UTILIZATION OF FARM SERVICE CENTRES IN THE EASTERN FART OF PLATEAU STATE

By

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DECLARATION

I hereby declare that this Thesis has been written by me and that it is a record of my own field investigation (research work). It has not been presented in any previous application for a higher degree. All quotations are indicated and the sources of information are specifically acknowledged by means of references.

Signature:.....

Date:.....

DEDICATION

This Thesis is dedicated to my wife, Mary Baklit; Late father, Mr. Caleþ Baklit; my mother, Esther Nachik; my grand-father, Mr. Haruna Mutsep and Enman Baklit - daughter.

CERTIFICATION

This thesis entitled UTILIZATION OF FARM SERVICE CENTRES IN THE EASTERN PART OF PLATEAU STATE by Gideon Baklit meets the regulations governing the award of the degree of Master of Science (Rural Development) of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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- Baklit, G.H.
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ABSTRACT

One of the programme(s) of action adopted by-Nigerian government to promote agricultural development includes, the creation of nodal centres called farm service centres. This design is to establish an efficient delivery system of farm inputs to the grassroots.

This study examines the operations and performance of farm service centres in the Eastern part of Plateau State. The purpose is to determine whether they are performing or not. Thus, organizational framework, utilization, input distribution, the provision of infrastructural facilities or services, impact on agricultural production, existing institutional organizations and role in adoption of innovation was assessed to determine the extent of progress made. This was done with the intent of developing a strategy that can further enhance FSCs functions so as to meet the needs and aspirations of the peasant farmers,

The research findings revealed that awareness, and accessibility affects the utilization of FSCs in the study area. FSCs supply pattern (fertilizer) was found to be commendable as it meets farmers demand even with surplus although there may be

shortcomings associated with the sources of data used. However, other important inputs were in short supply. Input deficits especially with respect to improved seeds, agro-chemicals, rotary weeders account to a large extent for the inability of rural farmers to attain some of their expected goals. Sub-optimal application of these farm inputs makes the desired increase in agricultural productivity very elusive. Even the untimely supplies of fertilizer, sometimes frustrate farmers plans and have a negative effect on production. These supply bottlenecks have their origins in the present set-up where the Federal Government Ministry of Agriculture (MOA) constitutes the monopoly for input procurement from overseas manufacturers - for onward transmission to the states.

The FSCs tend not to be very much concerned with existing institutional organizations such as farmers co-operative societies, adoption of innovations or provision of infrastructural facilities.

In a developing economy such as the Eastern part of Plateau State or Nigeria as a whole, where majority of farmers are small-holders, and rural infrastructures are grossly inadequate, input delivery strategies must be aimed at providing a

package of inputs to the farmers at the village level to ensure accessibility and effective use.

The study therefore suggests the creation of an integrated FSC system in the study area with the wards within the villages as nucleus of operation in co-operation with research or agricultural institutions, financial institutions with government participation just for surveilance to encourage the production of adaptable machinery or development of new farm innovations - local resource base and protection of public interest.

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CHAPTER ONE

1.1 Statement of Research Problem

There is a crisis in Nigerian Agriculture. The Nigerian farmers are not producing in sufficient quantity to meet the food and raw material needs of the people. A major reason for this food gap is the constraints within which farmers operate. The problems Nigerian farmers face are very diverse in nature. Farmers have to contend with soil improverishment, climatic vagaries, socio-economic, political and cultural constraints. There is also a consensus that this food gap results from the low productivity of the farmers, which in turn is a consequence of the inability of farmers to obtain required inputs at the right time, quantity, price and place. It was in recognition of this problem that the World Bank Assisted Agricultural Development Projects (ADPs) started experimenting with a relatively new input delivery system which involved the provision of inputs at the village level.

Supporting physical infrastructures such as rural feeder roads, silos or storage facilities, marketing and water supply are totally lacking or inadequately provided for in the area of agricultural crop production. Farmers low level of production may be due to other problems such as the rudimentary state of rural institutions with

specific reference to the number and quality of co-operatives in farm input procurement, storage and distribution. The poor attitude of officials of local or state government in rendering services as well as management of farm input distribution at various levels also affects farmers production.

A number of measures have been taken in Nigeria by the government in the past and present times to remove some of these constraints and to make the farmers produce more. The strategies adopted include the establishment of institutions such as World Bank assisted Agricultural Development programmes of 1970's in all the states of Nigeria. A central concept of these ADPs were the FSCs. The creation of these nodal centres or FSCs was to promote agricultural production in the rural areas. The "farm service centre is conceived as an in-put out-put centre at the village level where farmers can obtain extension service or advice, credit, other farm inputs as well as sell their produce" (Okorie and Idachaba, 1983, p.9).

Government established Nigerian Agricultural and Cooperative Bank (1979) Credit Guarantee Scheme Sections under the states Ministries of Agriculture (MOA) for the purpose of funding production. However, so far, "the direct lending scheme has tended to favour corporate, large scale farms and farmers who possess adequate collaterals"

(4th National Development Plan, Vol. 7, 1981).

Despite the existence of old and newly created institutions concerned with promoting agricultural production such as the Fertilizer Allocation and Distribution Agency (FADA-1988), the Directorate for Foods, Roads and Rural Infrastructure (DFRRI-1986) rural farmers production is still very low. Questions are being raised as to the success of these programmes in view of the ever worsening food crises situation in the country. All too often, services of existing institutions such as those mentioned above, do not reach the grass root level with the consequence of the total neglect of the problems affecting agricultural production faced by rural farmers not only in the Eastern part of Plateau State but in Nigeria as a whole.

I chose to study farm service centres because they have been in operation for quite a long time now in Plateau State (a decade). The agricultural sector is one from which a lot had been expected especially from the point of view of providing employment opportunities and self-reliance in basic food production .... "These expectations have however, not been realised particularly when viewed against the background of rising food crisis, the decline of production - especially traditional food crops ..." (4th National Development Plan, 1981, p.76). The question to ask is, what is the

extent of achievement after several years of organized efforts at setting up FSCs to provide farmers with necessary inputs and complementary services in order to boost agricultural production?

Common agricultural problems such as inadequate input supply, land development or preparation (before and during planting), floods, soil erosion are still prevalent in many villages in the study area. There is the problem of insufficient supply of improved seeds, inadequate extension service(s), poor mobilization of rural farmers to patronise FSCs and encouraging the adoption of appropriate technology and other complementary services to assist the local farmers increase their productivity.

While there is a large and growing literature showing government concern in agricultural development in Nigeria, that fact has made minimal impact especially in the various rural development programmes such as agricultural engineering services, credit facilities and land development services, The problem of inadequate input supply and other complimentary services is still a major concern that demands attention either by the people or government.

Rural farmers agricultural production is very low, if not below or at subsistence level. The

questions to ask include: How can FSCs be suitably organised in a regional net-work to ensure better patronage and utilization so as to achieve the desired results? How can FSCs be operated according to farmers need rather than market demand? Is there room for genuine participation at grass root level, in terms of individual or collective participation in the planning and implementation of FSCs systems in the Eastern part of Plateau State?

In the light of these observations, it is necessary to carry out an evaluative study to determine how effectively FSCs have been carrying out their terms of reference and the problems both service centres and their clientele face in order to remove some of the major obstacles to agricultural production in the Eastern part of Plateau State.

1.2 AIM AND OBJECTIVES

The general aim of the study is to determine the pattern of utilization of farm service centres in the Eastern part of Plateau State and FSCs impact on the agricultural production of the rural population. This investigation is necessary so as to know how to make the centres effective in promoting rural development. In pursuance of this aim, the following objectives will be pursued.

The specific Objectives:

(i) to identify the factor(s) that govern the demand for the functions of the farm service centres in the Eastern part of Plateau State.

(ii) to determine the adequacy of FSCs supply of services to the rural residents in relation to their demand.

(iii) to determine the utilization of the FSCs by the farmers.

(iv) to examine the impact of FSCs on the agricultural production of the rural farmers.

(v) Propose how rural residents of the study area can be better served as FSCs.

1.3 THE RESEARCH HYPOTHESES

In this study, an attempt will be made to test the following hypotheses.

(i) That the demand for FSCs functions is not greater than the services provided to the rural farmers in the Eastern part of Plateau State.

(ii) Existing FSCs do not have significant impact on the agricultural production of the rural residents in the study area.

(iii) There is no significant relationship between rural residents level of (a) awareness, (b) socio-economic characteristic and (c) accessibility to and utilization of FSCs.

1.4 THE RESEARCH METHODOLOGY

(i) To get the information required for the research, both primary and secondary data were collected for analysis.

1. Primary Data: One set of questionnaire was designed with two parts. The first part concerns general information for instance, respondents occupation, gender, educational qualification and village or FSC name. While the second aspect relates to residents patronage, mode of transportation, accessibility to and utilization of FSCs.

The field survey was undertaken with the help of five field research assistants. The head-teachers or principals and headmasters also assisted me greatly by soliciting with their staff to help in the interpretation of the questionnaires to the respondents in their local language. Personal observations and measurements were done. For instance, counting the number of the residents that visited FSCs, noting the type of services available, determining accessibility

of FSCs to rural farmers in hours kilometer especially, to the nearest FSC. Also interviews were held with departmental heads of the FSCs in relation to the problems FSCs face in carrying out their terms of reference. This approach or method was adopted to supplement records that could not be obtained through secondary data sources.

(ii) The random sampling method was adopted to avoid bias. That is, to ensure that every village in the study area with FSC, had equal chance of being selected.

(iii) Sampling Procedure: From the lists of existing FSCs in the Eastern part of Plateau State, the names of the villages with FSCs were compiled in alphabetical order as follows:

a)
1. Amper
2. Bashar
3. Dengi
4. Dokan Tofa
5. Gagdi
6. Gangnin
7. Garkawa
8. Gangnim
9. Jarmai
10. Kallum
11. Kwande
12. Kwalla
13. Kwansan
14. Kurgwi
15. Langtang
16. Mabudi
17. Mile Eight
18. Namu
19. Pankshin
20. Pil-Gani
21. Sabon Gida
22. Shendam
23. Wase
24. Yelwa

b) Twelve villages with FSCs were selected from the list above, using a table of random numbers. The centres selected were: Amper, Dengi, Namu, Dokan Tofa, Pil-Gani, Mabudi, Wase, Kwansan, Gagdi, Kallum, Kwalla and Garkawa.

c) Selection of Households

After selecting the twelve villages with FSCs thirty (30) households were rnadomly selected in each of the villages where the FSCs were located. The households were chosen using expanded programme on Immunization number system. For the purpose of administering the questionnaires in the selected villages, (thirty households per FSC) the heads of each household or representatives were used. Thus, thirty (30) respondents were sampled in each FSC. The response rate was high because out of 360 questionnaires administered, 315 respondents returned their completed questionnaires.

