieties of seeds introduced by VORADEP than before	24	3	3	80.0	1
2. Farmers now use more fertilizers than they used to before their contact with the programme	22	6	2	73.3	2.5
3. Most farmers now use more weedicides to control weeds on their farms than they used to.	6	11	13	20.0	8
4. Most farmers now use more pesticides for crop protection & storage of produce than before.	22	3	5	73.3	2.5
5. Farmers now plant their crops in lines on their farms	18	8	4	60.0	5.5
6. Most farmers now space their plants as recommended by VORADEP	8	8	14	26.7	7
7. Most Farmers now practice thinning out to achieve the required plant density and population on their farms.	4	10	16	13.3	9
8. Farmers now produce more for the market than for home consumption.	18	7	5	60.0	5.5
9. Farmers do not increase their acreage cultivated in order to increase their yields	20	6	4	66.7	4

This, needless to say, relates closely with the earlier findings. Although the rate of adoption of the improved varieties of maize seed was not found to be impressive, there is sufficient evidence to show significantly positive changes in the attitude of the farmers towards the improved seeds introduced by the programme. The table also shows that items two and four were rated equally at the second position. About 73.3 per cent of the respondents were convinced that most farmers in the project area now use more fertilizers and pesticides for crop protection and storage of produce than they used to before their contact with the programme. This also confirms our earlier findings that there had been significant changes in the use of these agro-chemicals since VORADEP intervened in the agricultural sector of the area under study.

More than half of the field extension officers were agreed that the farmers did not expand their acreage cultivated in order to increase their yields. This seems to contradict the information gathered so far. With the remarkably low rate of adoption of the recommended inputs extended under the programme, it seems rather not probable for the farmers to maintain the same acreage of plots when they wanted to achieve higher yields. Thus, the assertion that the farmers in the project area did not increase acreage cultivated in order to achieve higher yields could only be either a statement of principle or applicable to farmers who had adopted all or most of the recommended inputs. And, for those who maintained the acreage cultivated without the necessary inputs, they could only have been cultivating at the

optimal level, most probable, for home consumption. Other than that, it should be said that most of the farmers necessarily had to increase their acreage in order to raise their level of food production.

The table also shows that about 60 per cent of the respondents were agreed that the farmers in the project area now plant their crops in lines and that most of the farmers now produce more for the market than for home consumption. These statements, it is significant to note, seem to confirm the earlier findings. Indeed, my own observations from the field show that planting in lines was the most popular planting technique with the farming population of the Volta Region and perhaps, it is the most conspicuously seen feature of virtually all the farms within the project area.

The findings on spacing of plants on the field, thinning out and use of weedicides also seem to correlate strongly with the assessment of the field extension officers. Only four (13.3 per cent) and only 6 (20 per cent) were agreed that the farmers practised thinning out and used more weedicides respectively since their contact with the programme. Again, only eight (26.7 per cent) of the field extension workers said that the farmers space their plants according to the inter-row and intra-row distances specified by VORADEP. Observations from the field further confirms that although the farmers used improvised garden lines to achieve straight lines for the plants they hardly achieved the right spaces within the rows for the plants. Most often than not, it was easier for the farmers to achieve the inter-row than the intra-row specifications. According to one of the field extension officers, this accounts for the fact

that most of the farmers hardly obtained the target plant density and population on their farms and also that farmers never achieved the expected yields.

6.VI]IMPROVING VORADEP'S AGRICULTURAL EXTENSION PROGRAMME

The views of both the extension officers and the sample farmers were sought on how VORADEP'S agricultural extension programme could be improved to enable farmers to improve their farming methods, practices and techniques. The views expressed have been summarised in table 29.

Table 30 Respondents' Views on How to Improve VORADEP'S Agricultural Extension Programme

I T E M	EXTENSION OFFICERS			F A R M E R S		
	FREQ.	PER CENT	RANK	FREQ.	PER CENT	RANK
1. Availability of Inputs	20	66.7	3	56	46.7	2
2. Tractor Services	17	56.7	4	43	35.8	5
3. More Sales Depots for Inputs	10	33.3	7	52	43.3	3
4. Subsidised Inputs	22	73.3	2	46	38.3	4
5. Credit Facilities	26	83.3	1	66	55.0	1
6. Logistic Support for Staff to facilitate more Extension contacts	14	46.7	6	25	20.8	7
7. Marketing System	15	50.0	5	33	27.5	6
8. Farmers' Association	8	26.7	8	20	16.7	8

The relationship between the views expressed by the extension officers, on the one hand, and those of the survey farmers studied, on the other hand, on how best to improve

VORADEP'S agricultural extension programme show a relatively high and significant Rho value of +0.714. The value shows a high degree of positive relationship and it can, thus, be argued that there was a fair assessment of the situation by the two independent groups of respondents.

From the table, it can be seen that the need to provide credit facilities and to form farmers' associations as support services for the extension programme was equally ranked by the two groups of respondents. Indeed, the need to provide credit facilities seems to be paramount to both the farmers and the field extension officers, representing the majority view of 66 (55 per cent) and 25 (83.3 per cent) respectively. To recapitulate, it was discussed earlier that one of the main constraints to the adoption of the agricultural inputs was that the farmers lacked funds to purchase the recommended inputs. Incidentally, the respondents did not request for loans in the form of cash advances for the purchase of the inputs but that the inputs should be supplied to them on credit basis which should be repaid after harvest and sale of farm produce. This is perhaps, because the farmers had realised that the non-availability of the inputs at the right time was also an impediment to their adoption of the inputs. The idea, seems to be that if cash advances were given to them it could be that they would not get the inputs to buy. It seems plausible, therefore, that the inputs should be supplied to them on credit basis so that the problem of non-availability of inputs could as well be solved.

In fact, the table shows that the idea of making the inputs readily available to them as and when needed was the second priority of the farmers, although it was the third consideration of the field extension officers. One other way by which the inputs could be made available to the farmers, according to the table, was to open up more sales depots. Although, this idea was not properly conceived by the field extension officers, it became the third consideration of the farmers. Indeed, not less than 52 (43.3 per cent) of the survey farmers studied felt that more sales depots should be opened close to their local communities from which they could purchase the inputs when they needed them. It can be recalled, that one of the main complaints of the farmers was that they found it difficult to transport the purchased inputs to their farms from the depots which were centralised and far removed from their farms. It seems to be the considered view of the farmers like the field extension officers that this problem would be solved if more depots were opened nearer to their homes to facilitates the sale of the inputs.

As the second priority of the field extension officers and the fourth consideration of the farmers, one other way by which the programme could be improved was for the government to subsidise the recommended agricultural inputs. About 22 (73.3 per cent) of the extension officers and 46 (36.3 per cent) of the sample farmers expressed this view. Perhaps, this is based on the realization that such a move would help reduce the prices of the inputs so that low income small - scale farmers could also purchase them for use on their farms. As discussed earlier the present trend of increasing prices of the inputs seems to

cut out the small-scale farmers from the programme since it favoured farmers who had additional sources of income to be able to buy the recommended inputs. By subsidising the inputs, the problems of rising costs of inputs and other financial constraints on the adoption of the recommended inputs would be eliminated so that the small-scale farmers would take full advantage of the economic potentials of the innovations extended by the programme.