2. Secondary Data: All the required documentary information or material was sought for from institutions and organizations such as the Plateau Agricultural Development Programme and the Ministry of Agriculture. Archival sources like maps were also obtained from the Ministry of Lands and Survey and Ministry of Information. The data collected include records of supply of inputs to all FSCs, population size of farming families and names of villages with FSCs.

1.5 DATA ANALYSIS

The following types of statistical techniques were used for analysing the data.

(a) Frequency tables, graphs, averages and percentages for general presentation and description of information on crop-production, adoption of innovations, extension visits, the mode of transportation, or interaction of rural residents with FSCs.

(b) Inferential statistical tools were used such as Pearson's 'r' for testing hypotheses (i) and (ii) and the chi-square (x^2) for hypothesis (iii).

1.6 THE SCOPE AND LIMITATION OF THE STUDY

This study attempts to investigate the utilization of farm service centres by rural

residents in the Eastern part of Plateau State. It focuses on farm service centres located in five local governments. They are Pankshin, Kanam, Langtang, Wase and Shendam.

Emphasis is largely on, the identification of the demand factors for the FSCs functions and the adequacy of services provided in relation to the demand of the rural farmers. Demand and supply factors will throw more light on FSCs utilization as well as their impact on farmers agricultural crop production.

The major limitations of the study include:

(i) The problem of getting accurate records of the patronisers place of origin (rural residents home villages) from the FSCs.

(ii) Lack of accurate map of the Eastern part of Plateau State. The only maps available are old and had to be up-dated to include the names of some of the villages where FSCs are located.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Regional Development Theory

A region is a locality having specific socio-cultural and geographic character in any nation or across national boundaries. This presupposes the need for recognising the micro-units while planning for a state, a LGA or a rural region in order to:

i) cause balanced development between various settlements within the region.

ii) mitigate existing disparities among them, and

iii) secure maximum utilization and efficient management of resources.

Development according to the United Nations (1961) embraces the following components: "The satisfaction of wants or needs in a certain well-defined equitable, and quantitative aspects of total life situation. For instance, health, food consumption and nutrition, education, employment and condition of work, housing, social services and security, clothing, recreation, human freedom, together with a number of "background" conditions, including demographic and aggregate

consumption, savings, transportation and communication". A critical review of regional development theories and postulations could be a good starting point because the knowledge of certain ideas or principles that are considered valid could be adopted. It will also serve as a frame-work for systems thinking in order to pursue the goals of rational planning of say service centres over space in a developing economy such as Nigeria.

It is a known fact that development cannot be uniform over space. Neither the government nor the private sector can provide everything. Resources are scarce and deminishing because of the competing needs for their utilization, especially in the rural areas of most developing nations where the present trend of land speculation like in Shendam and resettlement area in the eastern part of Plateau State in Nigeria, is on the increase and also human population is doubling. From the preceding discussions, we need to view this statement critically that "in developing nations, the proper location of services and facilities is particularly important with scarce resources, limited administrative capacity and increasingly urgent needs to expand food production and manufacturing ...." (Rondineli, 1983, p.21). As noted in the introductory part

of Chapter One, not much has been achieved in terms of increased food production in spite of the existence of several institutions responsible for assisting farmers with various forms of services to promote agricultural development. Some scholars like Mabogunje, contends that agricultural programmes in some instances, have aggravated the problem rather than solved it. A case in point is the "displacement of fifteen thousand (15,000) rural farmers by the Bakolori Dam project in Sokoto State in the late 1970's" (Igbozurike, 1980). Some farmers were denied compensation and an appropriate alternative site or means of sustaining themselves. Farmers in Talata Mafara even stayed for three years without a means of survival. This is the type of situation which Mabogunje confirms by saying that all we have managed to achieve so far, is a situation of intensifying social and territorial inequality of income and opportunities (Mabogunje, 1978, p.13).

Campell (1981-82) quoted Goldsmith and presented three schools of thought on regional development theory (planning) as follows:

(i) Technically conservative approach. This is based on the premise that market forces will eventually even out.

Equilibrium stage will be reached so that there will be no regional disparities. (An assumption - based on mobility of factors of production).

(ii) Liberal approach. Points out multi-functions of the market system and suggests policy instruments for limited intervention with incentives, say in agricultural development, for instance, provision of inputs at affordable prizes at service centres at the village level or export staples and improvement of market.

(iii) Radical approach. Holds the view that market mechanisms cannot be relied upon for equity and benefits and also because of the stronger forces of concentration that it produces.

Salih et al, (1981) summarised these classifications as follows:

(i) Neo-classical approach
(ii) Structuralists approach
(iii) Neo-Marxists approach.

However, the dilema is with how to make the choice of development strategy because it is fraught with problems. For instance, in Nigeria and most Third World countries, spatial organization

of development and change is invariably shaped by two major factors.

(a) Continuing influence and patterns of relationship of colonial legacy, external domination and internal under-development especially rural areas.

(b) Post war, post colonial economy of Third World countries.

Appalraju and S'afier (1976) maintained that "the intrinsic nature and historical circumstances of less developed countries (LDC's) and prevailing conditions of poverty, inequality and under-development offer a different environment in which establishing a centre or set of centres to be able to modify existing structural relationships of production, distribution and organization" becomes difficult. Defficiencies in the structure of economic, social and political institutions and relationships that have gradually developed need to be corrected or improved. If done, it will help release our local people who are being bounded into a global web of organised exchange system between the "core" developed countries and the "periphery" less developed countries on unfavourable terms. In the past, there was less emphasis on inter or intra regional interaction for service needs of the rural populace. This gave rise to

highly specialised activities intensively operated in a widely separated locations in Nigeria and other Third World countries. Inequality in development patterns emerged. In contemporary world of Nigeria today, the trend seems to have changed as successive governments have been making concerted efforts to redefine their development strategies and concepts. The initial emphasis was on economic growth (GNP), maximum capital flows and improved balance of payments through market economy. But later on, equity issues were incorporated after noticing disparities in development patterns. Hence, the need to consider the ingredients of regional income inequality.

2.2 Regional Income Inequality Theory

According to Mabogunje (1980) "the penetration of capitalist mode of production into the economy of most Third World countries lead to the creation of new spatial order". This phenomena is responsible for the emergence of different levels of economic development. Scholars, strategists, politicians, planners and economists over the years have continued to seek for possible causes of regional imbalance in development. The aim of course is to trace the root of regional income disparities.

Most of the group of professionals mentioned above, sought for reasons of spatial variations in economic growth on national scale in terms of traditional models of inter and intra economic relationships, particularly trade models.

From this assumption, income disparity was seen as merely a temporary phenomenon, just a slag in adjustment mechanisms. However, Myrdal's (1957) idea of "commulative causation" implies that "the play of the forces in the market economy normally tends to increase rather than decrease the inequality between regions".

2.3 The Growth Pole Theory

The growth centre concept has its origin in the growth pole theory of Francois Perroux's seminal paper of (1955/64) which holds that growth does not occur everywhere at once, it starts at some points (growth poles) from which it spreads to other areas through various channels with varying intensities. Growth centres are regarded as the geographical expressions of these growth poles.

Moseley (1974) considered a growth centre as "a town which has recently experienced or is presently experiencing or is planned to experience rapid growth." "The trickle down

effects" from the growth centres have been found to be very minimal. However, with careful planning and appropriate investments as documented by Ariyo (1984) in his research work of NTC Zaria farm service centre programme at Maigana, the principles of the growth centre strategy could be used to stimulate regional economic development (especially agriculture) in regions such as the eastern part of Plateau State. This could be achieved through establishing an efficient FSC systems in the area.

2.4 The Concept of Central Place Theory

Central Places and Central Place Theory

A central place has been defined by Marshall (1971) as "a town which directly supplies goods and services to consumers including those living outside its physical limits." Christaller's starting point according to Scot (1970) is that "an urban centre, whether town or hamlet, exists primarily to provide goods and services for the surrounding area. Such services are termed "central functions" and the service centres providing them are "central places." Precisely, "central place is a generic term used by Christaller to denote urban agglomerations" Johnson (1976, p.117). The central place theory refers to "a set of ordering principles that

explains the distribution of settlements performing central place functions," (Hoover, 1971, p.20). Thus, central places in reality, refer to those human settlements distributed over space (region) providing a wide range of goods and services to the population surrounding them.

The central place theory has been greatly criticised due to its simplistic assumptions. Despite its limitations, however, it is useful in the planning of activities in a region. "A hierarchical system of centres avoids duplication and waste. It is a relatively efficient way of administering and allocating resources within a region, facilitating the realization of social benefits (services) accruing from economies of scale" (Glasson, 1974, p.139). Furthermore, the threshold and range concepts serve as useful guides in deciding the appropriate scale at which goods and services should be provided within a region.

2.5 Location and Hierarchy of Service Centres

The central place theory identifies relationship between centres and other hinterlands. By inference therefore, service centres are points at which town and country side interact. This type of interaction is usually not accidental.

They tend towards a regular symbiotic pattern of dependence over space and time.

One basic fact is that this type of interaction in the past or present times, has led to agglomerations of settlements and the emergence of hamlets, villages, towns, cities and metropolis. This is largely as a result of the process of man's search for prefered centres with attractive prizes of goods and services. In the planning of service centres whether in developed or developing countries, attention is given to the idea of clustering and inter-dependence of activities embedded in Christaller's central place theory.

Walter Christaller's theory attempts to provide an answer to the question, what laws govern or determine number, size and spatial distribution of human settlements? This is viewed within the context of his assumption of an isotropic plain and the idea of the emergence of competetive equilibrium tendencies over space. If we reconcile the concept of centrality with farm service centres, the point of focus for consumers who must visit the market (centre) place, on a regular bases, will be a location that permits them to conduct their business with minimum efforts.