The issue of the provision of tractor services was almost equally ranked. Not less than 17 (56.7 per cent) of the field extension officers and 43 (35.8 per cent) of the farmers were of the opinion that a plant pool should be established to provide tractor services for the farmers on credit basis. Investigations from the Ministry of Agriculture revealed that such a system of tractor services operated in the 1970s during the Operation Feed Yourself (OFY) era but it failed to achieve the desired purpose. According to the source the tractor became monopolised by large-scale farmers who could easily influence the tractor operators so that the small-scale farmers hardly had access to them. Similarly, the tractor operators did not properly account for the monies collected from those who hired their services so that the Ministry had to draw on its reserves to service the tractors. In short, the venture became economically not viable. Consequently, when the tractors broke down there were not funds to repair them. Eventually, the tractors were sold out and as expected were bought by the large-scale farmers.

An alternative arrangement was offered by the farmers. That is, that farmers' associations should be re-organised at area levels to serve as the channel for the distribution of farm inputs. Although this view was presented by a minority of less than ten (26.7 per cent) of the extension officers and just about 20 (16.7 per cent) of the survey farmers it could be useful if the groups should be properly organised, managed and made functional. Such farmers associations, according to this view, should be able to generate their own funds, able to procure tractors and other inputs for use by their entire membership.

One other way by which the respondents thought VORADEP could help them improve their farming better than they were doing was stated by 15 (50 per cent) and only 33 (27.5 per cent) of the field extension officers and the survey farmers studied respectively. According to this view, an effective system should be developed so that farmers could sell their produce at reasonable prices at any time, since most of them found it difficult to obtain the preventive chemicals to store their produce for a long period of time. It was said that most farmers did not always get ready market for their produce, and in order to avoid heavy post-harvest losses and to meet domestic commitments and to pay their debts, they were forced to sell their produce at relatively cheap prices to middlemen. The farmers, therefore, were of the opinion that VORADEP should take up the challenge of buying the produce in bulk at harvest time at reasonable prices to serve as an incentive for farmers to

increase production. Such a system, according to them, would also make easy the recovery of any loans granted them by VORADEP or any other financial institution.

The last recommendation was that enough logistic support should be given to the field extension staff to facilitate more extension contacts. Not less than 25 (20.0 per cent) and 14 (46.7 per cent) of the survey farmers and the extension officers held this view. When the field extension officers were questioned further, they intimated that since 1990 the extension staff was considerably reduced and the extension areas were expanded for each worker. However, staff allowances for travelling expenses and the maintenance of their motor-cycles were also reduced so that it was becoming increasingly difficult for them to achieve the standards of extension contact obtained during the project period. Such a situation, according to them, makes it difficult for them to reinforce what they had taught the farmers and a tax on the sustainability of the project.

CHAPTER SEVEN

DISCUSSION OF THE RESEARCH FINDINGS

7.1 SUMMARY OF FINDINGS

VORADEP'S agricultural extension programme was designed, primarily, to reach the small-scale farmers within the project area with innovative agricultural technologies through the Training and Visit (T & V) System of extension. The crop development programme was the main component of the project. This was based on the assumption, that the extension of relevant and modern agricultural technological packages to the farm families would help to improve their productive capacity, and consequently, would lead to an increase in the level of food production and then the standard of living of the people of the Volta Region.

In this research, therefore, the effectiveness of the project in general, and the T & V system of extension, in particular, were measured firstly, by the level of awareness created for the major technologies extended under the programme. Secondly, and most importantly, the impact of the whole programme was considered in terms of the extent to which the farmers had adopted the new ideas and practices introduced to them. The attempt was to estimate the extent to which the extension programme had influenced the farmers' desire and willingness to change their existing modes of production for new ones and how much the programme had effected positive changes in the farming behaviours of the farmers within the project area.

From the data presented and analysed, the major research findings can be stated as follows:-

- There was remarkably high degree of frequent and regular interactions between the farmers and the field extension officers.
- The respondents had demonstrated an appreciably high level of awareness for the major technologies extended under the programme. In all the cases, a significant majority of the farmers were sufficiently informed about the main innovative ideas, methods and practices introduced to them.
- A relatively large proportion of the respondents had tried all the project innovations. Thus, it can be said that the initial adoption rate was generally high. In specific terms, however, improved maize seed varieties, fertilizers and planting in lines were more initially adopted than spacing, pesticides, weedicides/herbicides and thinning out.

A significant proportion of those who had tried the innovations had continued using them. Thus, the discontinuance rate for those who had initially adopted the innovative technologies extended by VORADEP, can be said to be low.

Whereas a significant proportion of the farmers had completely adopted the use of improved varieties of maize seed and planting in lines, the rate of adoption of the agro-chemicals and the other planting the farm management techniques was relatively low. Improved varieties of maize seed and planting in lines were, by far, the most adopted innovative technologies.

- Almost all the new technologies extended by VORADEP were still in use in the project area. Thus, the level of adoption of the new technologies can be said to be high.
- Significant differences were seen in the rates at which the various agricultural inputs introduced by the programme were adopted in the project area. An insignificant proportion of the farmers had adopted all the innovations as a package - the average number of technologies adopted by the farmers was three. It can be said, therefore that the level of adoption of the new technologies was relatively low.
- There was a high degree of positive correlation between the extent of extension contact and the level of awareness for the innovations created by the programme.
- There was, however, a statistically insignificant relationship between the level of awareness created for the new technologies and the rate at which these new technologies were adopted in the project area.
- A significantly large proportion of the farmers were producing more for the market than for home consumption and were becoming self-sufficient in food production since their contact with the programme.
- The Training and visit (T & V) system of extension under VORADEP was effective to the extent that:-
 - (i) a high level of awareness for the major innovations was achieved;
 - (ii) the farmers in the project area had become innovative because they had developed positive attitude to change;

- (iii) significant changes had occurred in the production patterns as well as the methods, practices and techniques of cultivation of the majority of the farmers within the project area.
- However, the programme had failed to achieve its goal of reaching out to the small-scale farmers because of very significant constraints to the adoption of the new technologies as identified below:-
- (i) Non-availability of the recommended inputs as and when they were most needed;
 - (ii) High cost of inputs;
 - (iii) Lack of funds to purchase the recommended inputs;
 - (iv) High cost of transportation;
 - (v) Unfavourable market conditions; and
 - (vi) Complexity of the technologies extended because they were time consuming, difficult to understand and practice, labour intensive and, therefore, expensive to adopt.

Consequently, the small-scale farmers for whom the project was designed were marginalised to the extent that they found it difficult to take full advantage of the opportunities and benefits made available to them by the programme. Thus medium and large scale farmers as well as people with available sources of income to procure the recommended inputs became the main beneficiaries of the programme.

7.2 DISCUSSION OF FINDINGS

Awareness Creation.

The research findings show that there was a high degree of positive correlation between the extent of extension contact and the level of awareness created for the new ideas and practices introduced by the programme. Indeed, the participants in the programme were helped to have sufficient knowledge about what kinds of the new technologies to use, how much to use, when to use and how to use them. To this extent, it can be said, that VORADEP'S agricultural extension programme was effective as intimated by Benor and others (1984).

It can be concluded that the level of awareness of innovations achieved by any programme of intervention depends, almost invariably, on the extent of interaction between the source and the receiver variables in the information system used. This reaffirms an earlier discovery of Hagerstrand (1952) that information sources and information flow must be considered as important stimuli to the individual in the adoption process. It is the role of extension systems to persuade or motivate participants, in a social intervention programme, enough for them to want technical knowledge, to use it and to adopt progressive attitude toward change (Maunders, 1972). An extension system is, thus effective to the extent that it performs its historic role of helping farmers to form sound opinion, make good decisions and through communication, provide them with the information which they need (Hawkins, et. al., 1984). Indeed, the high level of awareness created for the innovative agricultural technologies extended under the programme meant that the communication system and the processes

.....ion of the messades from the sources to the

receivers were effective. The message variables, channel variables and the receiver variables could be seen to be well coordinated so that the participants were able to decode the messages which they were, at least, able to develop into ideas in their minds. These ideas they could either use or not but that they were able to use it would depend on other intervening variables (Van den Ban, et. al, 1988). The success of the diffusion process therefore depends, almost invariably, on the extent of human interaction, a process which Roling Neils (1988) describes as one in which one person communicates a new idea to one or several other persons.

Rate of Adoption

For most Third world countries extension programmes are considered as educational solutions to rural problems. Effective agricultural extension systems are, therefore seen as those capable of motivating farmers to use new ideas and practices and with the ability of inducing permanent behavioural changes within any target farming population. It is not enough for extension programmes to only enhance the ability of the producer to acquire and decode information about the productive characteristics of new inputs. On the contrary, the impact is that the farmers who had participated in the programme were be able to use the information by adopting new farming practices, techniques and methods, and as result increasing their productivity and level of production towards improving their general well-being (Dreyfus, 1982).

The research findings show that the initial response of the participants in VORADEP's programme was impressive. A significant proportion of the farmers immediately tried out the new technologies introduced to them. This means that a majority of the programme had, at least, reached the trial

stage in Roger's (1962) typology of the stages in the adoption process. The conclusion is that the delivery system used by VORADEP was able to move the participants through the stages of awareness, interest, evaluation and then trial. The dynamics of the process of movement along these stages may be explained by what Rothman's had suggested in 1974. According to him, when a target population is sufficiently exposed to innovation, much interest is generated for them to want to gather more information about the new ideas and practices. This leads to a point of decision making as to whether or not to try the innovation. If a positive decision is taken, then the target population tries the innovation and then decides as to further continuation.

The fact that quite a significant proportion of the farmers had tried the innovation meant that sufficient information and exposure was made enough to generate much interest in the farmers and to motivate them to initially adopt the new technologies. The evidence before us shows that the farmers had demonstrated their interest when a significant majority of them took the initiative to seek information about the innovations and also that the rate of participation in the extension activities of VORADEP was relatively high. The research findings also show that economic considerations - early yielding, higher yielding, drought resistant and increased farm income - were the main determinants of the farmers' decisions to try the improved maize seed varieties. Similarly, in all the cases, the respondents were convinced that the new technologies were economically superior to the traditional ones. From these observations, one can argue for Jones (1970) when he suggested that the decision of participants to initially adopt project innovations depends, almost invariably, on their perception that the innovations had the potentials of solving their individual problems

and needs. Indeed, in societies with large family sizes, poverty and increasing dehumanization, agriculture becomes an issue of survival and sustenance. Therefore, the decision of rural people to take risks such as adopting new technologies should, nonetheless, be determined by their perceived economic returns from such ventures.

For those who had tried the new technologies diffused by VORADEP, the results indicated that the drop out rate was low. This discovery collaborates the one made by Van den Ban and others (1988), when they applied the "law of effect" (the basic law of learning) to the decision of the individual to either continue or discontinue the adoption of a new technology. Using that premise, it can be argued, that the trial of the new technologies by the participants in the programme must have confirmed the farmers' perceived advantages inherent in their use for them to want to continue the adoption. It stands to reason, therefore, that an action that leads to a desirable outcome is likely to be repeated in similar circumstances. The significant reason for them to want to continue the adoption was that the farmers considered the technological packages extended to them as sufficiently beneficial (Uma Lele, 1975). The trial of the innovations can, thus, be considered as a reinforcement mechanism and an important stage in the adoption process. It can also be argued, that for any social intervention programme to succeed, change agents must be able to make or motivate the target population to try the innovations being diffused. The trial stage, thus, becomes the critical point in the decision-making and the whole adoption process. All agents of change must, therefore, learn to work towards that.

It is, however, significant to know that the decision of any target population to repeat the action that had produced a desirable outcome is also dependent on the fact, that the circumstances are similar. This suggests that the decision to try and the trial of an innovation do not necessarily lead to complete adoption. It can be said, therefore, that for those who had discontinued the adoption, their reasons was that the circumstances were not similar, due probably to some other intervening variables, which we shall discuss later.

The results of this research has indicated that a farmer's knowledge about an innovation does not necessarily make him/her to adopt the said innovation. This means that the decision to use the ideas, methods and techniques being diffused depends on other variables which may not be located within the communication system. Indeed, our research had shown that there was a statistically insignificant relationship between the level of awareness created for the innovations and their rate of adoption. One therefore, agrees with Rogers (1976) that the diffusion process and or the delivery system does not necessarily lead to the adoption of the innovation being extended but on the extent to which the constraints to adoption were premeditated and dealt with in the project design.

7.2.III EXTENT OF ADOPTION

The research has shown that there had not been a full - scale adoption of any of the technologies extended. This agrees with Rogers (1962) that all target systems do not adopt an innovation at the same time. Similarly, not many of the farmers had adopted all

the innovations as a package. On average the farmers in the project area had adopted only three of the technologies extended, thus making the level of adoption to be significantly low. At the same time the evidence before us demonstrates, that significant differences exist in the rate at which the various new techniques, ideas and practices were adopted by the target population. In a similar investigation conducted by the World Bank in 1989, it was realised that almost all attempts at introducing new technologies over the past years had shown disappointing results inspite of the massive investments in community development efforts and agricultural extension programmes. The Bank report which shows a low rate of adoption, declared that the "off the shelf technology" planned and injected into the developing economies almost always failed to achieve the desired results. From this research, it can be seen that apart from the adoption of the improved varieties of maize seed and line planting, the rate of adoption of the agro-chemicals as well as the other planting and farm management techniques were remarkably low.

Observation from the field indicated that a significant majority of the farmers effectively combined the use of the improved varieties of maize seed with the agro-practices of planting in lines and spacing as specified by the project rather than with the use of fertilizers and the other agro-chemicals. Again, in rare cases was it seen that the farmers increased their land acreage under cultivation to supplement losses that might have occurred without the use of the agro-chemicals. Perhaps, the conclusion to be reached is that farmers who cultivated relatively

fertile lands could achieve some level of high yields from maize cultivation if they effectively combined the use of improved varieties of maize seed with the agro-practices of planting in line and spacing as specified by the programme without necessarily using fertilizers and the other agro-chemicals. This observation seems to agree with the view that for farmers to derive maximum yields from the improved maize seed cultivated, they necessarily had to adopt the new technologies as a package. Although the farmers might not have derived the maximum yields with regards to project estimations, it can be argued that the yields were at relatively high levels to the extent that the participants were producing more food for the market than for home - consumption. Similarly the research has shown that a good majority of the farmers were self-sufficient in food production and less dependent on the market for their food supplies. Thus, unlike the observations made by Gakou (1987) when he studied the Sedhiou (Senegal) Rice Project, some increases in food production were achieved in VORADEP'S project area and it is possible to conclude that the basic stable requirements of the farmers were met.