If a choice of location is available, they will always prefer, the one which involves least

effort. "Yet their business trips are varied. They are willing to travel only short distances to obtain items needed frequently. Less frequent purchases can often be postponed so that single longer trips can accomplish several things - not only shopping but socialising, entertainment, politics and so on" (Berry, 1967, p.3).

What determines an individual's interaction with a particular point of activity, is its centrality in space. Johnson (1976) holds the view that "centrality of a settlement signifies its importance in service provision and goods for a tributory population. This is indicated by the number of services it provides and the proportion of those services supported by the tributory population". In other words, centrality is the difference between the inner range value for a service and the population of the place providing it. The larger the difference between the two, the greater the centrality of the place.

This concept of centrality is derived from the fact that towns act as distribution points for goods and services to villages and surrounding hinterlands. Central places make available to people living in rural areas those services requiring fixed locations or large number of customers. Service centres provide functions which cater for discrete areas. Business enterprises

require a large enough area (population size and purchasing power) from which to derive sufficient revenue. Hence, the emergence of interlocking cobweb of exchange points known as central place systems.

The attraction of a central place to the dispersed population or its complementary region depends on the variety, quality and prizes of the central goods and services available. But the range and variety of these central goods and services perforced depends also on the receipts that the central place traders, producers, professional men may expect from the sale of their goods and services. It implies that unless an enterprenuer, like farm input producer or supplier, is sure of the fees rural farmers are ready to pay is quite substantial to ensure maximum income generation, he may not set up the business in the area.

Density of population becomes an important element to be considered in determining the variety (hierarchy) of central place functions, the locations of farm service centres, the particular type of goods and services or facilities to be provided in an area. For example, a small village or settlement with low population can be provided with silos or storage

facility because the demand may support such services but the same village may not support a tractor workshop or a grain processing industry. This comes into being because the economic nature of distance is emphasised, the range is specific to particular persons. Beavon (1977) confirms this by saying that "the same commodity or service would not be equal in all directions about each central place".

The role of population density should not be over-emphasised. Numbers of people of course, are not by themselves a measure of effective demand. It will depend on the size of the income, (purchasing power), the spatial distribution of incomes and the relative number of high, medium and low income receivers. Again, this fact is very critical in designating specific central places and types of goods and services to be provided.

To ensure maximum derivation of benefits, goods and services provision should be made with due recognition of existing range and hierarchical interdependence of service centres in a developing economy such as the eastern part of Plateau State. In the selection of a suitable site for locating service centres, the following conditions should be carefully examined.

1. The characteristic of the region in which a centre will be located.
2. Consideration of special features of a particular site within the region in which the centre is to be located.

However, overlaps may occur in geography, agronomy or ethnographic factors which may influence the choice of a region or site.

2.6 The Concept of Farm Service Centre

The origin of FSCs in Nigeria is traceable to the establishment of World Bank assisted Agricultural Development Programmes at Funtua (FADP) and Gusau (GADP) in Kaduna and Sokoto States respectively. The central objectives of the projects was to increase agricultural productivity and incomes of the farmers in the project area, thereby increase total food supply for the fast growing population and raw material for agro-based industries. This objectives was to be achieved by providing a package of essential inputs and an efficient input delivery system through FSCs.

The farm service centre is conceived as "an input-output" centre at the village level where farmers can obtain extension advice, credit and other modern farm inputs (machinery) as well as

sell their produce", (Okorie and Idachaba, 1983, p.9). Ideally, the idea of the farm service centre concerns the development of an integrated well established delivery system which will make necessary agricultural inputs available to the farmers especially, the small-scale holders in a timely fashion.

The establishment of FSCs in the villages is intended to maintain grass root contact. The main objective of establishing and maintaining such centres was based on the premise that FSCs should be able to promote agricultural development which may in turn contribute to improve income earnings of farmers and thereby reduce rural poverty. Thus, FSCs are expected to facilitate the transformation of the structure of production and settlements at the local level. The system is designed to ensure that all farm inputs necessary for agricultural production and marketing are conveniently made available in one location.

Conceptually, the location of FSCs in an area like the eastern part of Plateau State can be regarded as a location - allocation problem. Several factors have to be critically examined in selecting the site of a centre. These consists of assigning a given number of FSCs, for instance

seventy seven (77) were proposed in the case of Funtua (FADP) D'Silva (1980) to a given number of villages so as to minimise the distance travelled by farmers to obtain inputs from these centres. According to some scholars, a prior expectation suggests that the location of service centres should take into cognisance the following:

(i) Demographic factors such as population density (about 1000 farming families to a centre as recommended by some agricultural specialists in Nigeria).

(ii) Centrality and accessibility; and

(iii) Political factors.

Centrality here, involves the average distance the users of the FSCs have to travel to reach the facility. In Funtua, FSCs were constructed in 72 villages so that farmers would not be more than 5-10km away from a centre. The measured average walking radius to be covered by farming families in Funtua was 5.83km and 5.61K/ms in Gusau. At best, the range of the service centre walking radius should be within 5 K/ms which conforms fairly with farmers walking experience to facilitate input purchase or procurement, delivery and distribution to farmers at the right time, quantity and place.

Though many economists may not emphasise the role of political factors, we can view them as important institutional factors which any development effort and or introduction of innovations must build into operational model for success to be achieved. The set of political factors here relates to the influence and political weight of the village head, and the political leadership at the project and state levels. For instance, a powerful chief or village head may be interested in having a service centre close to his house to reduce his own cost of obtaining inputs, or to influence the distribution of inputs or to have close "supervision" of the operations of the facility. (At times even anticipating gratification or some favours). During the political era, (second republic) the distribution or location of socio-economic services was done on the bases of satisfying constituencies such that powerful politicians could win many things for their electorates. Villages without powerful connection at the headquarters suffer from inadequacies or lack of provision of service centres. It is very unfortunate that political criteria are usually controversial in Nigerian context.

The FSCs Structure and Staff Organization

A centre consists of a main store with a

storage facility of say over 3,000 tones of fertilizer and seeds. The floor space of a centre usually has a lnegth of 50-53 metres and a width of 19-27 metres. Attached to this is a minor store for insecticides and seed dressing. FSC staff are of two categories. They are technical and commercial staff. The first take charge of extension services while the latter is responsible for "farm input procurement, distribution and sales as well as produce buying" (Okorie and Idachaba, 1983, p.18). A centre is controlled by an agricultural assistant.

Examples of FSCs

A brief discussion of the activities of Funtua and Zaria Nigeria Tobacco farm service centres will be made here.

At Funtua, inputs provided to the farmers by the FSC include fertilizer, improved seeds (Maize, Sorghum, cotton and cow-pea) ox-ploughs, sprayers and extension services. Only ox-ploughs and sprayers could be obtained or purchased on cash or credit. Fertilizer, seeds and agro-chemicals are sold only on cash bases.

Nigerian Tobacco Farm Service Centre

In an attempt to solve or tackle agricultural problems and ensure a high level of crop production

of the target population, NTC Zaria has established an efficient FSC located at Maigana (Soba LGA) 25kms away from zaria. The Company offers assistance to farmers through the provision of extension services and credit facilities.

For instance, NTC provides tractor hiring services for land clearing (development) and fertilizer on credit and improved seeds of maize or sorghum free of charge. Cash advances are also provided to farmers to recruit or hire additional labour to meet up their needs especially during those critical months before harvest the farmers have nothing to sell.

2.7 The Organization of Service Centres Over Space

From the discussions in the preceding sections recognition has been made of the central themes of central place theory that have become embedded in regional studies and are being used increasingly as a framework for planning the world over. A full grasp of the variations of threshold and range requirements by goods and services, will assist to inquire at what point and for what goods or services, entreprising individuals will succeed at a location other than one of established larger centres.

To handle the situation noted above,

Christaller proposed geometric models in the form of hexagonal constructs in which two economic principles are worthy of notice. The first of these principles is "the marketing principle" and the second, "the transport principle". If the objective (of planning service centres) is to achieve largest provision of central place goods and services by minimum number of central places, he indicates how this can be done or accomplished by his marketing principle (see Fig. 2.1).

The largest central place P.1, can supply "higher order central goods" for the entire area bounded by the P.2 perimeter (Area I) and all P.2 centre, will be corners of six equilateral triangles centred on P.1. The P.2 centrs (second largest) will have complementary regions bounded by P3 perimeter (Area II) and will supply central goods of a "lower order". Following this regression, the P3 places will be centres of regions (Area III) bounded by P4 places (shown on the diagram as dots) and supply the "lowest order" of central goods. Each of the P4 centres will have their respective miniscule market areas in which "dispersed goods" will be distributed. If the intension is to satisfy minimum demand for transportation of goods at minimum cost, Christaller recommends the establishment of as

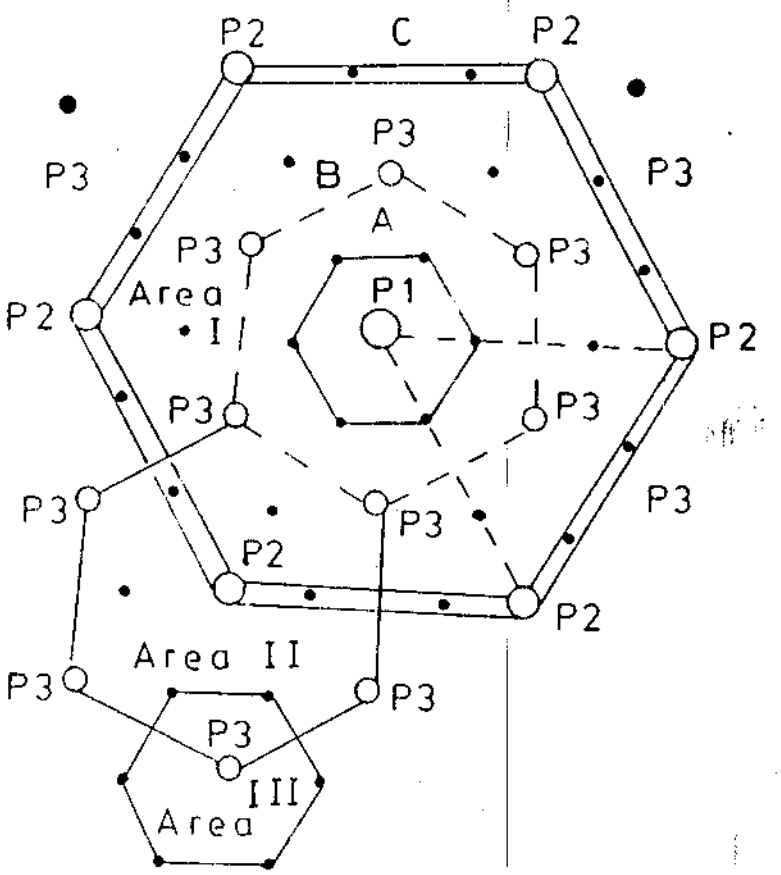


Fig. 2:1 : CHRISTALLER'S DISPERSION OF CENTRA PLACES UNDER THE MARKETING PRINCIPLE

Source: Adopted from Johnson E. A. 1976 : The organization of space in developing countries

many central places as possible along major traffic route(s). The above two economic principles of Christaller are important principles that readily present two alternative planning approaches for the orientation of service centres over space. For instance, the marketing principle tends to emphasize dispersion of central places to ensure the largest provision of central place goods and services by the minimum number of central places. The transport principle, places its emphasis on satisfying the minimum demand for transport cost, which requires the need for the location of as many central places as possible along major traffic route(s).