However, since this research could not produce any statistical data on the changes in the level of production and the consumption patterns of the farmers, it becomes difficult to reconcile the high level of market orientation, on the one hand with the low level and rate of adoption of the recommended inputs on the other hand. Similarly, there is no evidence to show a glut of foodstuffs in the local markets and made available at cheap prices either. Suffice to say, however, that majority of the participants in VORADEP'S agricultural extension programme were producing enough food to feed both their families and the markets.

7.2 IV CONSTRAINTS TO ADOPTION

The evidence from this research shows that the constraints to adoption were not located in the target population. There seems to be no evidence to suggest that there were persistent structures within the target communities capable of making change a most difficult phenomenon as Foster (1962) and Frost (1961) would want us to believe. Similarly, the rural small-scale farmers in the project area did not demonstrate any tendency towards the rejection of the improved technologies because of such factors as ignorance, passivity, innate conservatism and similar negative characteristics as suggested by Sands(1987).

On the contrary, the farmers studied showed a high degree of innovativeness to the extent that they tried the new technologies, were willing to adapt and adopt, sought information about the innovations and participated in the extension activities. The rate of interaction was high and the level of awareness created for the productive sureness of the proffered technological package, of its profitability, how to use, when to use, how much and what kinds to use were also high-which in their totality represent the ethos of an effective extension system as stated by Benor and others (1984). It can be argued therefore, that the problems of adoption did not generate from either the farmer or the diffusion method. Thus, the assertions made by Zandstra and others (1979) may be used as the most appropriate explanations for the phenomenon of the low level and rate of adoption of the new technologies extended by the programme.

In our specific situation financial constraints to adoption were the most predominant factor. Like the Caqueza Project, the Comilla Project and the Sedhiou Rice Project, the new technologies extended by VORADEP were found to require cash investment in the purchase of inputs. According to the recommendations of these projects, it was necessary for the farmers to apply fertilizers, manage water resources, apply pesticides and other agro-chemicals which required additional financial resources to purchase, before the desired yields from improved seeds could be achieved (Zandstra et. al; 1979; Swadesh Bose, 1974; Gakou, 1987). It can be argued that the farmers' rejection of the recommended inputs was intricately related to the cash constraints in the project area. Indeed, in the case of VORADEP no sound and adequate financial support was given to the farmers to at least, meet their initial costs of production. The project did not consider the extension of credit and loan facilities as a major and integral component of its agricultural extension programme.

As in the case of the oil palm project in the Imo state of Nigeria studied by Njoka (1991), the greatest constraint was the inability of the farmers to obtain credit for use to purchase the seeds, fertilizers and agro-chemical and the difficulty of obtaining the package of inputs in quantities small enough for use on one hectare or less farms. Perhaps, this situation explains why the farmers could not adopt all the items at the same time as a package. The sharp increases in the prices of the agricultural inputs since the inception of the project had led to a correspondingly high increase in the overall costs of production,

and therefore, a tax on the productive efforts of the small scale farmers. Thus the decision of the farmers to adopt was ruled by the law of opportunity costs because they could not afford to purchase all the inputs at the same time. Under such circumstances, the combination of inputs that appealed most to the farmers was that of improved maize seed and planting in lines. The farmers then rationalised their rejection of the use of fertilizers by asserting that the lands were fertile. The higher the cash inputs, the higher the risks involved. So that, inspite of the perceived higher gains from the recommended inputs and methods, the farmers were unable to adopt them because of the fear of losing the substantial amount of cash that was required for the recommended inputs. This fear is quite understandable because in a situation where agriculture depends on unreliable rainfall patterns, farmers would naturally resist being drawn into schemes for which the risks involved were too high.

Government prices and marketing policies have always been a hinderance to the effectiveness of agricultural delivery systems (Swadesh Bose, 1974). Our research findings show that VORADEP'S much recommended inputs were almost always in short supply or not available in time because of ineffective and inefficient procurement and distribution agencies, poor transport systems, limited foreign exchange and restrictions on private sector marketing of the agricultural inputs. Since there were no institutional changes in the areas of credit and marketing, the primary beneficiaries in the VORADEP'S programme, like similar such social interventions, were those who already had the means to cash in on the prevailing circumstances.

One other major constraint to adoption identified in the field was the participants' continued conception that the planting and farm management techniques were complex. There was sufficient evidence from the study to show that VORADEP failed to simplify the technologies extended for the farmers to understand and use them effectively. A good measure for an effective extension system, according to Benor and others (1984) is that new technologies are explained to the farmers and they are taught how to adopt and adapt improved production methods and practices under their own individual farming and resource conditions. Observation from the field show that the technologies extended by VORADEP were seen by the farmers as complex to the extent that they were not economical in terms of time, energy, labour and money.

The net effect of these constraints to adoption was that the programme became more popular with farmers who already had additional sources of income and therefore were capable of purchasing the much recommended inputs rather than the small-scale farmers. The indications were that the small-scale farmers, for whom the programme was designed were eventually marginalised and alienated by being priced out of the programme. This is because structures were not put in place to ensure that they were able to purchase the recommended inputs. It seems, therefore, that earlier observations made by Malassis (1976) and Neils (1988) in this direction are highly commendable. According to them, unless pricing and marketing systems and credit facilities as well as varieties of input availability objectives are designed and directed to the specific needs of small-scale farmers, it would be

a futile attempt to improve the productive capability and the status quo of the small-scale farmer. Thus, social intervention programmes without structures to lay sound economic base for poor small-scale farmers will continue to alienate those for whom they were designed so that the rich and the more affluent in society will cash in on the situation for their direct benefits. Indeed, the factors of increased adoption of the other agro-inputs under VORADEP could only have been found in the extremely rapid expansion in the supply of the inputs associated with the high yielding maize seeds, at a price that reflected high subsidy and the availability of funds for the farmers to improve their purchasing power.

The extension programme under VORADEP was found to be individualised and focused more on the contact farmers than the groups. In most cases farmers' groups never existed and where they did, were hardly functional, and the system of reaching out to the farming population through the contact farmers was poorly managed. Thus, the group strategy designed for VORADEP'S delivery system could not be made operational. It, thus, becomes difficult to accept the dictum that new ideas once introduced into a social system, spreads within the system from one decision making point to another over time. In the case, of VORADEP, the diffusion process did not become an automatic multiplier of the social intervention's effect as Roling Neils (1988) would want us to believe.

On the contrary, it is more acceptable to assert that new ideas do not always trickle down in a social system but rather flow laterally among people with similar accessibilities to resources and with equal social status (Setsoafia, 1993). Indeed, the

opinion leaders who were made the model farmers or contact farmers in VORADEP'S programme, and as obtained in similar such programmes, became the main beneficiaries because, as Freebain (1973) suggests, they had command over the financial resources, either owned or borrowed, necessary for investment and for the purchase of current inputs of seeds, fertilizers and other agro-chemicals inspite of the increasing prices. Their very position as contact farmers had set them over and above the others and always gave them added advantages to have access to the resources necessary to effectively participate in the programme for their benefit.

7.3 RECOMMENDATIONS

In spite of these weaknesses in the design and implementation of VORADEP'S agricultural extension programme, it had not been a total failure. On the contrary, it can be said that significant and positive trends were found in the attitudes of the participants to innovations and modest achievements were made with regard to the use of the innovative techniques, methods and practices in agricultural production in the project area.

In the first place, the relatively high degree of awareness achieved by the programme is, nonetheless, significant for the development of agriculture in the Volta Region and this trend needs to be sustained and strengthened. Since this research had confirmed the stand that the degree of awareness achieved by any social action programme depends, almost invariably, on the extent of interaction between the source and the receiver, it is important that the Ministry of Food and Agriculture continues to provide the required logistic support for the extension officers to be able to

meet their targets in terms of the number of visits and number of farmers to visit within the two weeks cycle. The area of coverage and the number of farm families assigned to each field extension officer could still be reduced, so as to help improve, further, the extent of interaction between the farmers and the field extension workers. In this way, the field workers would be brought closer to their target population than before and the farmers would be able to reach them as and when they wanted to seek information.

Secondly, farmers' groups should be reorganised or re-established so as to make effective the system of reaching out to the farmers through the contact farmers. In the first place, contact farmers need not be selected from only the ranks of opinion leaders, medium or large scale, rich and well educated farmers. Since it was observed from the field that information hardly flowed laterally from these category of farmers to their less fortunate counterparts, it would be necessary for farmers within the same social classification to be organised into a group. It is envisaged that such an arrangement will ensure easy intragroup social interaction whilst other extension activities could be used to facilitate inter-group socialisation among farmers in the project area.

Thirdly, a programme should be designed so as to provide the contact farmers, thus selected, with the necessary training that would develop in them the leadership skills needed to function effectively and efficiently. Most importantly, the contact farmers should be capable of communicating the messages received to their follower farmers. It is the belief of the researcher that if these

steps are taken, the group approach to extension as envisaged by the project design, than the individualised approach would be achieved, and the small-scale farmers would then be well catered for in the programme.

With the farmers' groups made functional, it should be possible to diversify the extension activities to ensure a much higher level of participation by the farmers than achieved. Farmers' groups should then be able to mobilise resources for the organisation of field trips, workshops and film shows to supplement the efforts being made with the use of farm visits and demonstration classes. It is envisaged that the diversification of the delivery system would strengthen the already high extent of interaction between the field extension officers and the farmers, on the one hand, and the level of awareness achieved, on the other hand.

7.4 CONCLUSIONS

This research had shown that although the rate at which the innovative agricultural technologies introduced by VORADEP were initially adopted was impressive, the rate of adoption, in general (defined as the number of participants using the new technology expressed as a percentage of the total sample farmers) had been disappointing. What is needed is an attempt to sustain the initial adoption rate and motivate the other farmers to adopt the innovations as a means to ensuring a high rate for adoption. This

would mean the eradication of the main constraints to adoption as a means to reversing the negative trends in the adoption process so as to achieve:-

- a significantly high increase in the use of improved maize seed varieties, fertilizers and preservative chemicals;
- a relatively new attitude to the use of weedicides and herbicides;
- a full-scale adoption of the technologies introduced;
- significant changes in the production patterns as well as changes in the practices and techniques of crop cultivation for a majority of the farmers; and
- a spread of benefits of the programme to all classes of farmers in the project area.

Indeed, research has shown that if low-income producers are given credit and technical assistance, as well as security that they will not become liable for their losses, most of them will not hesitate to increase their production (Gakou, 1987). In the case of the Caqueza Project area, Zandstra and others (1979) observed that technology adoption in corn production without credit and supervision was very minimal. The main problem to the adoption of new technologies has always been the financial constraints in the project area and this includes the high costs of labour and the recommended inputs especially for farmers who have a low capital base and limited access to public supported credit.

There is no gain saying that the rural small-scale farmers, having realised the economic potentials of the new technologies were in most cases, more than willing to use them. And, in order

for social intervention programmes, such as was endeavoured by VORADEP, to benefit the very people for which they are designed it would be necessary for the Ministry of Food and Agriculture to:

- reconsider the issue of subsidized agricultural inputs;
- attempt well-planned and monitored credit system which could be channeled through the reconstituted and well managed farmers' associations; and
- a further decentralisation of the outlets for the marketing of the recommended inputs;

It is the view of this researcher, that farmers' associations should be allowed to open shops with initial funds obtained from farmers' shareholdings and government cum bank loans. The benefits will be that:-

- the inputs will be brought closer to the people since the shops are likely to be located within the communities and within the reach of the people;
- the farmers will own the shops, and better manage it to ensure continuous availability of the inputs;
- transportation cost will be evenly shared among the patrons of the shops thereby reducing the burden on each individual farmer;
- profits derived from the economic investment in the shops could be used to provide credit for the farmers to hire labour;
- items from the shops can be sold on credit to farmers with the highest degree of sureness of loan retrieval and repayment;

- the shops could also serve as units for the wholesale and retail marketing of the farm produce of the community; and,
- the profits could also be used for the financing of development projects in the community.

That the participants in VORADEP'S agricultural extension programme were becoming more market oriented and self-sufficient in food production was a positive trend in the development of agricultural production in Ghana. It is significant that this trend be sustained and strengthened. Information from the field had shown, that the main problems of crop producers were storage, when to sell and the price of the farm produce in the markets. In view of the fact that the preservative chemicals recommended by VORADEP had priced out a majority of the farmers, middle men often cash in on the situation to buy the farm produce at cheap prices during the glut period. Again, according to those who benefitted from Global 2000 credit facilities, they were forced to sell their produce at cheap prices in order to make good their debt obligations.

What is needed therefore is an efficient and effective marketing system that would enable farmers to sell their produce at reasonable prices so that they can make profits to use for their general welfare. Farmers' Associations in the communities should, thus, be encouraged to build up storage facilities, buy produce from members and then store up to sell at wholesale prices when prices improve. By such a system the prices of farm produce would stabilise on the market for farmers to derive the maximum benefits from their labour and other investments. Again, as a matter of

policy, the Government of Ghana should direct its rural industrialisation and development efforts towards the establishment of agro-processing industries. Individuals and organizations willing and with the means should be given the required support to facilitate an easy and quick spread of such industries all over the country. Apart from reducing substantially, if not eradicating completely, the menace of postharvest losses, it will also create job avenues for the rural population and stabilise the prices of local staples, as an incentive for the farmers to continue to increase the levels of production.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 SUMMARY:

The main concern of this research was to assess the impact of VORADEP'S agricultural extension programme on the farming practices, techniques and methods of the small-scale farmers within the project area; and to find out the extent to which the training and Visit (T & V) system of extension used by VORADEP could be considered as an effective method for the diffusion of agricultural innovations among farming populations. In more specific terms, the research sought to find out the extent to which the participants in the programme:

- Were using the farm inputs extended by the project;
- had adopted the new planting and farm management techniques introduced to them; and
- had become more market oriented and innovative since their contact with the programme.

An attempt was also made to determine and seek explanations for the changes that had occurred in the farming behaviours of the target population and to find out and seek solutions to the problems created within the individual communities as a result of the design and implementation of VORADEP'S programme. The ultimate goal was to make some suggestions and recommendations that would help increase the effectiveness of the T & V system of extension.

The basic assumptions for this study were that VORADEP'S agricultural extension programme had;

- achieved a high level of awareness and a high rate of adoption of the major innovative technologies introduced into the project area;

- led to significant changes in the farming methods, practices and techniques of a majority of the participants; and

- achieved a high degree of market orientation and innovativeness among the farm families reached by the programme,

In order to answer these questions and to test the hypotheses, the researcher adopted the survey research method of the descriptive type which, however, involved some relational analysis. And in order to ensure some appreciable measure of comparability, of the farming behaviours of the participants, a "before and after design", in which each respondent served as his or her own control was used. With this, it became possible to test the significance of any changes that must have occurred in the farming behaviours of the participants since their contact with the programme.