The application of these principles in organizing service centres over space depends on several factors, like economic, social and geo-political conditions. The choice of any principle also depends on where emphasis is being laid. Where equity is emphasised as it is the top priority of most developing countries especially, rural development programmes, then dispersion of centres as provided for by the marketing principle is relevant. The advantage here is that it will ensure equal access to the means of production among members of say the Nigerian community.

Many countries both developed and developing have adopted Christaller's economic principles as a framework for re-organising their space economy. In Ghana for instance, it has been used in considering the needed changes in urban centres. This was done after a careful study of the hierarchical structure of human settlements or agglomerations of towns lacking certain facilities that other centres possessed of similar rank in hierarchy. Groove and Huzzar (1964) noted this and proposed a "filling in the gap" strategy as a policy for effecting the needed change. Investment was then made in lagging areas or centres. Another example is that of Tanzania. Nyerere's Arusha declaration of (1967) was a demonstration of the recognition of the idea of hierarchical arrangements as basic in space organization. He started the idea of re-organising rural areas under the umbrella of his Ujama'a philosophy, to merge smaller villages to form larger ones (villagization programme). This was done to "counterveil urban supremacy and reduce inequality by making a dual thrusts towards integrated rural development and the redistribution of economic growth over (space) a number of secondary centres away from the state capital-Dares-Sala'am" (Mohammed, 1987).

Also, the Dutch adopted the principles in "planning settlements to serve farms newly created

or established on polders reclaimed from the Ijsselmeer by creating two level hierarchy of market centres for farmers (International Institute for Land Reclamation and Improvement, the Netherlands, (1971)). Yet another example, is on the Lackish plains East of Gaza Strip, Israel built a system of settlements on three tier level hierarchy as mentioned below.

(i) Settlements (including protective boarder Kibutzim) of various kinds, absorbing new immigrant settlers and Israeli pioneers and serving as centres of agricultural cultivation, containing facilities used daily by the settlers.

(ii) Settlements (Rural Committee Centres - RCC) planned to serve four to six village settlements and supply buildings and facilities used by them once or twice a week.

(iii) Regional Centres. A town roughly at the geographical centre of the region to provide administrative, educational, medical, cultural services and factories for crop processing (Newbury, 1980, p.235).

These specific examples are practical or symbiotic expressions of the relevance of central place concept in organization of space economy.

The basic argument for the support and use of the central place ideas in spatial planning rests on the premise that "a system of centres arranged in a hierarchy provides an efficient way of articulating distribution and administration of regions" and also that "the very leadership of major central places, as growth poles, sets the pace of progress of their regions" (Berry, 1967). The question to ask here is, how successful have these been?

2.8 The Relationship Between Farm Service Centres and Their Hinterlands

There are many kinds of relationships between FSCs and their hinterlands. Ideally, the location of a service centre in a village is supposed to pave the way for increased income of rural dwellers as a result of the services and availability of improved means of production. This could be possible because the provision of improved seeds, rotary weeder, tractor services, no doubt affects the basic functions of production. Idachaba et al, (1981) once asserted that "infrastructural facilities provided by FSCs are essential for marketing the nations surplus food and fibre. They also help ..... foreign exchange earnings, income generating capacity and offer gainful employment opportunities in the rural sectors."

So, where FSCs try to improve the quality of rural roads and provide certain institutional infrastructures like farmers cooperatives or associations, bore holes for surface or sprinker irrigation to farmers during the dry season, the story is different. This will even encourage or enhance private participation in farm input procurement and prompt delivery to farmers and reduce the chances of damage or loss.

Infrastructures are inadequately provided for or lacking in many Nigerian villages. The implication of this condition is that it impedes development of the rural areas. It is largely as a result of this problem that previous or present government efforts have failed in executing programmes like the Green Revolution or Operation Feed the Nation (OFN). The development of infrastructures around FSCs, creates an avenue for concious attempts towards specialization, division of labour, monitization of production and input purchase, all of which are characteristics associated with advanced economies. For instance, the mere speculation of the prospects of road construction can spur commercial production in an otherwise subsistence economy.

In essence, infrastructural facilities like plants and storage facilities contribute in no small way towards agricultural development.

Processing plant helps in reducing wastage, simplifies transport requirements, spreads the period of consumption at greater convenience for the consumers and it also introduces a concentration point in the marketing system which may constitute a focus for improvement in supply and distribution channels most especially where economies of scale is envisaged in processing. Furthermore, storage facilities assist farmers by protecting their agricultural products against deterioration after harvest until when the demand for them is high.

Below is a summary of the expected impact of service centres on agricultural production within their hinterlands.

1. act as local market points or collecting centres of farm produce for storage.
2. act as collection points for export overseas.
3. provide specific inputs and services to encourage agricultural production.
4. provide such market information as where, when, and for how much services, inputs or products (goods) can be sold which are essential in determining which crops to grow or goods to produce.
5. it may in the long run stimulate the establishment of servicing entreprises

initially, may be to effect repairs of tractors or transport equipment and then move on to the advanced stage of agricultural engineering services or functions.

In support of expected impact (No. 4) Johnson (1976) opined that the "existence of small service centres act as powerful stimulus to agricultural change" and for this, he suggested that marketing or collection points be provided at such centres to rural farmers.

2.9 Summary

In regional development studies cognisance of micro-units in planning is made in order to cause balanced development, mitigate existing disparities or secure maximum utilization and efficient management of resources in a region. This consideration is important because development is concerned with fulfilment of the necessary conditions for the realization of human personality; including in the poor countries, a minimum income needed to be provided basic necessities, employment opportunities and lessening of inequality.

The central place model developed by Christaller, represents a hierarchical theory where each central place is a member of a

order of centres (interdependence). Recognition has been made of the central themes of central place-theory which has become embedded in regional studies are being increasingly used as a framework for planning the world over.

The concept of centrality is derived from the fact that towns act as distribution points for goods and services to villages and surrounding hinterlands. FSCs have been developed on this concept and the type of relationship between service centres and their hinterlands are varied in nature. Ideally, the location of a service centre in the village is supposed to pave the way for increased production and income of rural dwellers through the provision of improved means of production. By inference, the existence of an integrated central place systems along the lines postulated by Christaller is essential to the growth prospects (agriculture) of developing countries because it provides the link between urban and rural environment and hence the means by which the forces of change may be transmitted from "core" to "periphery".

CHAPTER THREE

3.0 BACKGROUND INFORMATION OF THE STUDY AREA

3.1 The Geographical Location and Size

The study area comprises five local government areas; namely, Kanam, Pankshin, Wase, Shendam and Langtang (see Fig. 3.1). It is bounded by Bauchi State to the North, Gongola State to the East, Benue State to the South and Akwanga (L.G.A. in Plateau State) to the West.

The area is situated approximately between latitudes $8^{o}34'$ and $9^{o}41'$ North and longitudes $9^{o}02'$ and $10^{o}35'$ East. The Eastern part of Plateau State covers 17,172.39 square kilometers (which constitutes about 31.66% of the whole state land mass of 54,234 - square kilometers - Ministry of Finance and Economic Planning, 1988).

3.2 Demographic Information of the Study Area

(The people and their overall population)

A broad classification of the main ethnic groups in the eastern part of Plateau State is "Chadic" (J. Raph et al, 1972) and they include: Ngas, Tal Fier, Chip, Pai, Mopun, Taroh, Jukun, Badawa, Kantana, Bagghom, Goemai, Kwalla, Piapung Montol Kanum (Kinim), Angara (Doka), Miriam and Dimmuk. There are settlers in this area which include Hausa and Fulani. The population of the

people within the study area is about 1,078,424 (see Table 3.1) which is (about 28.7% of the State's population size of 3,760,024 - Plateau Agricultural Development Programme, 1988.

These major ethnic groups mentioned above are found indispersed settlement patterns in the study area. This could be a reaction to the terrain of the area (see Fig. 3.2 and 3.3). The population density of the area ranges between 0-49 and 50-99 persons/square kms (Oguntoyinbo et al, 1976). Table 3.1 shows detailed information on the segments that makes up the study area.

3.3 Physiographic Characteristics (Relief and Soils)

In the eastern part of Plateau State the principal relief feature is the Plateau from which the state derived its name. Part of the Southern Jos Plateau escarpment extends to this area with more abrupt descent into Benue Trough than the Northern section which descends gradually and merges with the Hausa plains. The area rises from 50-4000 metres above sea level (Land Resource Development Oversea's, 1981, and Fig. 3.2).