The target population for this research was the farming families in the Volta Region who have had direct contact with the programme, that is, any farmer in the Volta Region who had participated in the extension activities of VORADEP was given an equal chance to respond to the questionnaires and interview schedules. A total of thirty (30) field extension officers and one-hundred and twenty (120) farmers were selected by a multi-stage sampling method. This approach was found to be desirable because

the population considered was large and well spread over a wide geographical area. At each stage of selection, a simple random method was used.

Interview schedules were used to elicit responses from the farmers and questionnaires were administered to the field extension officers. In all the cases a hundred per-cent response was achieved because the interview turned out to be the most realistic way to collect data from predominantly illiterate communities and the researcher took the pains to visit the field extension officers to collect the questionnaires. The questions were self-designed to reflect on the major issues raised in the research questions and therefore covered areas such as the demographic characteristics of respondents, extension contact, cropping patterns, use of the recommended inputs, finance, marketing and consumption patterns of respondents. The schedules contained twenty-three pre-coded and twenty-seven open-ended questions and the questionnaires had eleven and fifteen pre-coded and open-ended questions respectively.

For the data analysis both the computerised and manual approaches were used. After the frequencies were worked out and percentages determined, the responses were represented on tables, graphs and pie charts. Relational analysis were made by cross-tabulation and the Chi-Square (X^2) was used to test the significance of the research findings. In some cases, the mean and the Standard Deviation were used as the basis for judgement, and in other cases the Speerman's Rank Correlation Co-efficient was used.

From the presentation and analysis of the data collected from the field, the main achievements of VORADEP'S agricultural extension programme can be stated thus:-

- High degree of frequent and regular interactions between the farmers and the field extension officers. That is to say that all efforts were expended to ensure constant contacts between the sources and receivers of information;

- High level of awareness for the technologies extended. A significant majority of the participants in the programme can be said to be well-informed about the innovative agricultural technologies introduced by VORADEP;

- The participants had become innovative to the extent that-
 - (i) the attitudes of the farmers to change had changed significantly;

- (ii) the farmers had demonstrated high level of participation in extension activities;

- (iii) the farmers, as it became possible for them, took the initiatives to seek information on the new technologies;

- (iv) the farmers had shown a high degree of willingness to use the technologies extended to them;

- (v) there had been a high initial rate of adoption (a high degree of trial) of the new inputs.

- For those who had initially adopted the new technologies, there had been a low drop out rate;

- High rate of adoption of the new varieties of maize seed and planting in lines;

- Almost all the new technologies extended by the programme were still in use in the project area;

There were positive trends in the adoption of new:-

- Methods, practices and techniques of maize cultivation in the agro-system of the project area; and
- Participants in the project area were becoming more market oriented and self-sufficient in food production since their contact with the programme.

On the other hand the programme had failed to achieve the stated objectives as contained in the project design to the extent that:-

- there was a generally low rate of adoption of some of the technologies and the highest rejection rates were found in the use of agro-chemicals and the planting and farm management techniques;
- there had been no full-scale adoption of any of the new technologies in the project area;
- a rather insignificant proportion of the participants in the programme had adopted the new technologies as a package;
- no significant changes had occurred in the production patterns as well as the methods, practices and techniques of maize cultivation of the majority of the participants in VORADEP'S agricultural extension programme;

the constraints on adaptation and the intricacies of adoption appeared to be much more complex than was perceived in the project design. Thus, no concerted efforts were made in either the project design or later plans to remove these major obstacles to the adoption of the new technologies extended by

the programme. The major constraints to adoption in the project area had been identified as:-

- (i) non-availability of the recommended inputs on the market as and when they were most needed by the farmers;
- (ii) high cost of inputs - cost of inputs had shown an increasing trend since 1988;
- (iii) lack of money on the part of the farmers to purchase the recommended inputs;
- (iv) the location of inputs at depots far away from the farmers and there were no cheap and available means of transporting them to their farms; and
- (v) the complexity of the technologies extended in terms of time consuming, difficult to understand and practice, labour intensiveness and therefore expensive to use;

- Because of these constraints to adoption, the programme failed to benefit a majority of the small-scale farmers (for whom the project was designed) and those who had limited sources of income and other resources to enable them take advantage of the opportunities offered them by the programme.

8.2 CONCLUSIONS

On the whole, VORADEP'S agricultural extension programme had made some impact on the farming population in the Volta Region of Ghana. The Training and visit (T&V) system of extension can be considered as an effective method for the diffusion of new

agricultural technologies because it has the potentials of achieving:

- a high degree of interaction between the sources of information and the receivers of the said information;
- a high level of awareness for the new technologies being extended;
- significant and positive attitudes towards change; and
- positive trends in the adoption of innovations being introduced into any social system.

Accordingly, the T&V system can be adopted as a model for the future delivery of innovative agricultural technologies.

What had made the Training and Visit (T&V) system under VORADEP to achieve these changes in the agro-system of the project area were the system's inherent characteristics. From this study, the extension delivery system was seen to be an effective management system that enabled the efficient implementation of already known extension principles. Essentially, the system provided an organizational structure and a detailed mode of operation that ensured that the field extension officers visited their farmers regularly and to transmit messages relevant to their individual or group production needs. Under VORADEP'S extension programme, extension staff received the regular training that they required continuously to upgrade their professional ability so that they could serve the technological demands of the target farmers.

The delivery system was structured such that the cropping cycle was broken into two week periods or fortnightly. The first day of every cycle was used to train the field extension staff in the messages they were expected to pass on to the farmers during the rest of the cycle. Each cycle was meant to correspond with a farming activity such that, for example, at the beginning of the cropping season the field extension officers received training on land preparation, selection of improved seeds and sowing or planting techniques. These messages, they passed on to the farmer by a rigid system of visits to ten groups of ten contact farmers each for each field extension worker. Each target farmer then was expected to pass the same message on to ten follower farmers. The mobility of the field workers was enhanced considerably by the provision of appropriate transport for them to be able to visit their contact farmers. Again, the coverage of the field extension officers was improved to the extent that the number of families or households that each was expected to visit was limited.

The research findings had shown, however, that VORADEP'S agricultural programme could not achieve the desired impact as envisaged in the project design. The problem was not so much of the communication of the messages and the acceptance of the new idea, practices and techniques by the farmers as of the means to adopt these innovations. Thus, in order to duplicate this delivery system, as designed for VORADEP, elsewhere, it is important the problems identified with the design and implementation of the programme and those problems created within the individual communities by the project should be solved with the view to

increasing the effectiveness of the T&V system of extension. The loopholes of the programme, as identified by this research work was that it did not provide, correspondingly, for requisite institutional and structural changes within the agro-system of the project area that would increase the accessibility of the farmers to the recommended inputs. At the same time, the programme could not simplify the methods, practices and techniques of planting and farm management so that the farmers could easily comprehend and effectively use them with the least difficulty. The consequences were that:

- the recommended inputs were not always available on the markets to purchase for use as and when they most needed them;
- the cost of the inputs were too high for most of the farmers;
- the extension of credit facilities, that would provide funds for those who had limited sources of income to be able to purchase the inputs, was not part of the project design. As a result, a majority of the small-scale farmers could not benefit from the programme; and
- most of the farmers found it difficult to reach the depots, for problems of transportation, in order to buy the needed inputs.

It is the considered opinion of this researcher that if these problems are solved and institutional and structural changes are effected in the design of VORADEP'S extension programme, the delivery system could be used effectively and efficiently for other agricultural communities in Ghana.

8.3 RECOMMENDATIONS

As noted earlier, the main constraints to the adoption of the new technologies extended by VORADEP were not found in the message delivery system but the support services needed for the farmers to use the new ideas, practices, methods and techniques effectively. In order to increase the effectiveness of the T & V system of extension and to achieve the desired impact as a social intervention programme, the following recommendations are being made:

- Use of local materials for the production of fertilizers and preservative chemicals. Research must be made into the production of inorganic manure and preservative chemicals using herbal medicinal plants. Information got for the field work had shown that some farmers had already begun using compost and animal dropping manures and herbs for the purpose of improving their productive capacity. Extension officers must be made to encourage this practice in their areas of coverage.
- The farmers' associations should be re-established or reconstituted so that farmers within the same social classification could constitute their own groups. This arrangement is to ensure easy intra-group social interactions whilst other extension activities could be used to facilitate inter-group socialisation among farmers within the project area.



- Each Farmers' Association or Farming Community should be allowed to open shops with initial funds obtained both locally, through farmers' shareholding, and government Cum bank loans. These shops should serve as the:
 - i) means for the distribution of new agricultural inputs;
 - ii) units for the granting of credit facilities to the farmers because there is the likelihood of a high degree of sureness of loan/credit retrieval and repayment: and.
 - iii) units for the wholesale and retail marketing of the farm produce of the community.

It is hoped that profits from such investments by the community could be used to grant loans to farmers to hire labour and for the financing of development projects in the community. The ultimate goal would be to make the inputs available cheaply and always at the doorsteps of the farmers.

- A well planned and carefully monitored credit system to be channelled through the reconstituted and well managed farmers' associations should be made part of any delivery system meant for rural small-scale farmers.
- The recommended inputs should be packed in small units and quantities for the use of those who cultivate one hectare or less plots.
- The techniques and methods for planting and farm management should be simplified in such a way that all the participants could understand and use them easily and effectively.

It is envisaged that with the information available to the farmers on the innovative agricultural technologies being extended to them and the institutional and structural changes suggested above, it should be possible to achieve:

- i. Significant increases in the use of the new inputs;
- ii. a relatively new attitude to the use of agro-chemicals; especially, the preservative chemicals;
- iii. a full-scale adoption of the new technologies;
- iv. significant changes in the production patterns as well as in the methods, practices and techniques of maize cultivation of most, if not all, the target families of the project area, and
- v. the spread of the benefits of the project among all classes of people in the target population.

To conclude, it is believed that having achieved such a high level of awareness for the new technologies extended under the project and having provided the support services in the institutional and structural changes for the small-scale farmers, it should be possible that a social intervention programme in the manner of VORADEP'S agricultural extension programme would improve the productive capacity and increase the level of agricultural production among rural small-scale farmers.

8.4 SUGGESTIONS FOR FURTHER RESEARCH

For this research, it had not been possible to examine the adoption of the new technologies extended under the project in relation to the cultivation of all the major staples in the project area. Thus, the diffusion and adoption of new technologies in

maize cultivation was selected for this study. It is, therefore, suggested that a comparative study is needed to examine the extent of adoption of new technologies as they relate to all the major staples introduced into the agro-system of the project area.

Secondly, information for this study was sought from only farmers who had had direct contact with the programme. The intention was to find out how much learning had taken place among the participants of the agricultural extension programme of VORADEP. It should be necessary, therefore, to further explore the extent of multiplier effect of the programme on the non-participants in the programme.

Thirdly, since this research focused only on the level and rate of adoption of the new ideas and methods as well as the techniques extended by the programme, a follow up study is needed to find out the changes that had occurred in the level of production of the small-scale farmers since their contact with the programme. Lastly, the questions, relating to the cost effectiveness of the programme in its totality, changes in the income level of the participants as well as the changes in the living standards of the small-scale farmers since their contact with the programme should be examined in a future research.

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APPENDIX A

QUESTIONNAIRE ON THE IMPACT OF VORADEP'S AGRICULTURAL EXTENSION PROGRAMME FOR EXTENSION OFFICERS

INTRODUCTION

This is an attempt to measure the impact of VORADEP'S Agricultural Extension Programme on the farming behaviours of farmers in the project area. We, therefore wish to have your personal views on VORADEP'S programme and kindly request that you answer the following questions as frankly as possible. We wish to assure you that any information given will be treated as "strictly" confidential.

A. DEMOGRAPHIC INFORMATION

1. Sex: Male / / Female / /
2. Age: 24 and below Years / / 40 - 44 Years / /
 25 - 29 Years / / 45 - 49 Years / /
 30 - 34 Years / / 50 - 55 Years / /
 35 - 39 Years / / 55 and above / /
3. Marital Status: Married / / Seperated/Divorce / /
 Single / / Widowed / /
4. Number of dependants including children -----
5. Please, indicate your highest academic qualification by circling the appropriate code.
 Middle School Leaving Certificate 1 Diploma 4
 G.C.E. 'O' Level 2 Degree 5
 G.C.E. 'A' Level 3 Other 6
6. What professional qualification do you have as an Extension Officer?
7. In which year were you first employed as an Extension Officer?
8. What official duties do you perform other than being an Extension Officer?
9. What type(s) of work do you do privately which bring(s) to you some additional income?

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10. If you farm what type? Crops /____/ Animals /____/
Vegetables /____/

B. EXTENSION CONTACT

11. How often to your farmers come to seek information from you?
Once a week /____/ Once in a fortnight /____/
Twice a week /____/ Not at all /____/
Other /____/ Please, specify here
12. Do you consider working through the contact farmers and not directly with all the farmers
Very Satisfactory /____/ Satisfactory /____/
Not Satisfactory /____/ ?
13. Explain your answer for question 12
14. How far away do you live from your target community?
15. Roughly, how long (TIME) does it take you to get to work? (1 only mean going from your place of residence to your target community to work)
16. How do you generally get to your target community to work?
On foot /____/ By car /____/ by bicycle /____/
By public or private commercial /____/
By Motor-cycle /____/ transport /____/

C. EXTENSION IMPACT

17. In your opinion which variety(ies) of maize do the farmers most want to cultivate? (i)
(ii)
(iii)
18. What complaints do the farmers make about the new varieties of seed introduced to them?
19. How do the farmers perceive the new seeds as compared to the old ones?
(a) Higher yield /____/ the same yield /____/ lower yield /____/
(b) More palatable /____/ the same taste /____/ less palatable /____/

(c) Higher markets the same market lower market

 demand / / demand / / demand / /

20. Which of the new planting and farm management techniques recommended by VORADEP do the farmers find difficult to practise? (i) ----- (ii) ----- (iii) -----

21. Which of these new ideas and practices introduced by VORADEP have the farmers adopted and which have they totally rejected? (Use the code 1 for adoption and 2 for total rejection)

/ / Planting in lines / / Application of fertilizers

/ / Spacing / / Use of pesticides

/ / Thinning out / / Use of weedicide/herbicides.

22. What complaints do the farmers make about the new planting and farm management techniques?

23. What problems do the farmers face when they want to obtain the needed inputs recommended by VORADEP for use on their farms?

(i) (ii) (iii) (iv)

24. What problems do you face as an extension officer when introducing the new ideas and practices?

25. In what ways do you think VORADEP'S Agricultural Extension Programme can be improved as to make it more effective?

(i) (ii)

(iii) (iv)

26. How far do you agree with the following conclusions about the effectiveness of VORADEP'S Programme? (Please, rate the items by putting a Cross (x) in the appropriate columns.