Soils

The major soil units of the area belong to part of what makes up the bulk of Nigerian soils which Idachaba (1981) classifies as "Tropical Ferruginous Soils of 41.7% on Crystalline Lithosols,

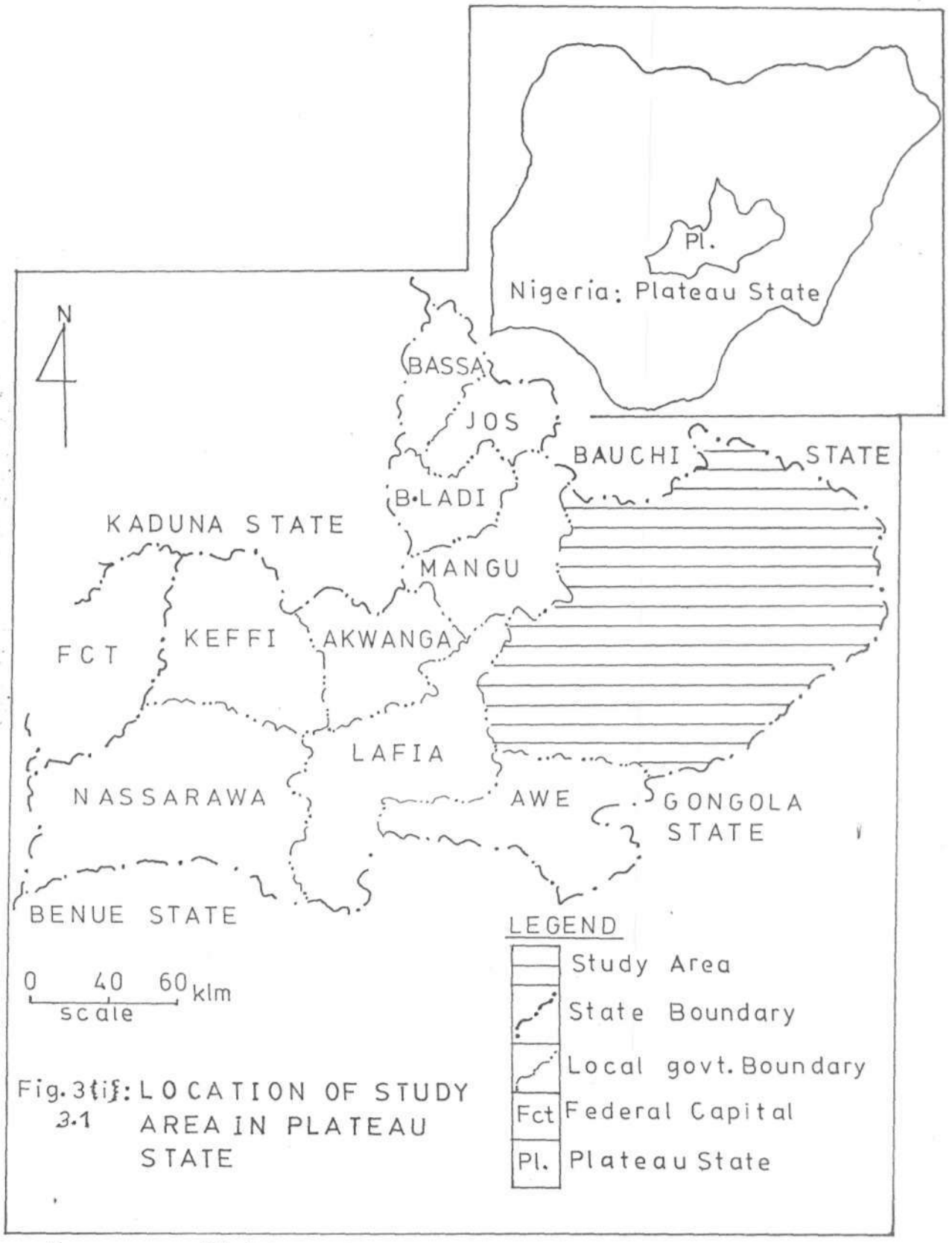
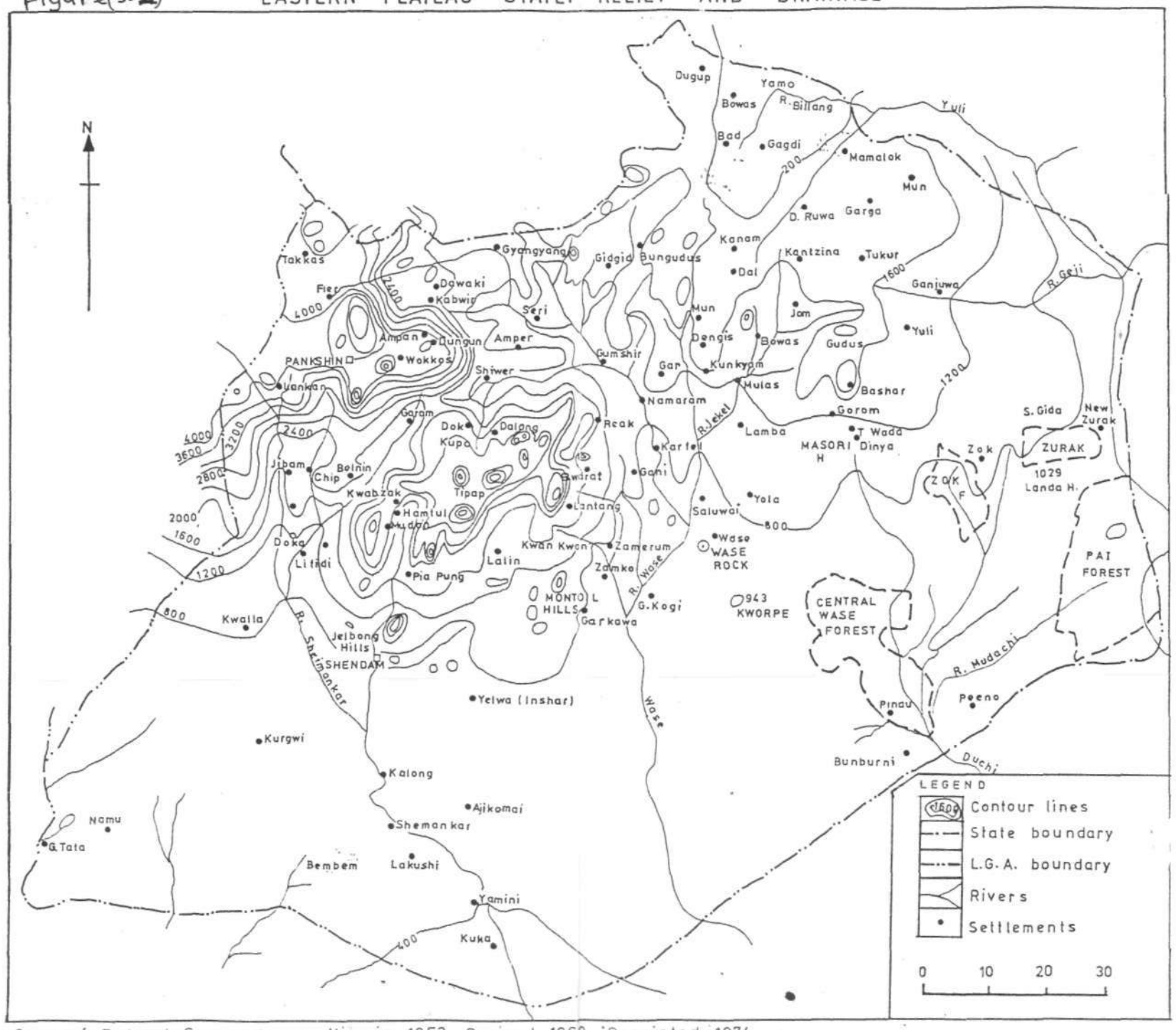


Fig. 3.1: LOCATION OF STUDY AREA IN PLATEAU STATE

Source: Ministry of lands and survey Jos

Figure(3.2) EASTERN PLATEAU STATE: RELIEF AND DRAINAGE



Source: Federal Survey Lagos Nigeria, 1953, Revised 1960, Reprinted 1974

Luvisols, Planosols, Acrisols and Arenosols (Chromic types, Land Resource and Development Oversea, 1981).

Table 3.1. THE EASTERN PART OF PLATEAU STATE: DEMOGRAPHIC DATA

L.G.A.	AREA Km^2	POPULATION 1988 (e) 2.5% PROJECTED	NUMBER OF DISTRICTS	NUMBER OF MAIN VILLAGES	NUMBER OF WARDS	TOTAL FARM FAMILIES
SHENDAM	5322.53	397,262	15	112	725	46,994
LANGTANG	2375.77	135,466	5	100	335	14,114
WASE	4306.40	133,191	4	53	343	11,255
KANAM	2833.84	178,308	4	67	542	15,431
PANKSHIN	2333.84	235,197	12	70	544	26,787
TOTAL	17,1972.39	1,078,424	41	402	2489	114,581

Source: P.A.D.P. (1980)

3.4 Socio-Economic Activities

3.4.1 Agriculture

In the Eastern part of Plateau State agriculture is the predominant economic activity of the rural residents. About 75% of the people are farmers (Field Survey, 1989). There is a slight variation in terms of farming practices among the rural farmers. This is found in tillage or soil cultivation and crop production. On the hills like around Pankshin, farmers practice terrace farming, while those on the lowlands (valleys) adopt grid system of ridge preparation. This is done by making ridges in circular form with hollows or depressions inbetween for trapping rain water while crops are grown on the upper portion of the circles. Farmers over the years, have adopted this method to counter excessive soil erosion by the rains. This is a traditional way of maintaining soil fertility. This contrast with the normal horizontal ridge making or mounds or heaps prepared for crops like yam in Shendam and Resettlement area (Langtang LGA).

At times farming starts earlier in some places in the study area like Shendam and Pankshin because the rains usually come early enough before other places like Dengi, Langtang and Wase. Mixed cropping is the predominant agricultural

practice in the study area. The major crops grown include, yam, rice, maize, sorghum, cassava, millet and cotton. Others include, cow pea, ground nuts, cotton and sweet potatoes.

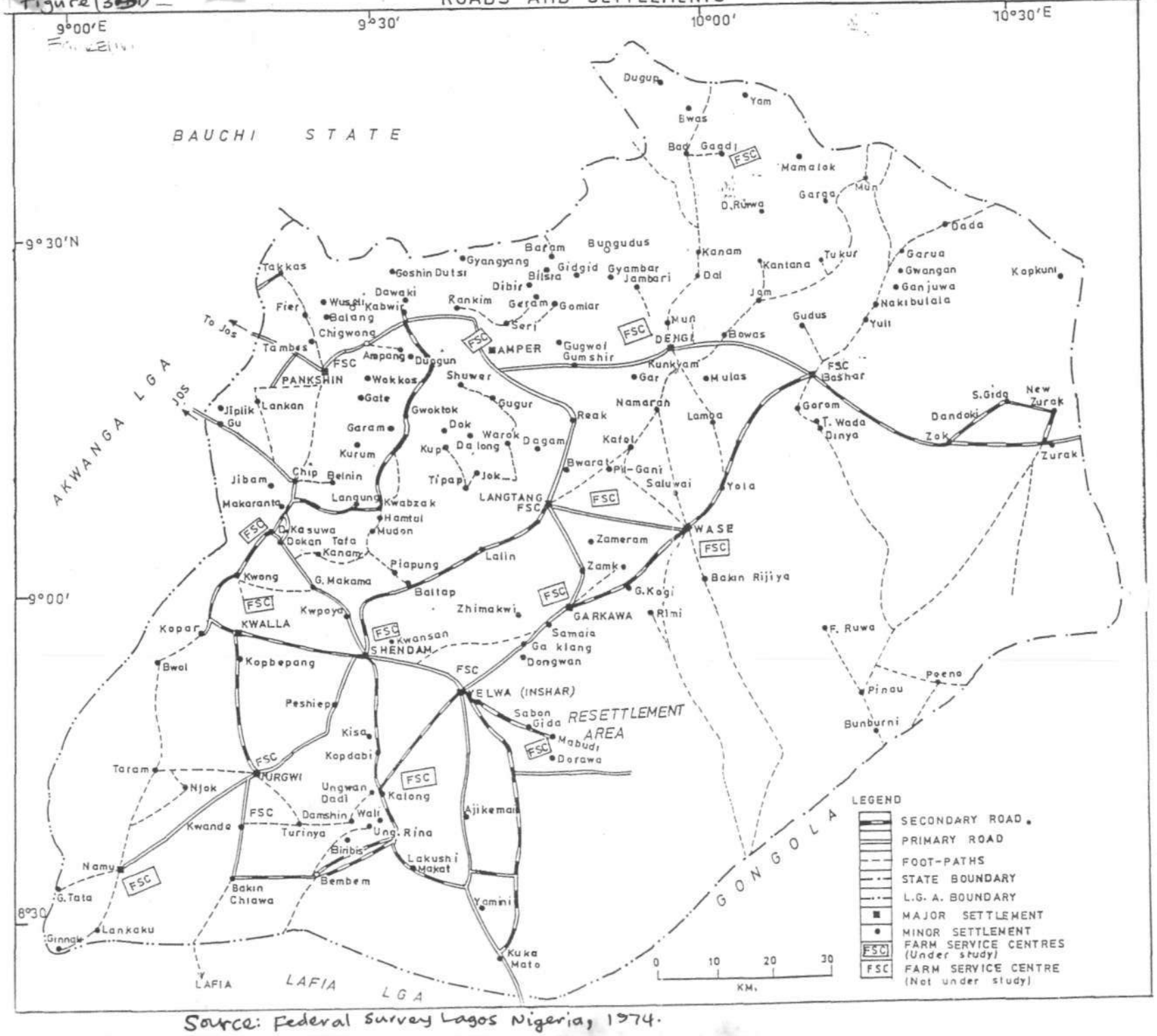
Livestock keeping is a common practice among the households in the Eastern part of Plateau State. Domestic animals such as cattle, sheep, goats, pigs and poultry are reared for commercial purposes or family consumption.

3.4.2 Industry

A good number of small scale industries are found in the study area. Some have been established with government sponsorship while others are owned by private individuals. With the present emphasis on self-reliance by the government, these types of industries will no doubt play significant roles in transforming the rural economy especially if FSCs assist rural farmers to expand production and utilize the abundant agricultural and other natural resources available within an enviable geographic setting in Nigeria. The prominent types of small scale industries include: rice milling, gari processing, local beer brewing, carpentary, bakery, knitting and weaving just to mention a few.

Figure (3.3i) —

THE EASTERN PART OF PLATEAU STATE: SPATIAL LOCATION OF FARM SERVICE CENTRES, ROADS AND SETTLEMENTS



Source: Federal Survey Lagos Nigeria, 1974.

3.4.3 Marketing

Marketing in the eastern part of Plateau State forms an important outlet for trade and exchange of ideas, goods and services. Farm produce in the region are brought to the market centres for sale. The major markets (daily) are located in LGA headquarters, there are still some elements of periodicity because they reach their peak periods at different days of the week. For instance, in Shendam and Langtang markets attain their peaks on Saturdays while those in Dengi and Wase maintain their peak periods on Fridays and Pankshin on Mondays. These markets attract a lot of people within the study area and also from other states in Nigeria.

3.4.4 Transportation and Communication

The Eastern part of Plateau State is fairly well linked with good roads (Fig. 3.3) with other centres in the state. The most important major road starts from Jos (The State Capital) to Pankshin, through Langtang to Shendam. From this road, small branches have been constructed to reach places like Dengi and Wase. The location of FSCs in the study area tends to follow the orientation of the major road networks (Fig. 3.3).

Although there is circulation all over the state, Nigerian dailies, Magazines or publications

do not reach many villages in the study area. Medium or short ware, FM Stereo, AM transmissions or television broadcasts are not received clearly on regular bases. Agricultural practice is dynamic, so FSCs can work better with farmers were there an efficient network of information flow and communication between the target group and service centres on modern farming techniques. Transportation and communication networks are central to encouraging farmers to increase their level of production.

CHAPTER FOUR

ANALYSIS OF THE OPERATIONS AND PERFORMANCE OF F.S.Cs.

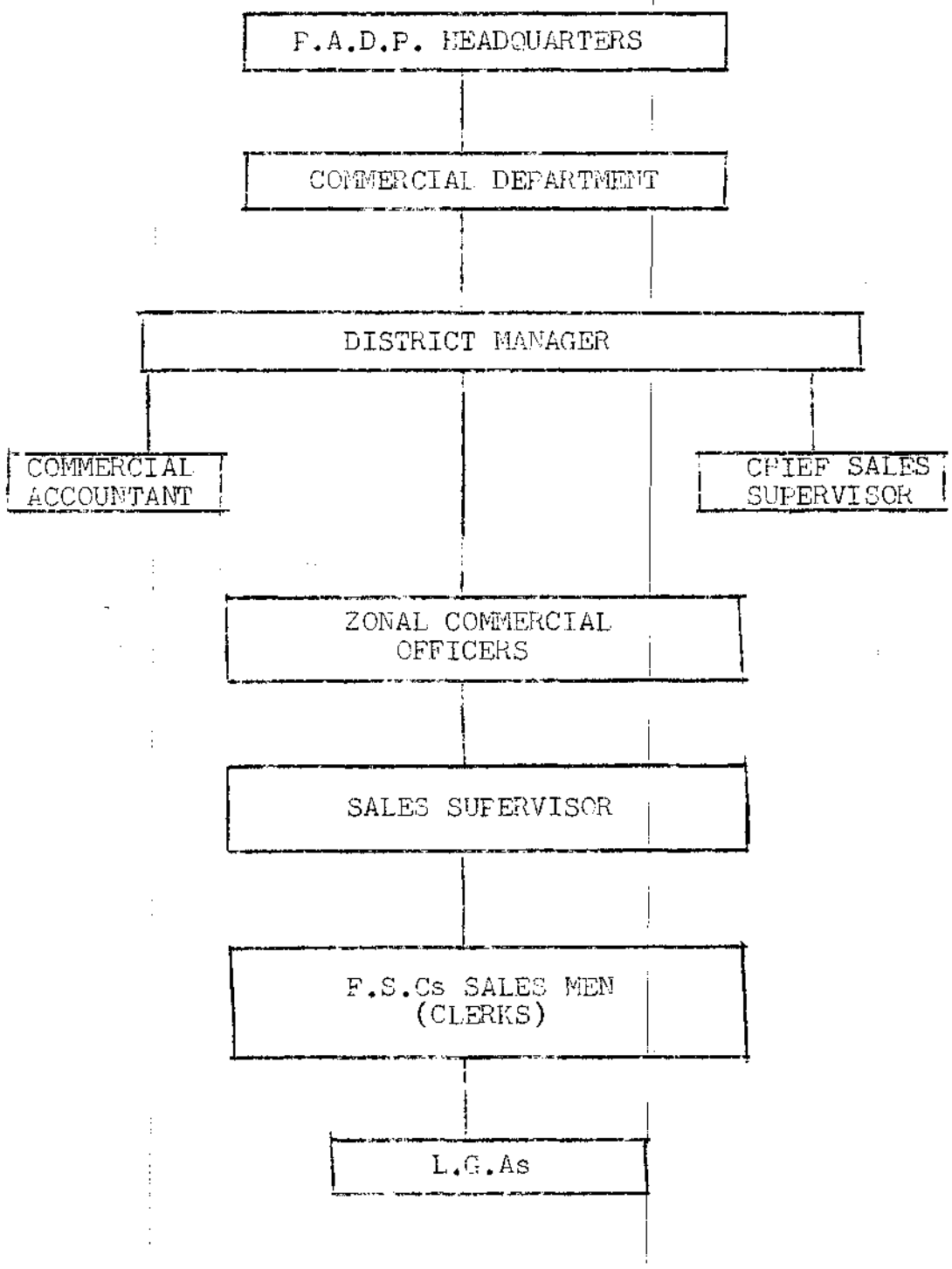
4.0 Organizational Frame Work

An understanding of FSCs organizational set up is very important in evaluative studies of this nature. To a certain extent, their functional roles may also depend on the degree of involvement of government personnel, communities or individuals and also how they are linked with the organization of FSCs over space to ensure efficient or effective utilization and also the realization of the expected impact on agricultural crop production of the target population.

Farm service centres organizational structure in the study area tends to adopt the top-bottom model. At the appex is the project committee which constitutes the highest policy making body. This is supported by the project management with the programme manager as the chairman and the Departmental Heads and Zonal Project Managers as members. FSCs are run by the Plateau State Agricultural Development Programme (PADP).

The commercial section controls the FSCs in the study area as illustrated by figure 4.1.

Fig. 4.1 THE ORGANIZATIONAL STRUCTURE OF FARM SERVICE CENTRES



Source: Fieldwork (1989) from the Commercial Department, P.A.D.P. Headquarters, Jos.

According to a senior officer in this section, the primary objective or task set for the FSCs by the government is that of input procurement, storage, delivery or distribution (sales) to the target group at the village level. In addition, this department provides the following functions:

i) Transfer of retail functions to the private sector.

ii) Advise on crop processing.

iii) Intervention in produce marketing as necessary.

This could be seen as a good intention of what government can do for rural residents (farmers) but the question to ask is to what extent are these functions carried out by FSCs so as to satisfy the needs and aspirations of these peasant farmers?