I T E M	Agree	Uncertain	Disagree
1. Most farmers now grow more of the varieties of seeds introduced by VORADEP than before			
2. Farmers now use more fertilizers than they used to before their contact with the programme			
3. Most farmers now use more weedicides to control weeds on their farms than they used to.			
4. Most farmers now use more pesticides for crop protection & storage of produce than before			
5. Farmers now plant their crops in lines than they did before			
6. Most farmers now space their plants as recommended by VORADEP			
7. Most Farmers now practice thinning out to achieve the required plant density and population on their farms.			
8. Farmers now produce more for the market than for home consumption			
9. Farmers do not increase their acreage cultivated in order to increase their yields			

APPENDIX B

AN INTERVIEW SCHEDULE ON THE IMPACT OF VERADEP'S AGRICULTURAL EXTENSION PROGRAMME ON FARMERS

A. DEMOGRAPHIC INFORMATION

1. Sex: Male / / Female / /
2. What was your previous occupation? -----
3. Do you consider farming as your major occupation? -----
4. What other type of work do you do besides farming? _____
5. Age (Years):

19 and below	/ /	40 - 44	/ /
20 - 24	/ /	45 - 49	/ /
25 - 29	/ /	50 - 54	/ /
30 - 34	/ /	55 - 59	/ /
35 - 39	/ /	60+	/ /
6. Marital Status: Single / / Married / / Widowed / /
Separated/Divorced / /
7. Number of dependants, including children -----
8. What level of education have you had?

No Formal Education	/ /	Incomplete Secondary	/ /
Incomplete Primary	/ /	Complete Secondary	/ /
Complete Primary	/ /	Technical/Vocational(Non-Formal)	/ /
Incomplete Middle	/ /	Technical/Vocational (Formal)	/ /
Complete Middle	/ /	Teacher Training College	/ /
- 9.(a) Do you own the piece(s) of land on which you farm?

Yes	/ /	No	/ /
-----	--------------------------	----	--------------------------

(b) (If No) How do you acquire your land for farming?

/___/ From family head /___/ By rent

/___/ Share cropping /___/ Other (please specify)

/___/ Through marriage

(c) (If Yes) How did you acquire the ownership of your land?

/___/ By purchase /___/ By inheritance

/___/ Gift /___/ Other (please specify -----)

10. Would you face any difficulties if you have to acquire more land to expand your farm?

Yes /___/ No /___/

11. If you are settler farmer how much do you have to pay as rent for the use of land? -----

12. Would you say this tax on land is satisfactory /___/

or Unsatisfactory /___/

B. EXTENSION CONTACT

13. How often do you go to seek information from the FEO?

/___/ Once a week /___/ Once every month

/___/ Twice a week /___/ Not at all /___/ Once a fortnight

14. How often does the FEO come and visit your farm?

/___/ Once a week /___/ Once every month

/___/ Twice a week /___/ Not at all /___/ Once a fortnight

15. Which of these extension activities do you personally participate in?

/___/ Farm Visits/Field Trips

/___/ Demonstration Classes

/___/ Workshops /___/ Film Shows /___/ None of these

16. How do you obtain the recommended inputs for use on your farm?

/___/ Purchase /___/ credit /___/ gift

/___/ None of these /___/ Other (please specify)

17. If you had to buy your inputs how did you raise funds for them?
/___/ Personal Savings /___/ Bank loan
/___/ Loan from friends/relatives /___/ Loan from money lenders
/___/ Other (Please, Specify -----)

C. PRODUCTION PATTERNS

18. What crop(s) do you cultivate on your farm? -----
19. What acreage of land, on average, do you cultivate annually?

D. EXTENSION IMPACT

(i) Use of Improved Maize Seeds

20. Which of the varieties of maize introduced by VORADEP was not new to you? _____
21. What varieties of maize were you cultivating before your contact with the FEO?
22. Provide information on the items below about the new varieties of seeds introduced by VORADEP that you are familiar with:
(i) Identity (Name or description by colour of grain) -----
(ii) Plant height at maturation -----
(iii) Average period of maturation -----
(iv) Yield per acre/hectare -----
(v) Planting Method (Seeds per hill of varieties) -----
23. How many of the varieties of maize seeds introduced by VORADEP do you know about? -----
24. Which of the improved maize seeds introduced by VORADEP did you ever cultivate on your farm? -----
25. (a) Do you still cultivate these improved seeds? No/___/ Yes /___/
(b) (If No) Why not? -----
(c) Which of the improved maize seeds have you stopped cultivating?
(d) Why did you stop cultivating it or them? -----
(e) Would you have liked to use them? -----

26. In order to estimate your perceptions about the new varieties of maize seeds introduced by VORADEP, Kindly rate the following items according to your extent of agreement by putting a cross (X) in the appropriate column.

Item	Agree	Uncertain	Disagree
Higher yielding			
Drought Resistant			
Good taste			
Higher Market Demand			
Increased Farm Income			
Early yielding			

27. State the reasons why you had never used any of the improved maize seeds

(ii) Use of Agro-chemicals

28. Which of the agro-chemicals introduced by VORADEP was new to you?

Fertilizer / ☐ /

Pesticides / ☐ /

Weedicides / ☐ /

29. Which of the agro-chemicals were you using before your contact with VORADEP'S programme? -----

30. For each of the agro-chemicals provide information as specified by VORADEP, in the spaces provided.

I T E M	Fertilizers	Pesticides	Weedicides
(a) Identification Name/ description			
(b) Method of Application			
(c) Time of Application			
(d) Importance/Uses			

31. Before your contact with the FEO which of the agro-chemicals were you using according to VORADEP'S specifications? -----
32. Which of the agro-chemicals introduced by VORADEP did you ever use on your farm? -----

33. (a) Do you still use them on your farm? No / ☐ / Yes / ☐ /

(b) If 'No', why not? -----

(c) Which of them have you stopped using? -----

(d) Why did you stop using it or them? -----

(e) Would you have liked to use them? No / ☐ / Yes / ☐ /

34. If you had never used any of agro-chemicals stated below state why (i) Fertilizers -----

(ii) Pesticides -----

(iii) Weedicides -----

(iii) Planting and Farm Management Techniques

35. Which of these techniques were you practising before your contact with the FEO?

(a) Spacing / ☐ / (b) Planting in lines / ☐ /

(c) Thinning out / ☐ /

36. Before your contact with the FEO, which of them were you practising according to VORADEP'S specifications? -----

37. Which of the new techniques did you ever practise on your farm?

38(a) Do you still practise it/them? No / ☐ / Yes / ☐ /

(b) If "No" why not? -----

(c) Which of them have you stopped practising? -----

(d) Why have you stopped practising it/them? -----

39. If you had never practised any of the techniques stated below, can you say why?

(a) Spacing -----

(b) Planting in lines -----

(c) Thinning Out -----

(iv) Market Orientation

40. Since your contact with the programme do you sell more of your farm produce in the market than you consume at home?

No / ☐ / Yes / ☐ /

41. Do you have to buy more food from the market for home consumption to supplement your home production?

No / ☐ / Yes / ☐ /

E. IMPROVING VORADEP'S AGRICULTURAL EXTENSION PROGRAMME

42. In what ways do you think VORADEP'S agricultural extension programme can be improved so as to help you better in your farming activities?