The importance of any programme (FSCs) is determined by what impact it makes on its area's of influence. The primary objective of this investigation is to determine the pattern of utilization and to bring to light what impact, if any FSCs have had so far on agricultural production of the rural residents in the study area. The discussion or analysis here is aimed at assessing the utilization of FSCs in relation to demand factors, input and other supply services,

provision of infrastructural services, adoption of innovations and their influence on existing institutional organizations.

4.1 Utilization of FSCs

The utilization of a facility depends on whether the users are aware (concious, know) of its existence or not. Awareness here is taken to be in terms of existence, operations and impact on the area where it is located. Awareness was determined from the returns of the response(s) of the rural residents by indicating YES or NO to this question: Are you aware of FSCs in your village? The results obtained was tabulated as shown below in table 4.1.

Table 4.1. Awareness and Utilization of FSCs in the Study Area

S/No.	Village Name	A Farmers Aware and Use FSCs	B Farmers not Aware Don't use FSCs	Row Totals
1.	Kwansan	29	1	30
2.	Kallong	18	3	21
3.	Kwalla	20	9	29
4.	Garkawa	14	14	28
5.	Namu	18	11	29
6.	Mabudi	15	10	25
7.	Dokan Tofa	18	4	22
8.	Amper	12	8	20
9.	Pil-Gani	15	11	26
10.	Gagdi	5	13	18
11.	Dengi	17	5	22
12.	Wase	16	8	24
	Total	197	97	294

Source: Field Work, 1989.

The residents (farmers) were grouped into two. Group (A) consist of farmers who are aware and use FSCs and (B) those not aware and do not use FSCs in their village(s).

Hypothesis (iii)a states that there is no significant relationship between rural residents awareness and utilization of FSCs. The assumption underlying this hypothesis is that utilization of FSCs may not be governed by the knowledge of their existence by the rural residents. The Chisquare (x^2) was used to measure awareness of the rural residents. For details of the working see Appendix (B).

Computed $x^2 = 37.5$ $x^2 = 19.68$.

This indicates that there is a significant relationship between awareness and utilization of FSCs by rural residents in the study area. About 63% of the rural farmers (residents) indicated that they were aware of the services of existing FSCs in their villages. However, it is one thing to be aware of services and another to have access to these services being rendered at the appropriate time in need.

Field survey revealed that farmers are perturbed by a number of factors such as non-availability or lack of inputs or irregularity of supply and delayance, distance, transportation

cost and staff indifferent attitude. The residents contend that the persistence of these intervening factors affect patronage and utilization of FSCs on regular basis.

To determine which of the factors really act as disincentive to rural residents close interaction and utilization of FSCs, farmers were asked to rank their answers on the field questionnaires. The results was compiled as shown in Table 4.2 which indicates that 49.5% of the respondents, rated lack of inputs or irregularity of supply and delayance as number one, transportation cost (24.8%) as two and staff indifferent attitude (23%) as third.

Table 4.2. Rating of Factors Affecting Utilization of FSCs by Rural Residents in the Study Area.

	Irregularity or Delayance of input Supply				Transportation (Cost)				Staff Indifferent Attitude				Distance (Physical Separatio			
S/No.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1.	2	5					4	7	25						1	2
2.	17	11	1			20			9					2	1	7
3.	29	2		1		8	15	1	1	19	4	4			9	1
4.	29					7	10	12		8	17	7		14	5	10
5.	6	8	10	4	11	10	7			3	5	20	6	10	7	4
6.	11	5	2	1	3	5	7	3	1	2	7	10	3	6	4	3
7.	6	2	4	5	3	8	4		1	1	5	9	8	5	2	1
8.	13	2	2	1	2	7	7	3		4	5	8	2	5	5	5
9.	12	3	7	3	2	11	11	1	2	6	5	12	6	5	3	10
10.	13	4			3	11	2	3	1	1	12	4	1	3	2	12
11.	7	2	3			6	6	1	4	6		4	2	1	2	6
12.	11	5	2		2	5	12	4	4	9	2	8	1	4	7	9
Total	156	49	31	15	26	78	105	35	48	71	62	86	29	55	47	81
	49%*				24*				23%*							

Source: Field Survey, 1989.

*Some percentages with asterics were worked out in order to determine the ratings of the factors. The serial number used represent names of villages as used in Table 4.1. Transportation, rated second by the rural residents (farmers) is highly related to the issue of accessibility. In fact this is an important factor that influences utilization of FSCs.

A useful definition of accessibility is that of J. Malcom (1979) which states that "when we talk about something being 'accessible' we are referring to put it crudely, to the degree to which it is 'get-at-able'." It is important to note that it is not the legal or social aspect of accessibility that is being emphasised but rather the focus is more on the spatial or physical dimension of separation of rural residents from the thing they desired in terms of how accessible or inaccessible FSCs are as focal points of rural economic life?

Ideally, "accessibility" is treated here as a concept as well as a tool that can simply be defined as a state in which an area is easily reached in relation to those who want to obtain goods and services. It involves people's ability to reach things which are important to them. Thus, accessibility centres on:

(a) The people (residents of rural areas)

(b) Activities or services they require; and

(c) Transportation and communication link between (a) & (b)

From the definition(s) above, a centre is accessible if it is linked with a good road network and inaccessible if it is not linked with all season road. The social aspect of accessibility could be in terms of the availability of the goods and services to the people.

To proof the hypothesis (iii)c which states that rural residents utilization of FSCs is not significantly related to accessibility, farmers were asked to indicate the approximate distance of the nearest FSCs to their villages (settlements). Frequency of use was determined from the outcome of their responses. Ideally, one expects that the nearer the farmers are to the FSCs, the more often the usage.

The distance values from field survey records show that rural residents (farmers) do not travel out in large numbers to FSCs located far away from their villages only 14% of the respondents travel beyond 10 kilometers to obtain goods and services. Refer to Table 4.4 for details.

Table 4.4. Accessibility and Utilization of FSCs in the Study Area

S/No.	Distance Range K/ms	Number of Users	Percentage
1	< 1	38	14
2	2 - 5	105	38
3	6 -10	78	28.3
4	10	55	20
Total		276	100

Source: Field Survey, 1989.

The figures in the table indicate that majority of the respondents, about 57%, travel within 1-5Klm range. Their movement depends on accessibility which also influences the means of transport to be used.

In relation to the discussion above, an attempt was made to establish, the pattern of patronage and utilization of FSCs in the study area. From the returns of respondents, the results indicate that most of the rural residents (farmers) prefer visiting FSCs that are closer to them (proximity) than those farther away. For instance, in Kwansan 27 farmers out of 30 patronise their village FSC and three move to Yelwa which is linked with accessible tared road. Also, in Garkawa, 15 farmers used the FSC in their village and the rest travel out. A clear picture of the patronage or pattern of utilization is shown in Table 4.3 and is also graphically represented to scale by figure 4.2. It shows the direction, volume and movement of the respondents (farmers) to FSCs in order to obtain goods and services. This presentation was done using the sampled respondents from the study area to show the direction lines on the map. These lines do not follow existing transportation networks.

The figure presents a rather unusual pattern instead of centralization on service

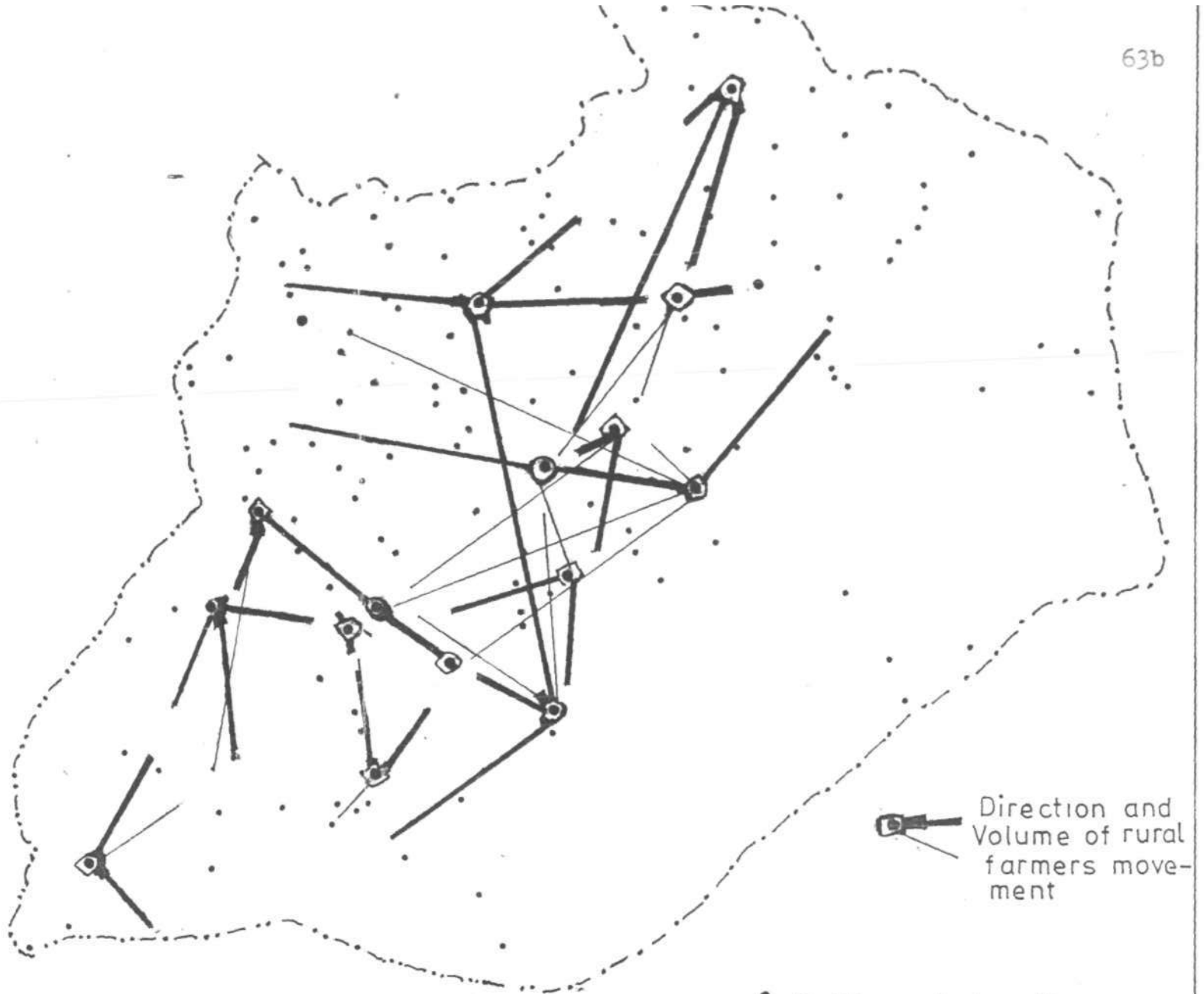


FIG. 4.2 Approximate farm service centre-service areas

Source: Field Work 1989

centres it is dispersion. Interview results with the respondents revealed the intricacies involved. Farmers move to FSCs that always have surplus or get early supply of farm inputs from headquarters, Jos or prefer going to centres in their villages of origin. But, for ruralities at Gagdi village that is placed under another FSC Pil-Gani located over 100Kms, have to move out to other centres. The road leading to Gagdi is seasonal as such, the village is deprived of access to timely supply of fertilizer during most farming seasons. Furthermore, the concentration towards the centre in Figure 4.2 is on Yelwa which PADP regard as a central depot (zone) for their operations. It is second in hierarchy to the headquarters, Jos. An official source has it that other inputs like agro-chemicals are supplied to this centre only. When I questioned the rational for this discrimination, the reason or excuse given was that farmers in other centres usually feel reluctant or do not buy such inputs. To me, it sounds very unrealistic.

Another important factor that may influence the utilization of FSCs by the rural residents is their socio-economic characteristic. Literacy is one of the most important aspects that readily comes to my mind. Literacy here is taken to mean ability to read and write, a display of capacity to manipulate numerals or what educationists refer

to as the 3 R's. A person is literate when he has acquired the essential knowledge and skills which enable him to engage in all those activities in which literacy is required for effective performance (functioning) in his group and community and whose attainments in reading, writing and arithmetic make it possible for him to strife to utilize these skills towards either his own improvement or that of the community's development. To measure literacy level, respondents were asked to indicate their qualification. The returns from respondents is presented in Table 4.5.

Table 4.5. Qualification of Sampled Respondents

Level of Education	Number of Respondents	Percentages
1. Primary	139	49.8
2. Secondary	39	13.9
3. Koranic	8	2.9
4. Post Secondary	8	2.9
5. No formal education*	85	30.5
Total	279	100.0

Source: Field Work, 1989.

*Specified on the questionnaire as illiterates.

Hypothesis (iii)b which states that rural residents utilization of FSCs is not significantly related to their socio-economic characteristic was tested. The assumption here is that literacy as

mentioned earlier may influence the use of FSCs. Using the information supplied in Table 4.5 respondents were grouped into two. The first group (A) consist of literate residents who use FSCs and the second (B) illiterates that do not use FSCs according to sampled villages. This is shown in Table 4.6.

Table 4.6. Literacy and Utilization of FSCs

S/No.	Village	Group (A) (Literates) Use FSCs	Group (B) (Illiterates) Do not use FSCs	Row Total(s)
		Number of Respondents		
1.	Kwansan	19	11	30
2.	Kallum	13	9	22
3.	Kwalla	22	7	29
4.	Garkawa	18	6	24
5.	Namu	17	13	30
6.	Mabudi	17	4	21
7.	Dokan Tofa	16	8	24
8.	Amper	14	6	20
9.	Pil-Gani	15	3	18
10.	Gagdi	12	6	18
11.	Dengi	15	8	23
12.	Wase	16	4	20
Total		194	85	279

Source: Field Work, 1989

Chi-square (x^2) was used to test hypothesis (iii)b. The information in Table 4.6 was used in the analysis. x^2 calculation was done using this formula adopted from Norcliffe (1977).

$$x^2 = \sum_{i-1}^{K} \sum_{j-1}^{e} \frac{(Oij - Eij)}{Eij}$$

Let K - represent the total number of categories

O - represent the total number of samples

Oij - the observed frequency in category i and j

Eij - the expected frequency in category i and j.

The expected frequencies were obtained using this formula (Mathews, 1981) $x^2 = \frac{\text{Row total x Column Total}}{\text{Overall Total}}$

For instance, for group B, the expected frequency value for sample No.1 with 30 as observed value, the expected frequency was obtained by multiplying thirty by 194 minus overall (row total) 279.

Thus, $\frac{30 \times 194}{279} = 20.8$

Computed $x^2 = 7.9$. See appendix (c) for details of the working. Theoretical $x^2 = 19.68$ was obtained by finding the required degree of freedom and level of significance (α). This is determined by a Greek letter V - pronounced 'nu' given as V = (K-1) (e-1) = (12-1) (2-1) = 11 df. calculated $x^2 \not> x^2$ which implies that the hypothesis does not hold and conclude that literacy may not be a strong determinant of FSC utilization by the respondents in the study area. Field survey

revealed that there is a slight variation in the percentages of literates 68% and illiterates about 30.5% who use FSCs. At any rate, one has to be cautious in making rigid value judgement because of the inter-play of other variables such as income, social class preferences or priorities of individuals in the community. Table 4.7 indicates categories of the users of FSC. The figures show that farmers constitute 82% and government workers rank second with 16%.

Table 4.7. Categories of Respondents using FSCs

Occupation	Number of Respondents	Percentages
1. Farming	241	82
2. Trading	7	2.38
3. Civil Service	47	16
4. Craft	4	1.36
5. Others	-	-
Total	293	100

Source: Field Work, 1989.

4.2 Input Distribution (Supply)

The supply of farm inputs at the right time and quantity is crucial to increased agricultural production. An important policy question is that of how to determine the effectiveness of FSCs in delivering available, mechanical farm implements, chemical and biological inputs to farmers in the

villages. This can be done by measuring the time liness of inputs (fertilizer) available to farmers. Timely availability of fertilizer in each season is defined as the quantity of fertilizer sold at each FSC at the end of May of the same season (year) and divided by the total fertilizer sold at the same FSC during the same period or season.

To establish the nature of input distribution by FSCs, records were obtained at Plateau State Agricultural Development (PADP) headquarters, Jos. This official information consist of records of input supply over the years (1984-88) to FASCs in the study areas as shown in Table 4.7. The question to ask is does FSCs supply order meet rural residents demand? An attempt was made to measure this by compiling the farm sizes of farmers devoted to maize and rice being major crops that demand the use of a lot of chemical fertilizer. To determine the quantity of fertilizer required, reference was made to what soil scientists recommend for the selected crops and compare with the supply (total) of the type of fertilizer in 1987 and 1988. For a crop like maize, eight bags of NPK_{15}^{3} as starter dose is required per hectare to provide 60kg of nitrogen and 5 bags of CAN for top dressing. Rice requires about 6 bags of UREA per hectare. The quantity of fertilizer required can be established by multiplying farmers farm sizes by

TABLE: 4.7 PLATEAU AGRICULTURAL DEVELOPMENT PROGRAMME (P.A.D.P.).

Farm Input Supply (Sales) Statistics, 1984 - 1988 to FSCs

In the Eastern Part of Plateau State

		(1) KWALA			(2) KALLUM			(3) PIL GANI			(4) MABUDI			Cumulative Row Totals
Input Type	Unit	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	
NPK 15^3	50Kg	-	574	-	11065	1803	13177	3200	766	-	670	1816	5322	38393
UREA	"	2	51	382	92	1525	2189	146	417	-	118	348	1262	6532
Sulphate	"	1	555	2284	108	351	125	54	392	-	1800	600	-	6270
CAN	"	-	338	7475	812	1389	2931	42	361	80	86	403	2779	16696
SUPA	"	-	31	475	196	5911	5379	1103	322	427	1683	1505	3247	20279
DAP	"	-	-	425	1590	1060	262	6	960	-	513	539	170	5525
BSSP	"	-	-	-	-	-	-	-	-	-	21	-	-	21
NPK 12^2-17	"	-	-	-	-	-	-	-	-	-		216		216
Totals		3	1549	11041	13,863	12,089	24063	4551	3218	507	4891	5427	12780	
RONSTAR PL	LIT(5)	-	-	-	-	-	-	-	-	-	-	-	-	-
" EC	"	-	-	-	-	-	-	-	-	-	-	-	-	-
Primagram	"	-	-	-	-	-	-	-	-	-	-	-	-	-
Gramoxone	"	-	-	-	-	-	-	-	-	-	-	-	-	-
Karate	"	-	-	-	-	-	-	-	-	-	-	-	-	-
Cymbush	"	-	-	-	-	-	-	-	-	-	-	-	-	-
Basudin	10G	-	-	-	-	-	-	-	-	-	-	-	-	-
Actellic Liq	Lit.	-	-	-	-	-	-	-	-	-	-	-	-	-
SEEDS	KG	-	-	-	-	-	-	-	-	-	-	-	-	-
Maize		-	-	-	-	-	-	-	-	-	-	-	-	-
Rice		-	-	-	-	-	-	-	-	-	-	-	-	-
SPRAYERS	No.	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 4.7[b](Cont'd)

		(5) AMPER				(6) GARKAWA				(7) DANGI				(8) LAMTARN			Cummulativ Totals
Input Type	Unit	1985	1986	1987	1988	1985	1986	1987	1988	1985	1986	1987	1988	1986	1987	1988	
C.C.	50Kg	4740	12474	7654	-	4627	1031	1430	9897	3131	100	1094	8504	1597	1623	4974	63162
SUPA	"	222	1815	2112	-	14	504	1837	650	-	-	-	5494	1010	2074	1840	20572
Comp 15^5	"	1297	3	-	-	1458	7640	5997	11004	2241	-	417	14954	4505	724	14317	61965
DAP	"	1217	3536	4690	-	-	23	3231	95	491	-	3536	254	194	776	983	18806
UREA	"	-	1516	3084	-	369	777	1230	621	15	-	556	3585	960	1276	1307	15296
SOPA	25Kg	-	-	-	-	1183	53	-	-	-	-	-	-	-	-	-	1236
BSP	50Kg	-	-	-	-	208	1550	-	-	-	-	-	-	-	-	-	1758
A/S	"	-	-	-	-	-	1525	1033	219	-	-	1	1611	17	290	1428	6124
Total		7464	18344	17540		7859	13101	18791	22286	5902	100	5994	31063	8023	6763	27,919	
Other Inputs	Unit																
Ronst.Nl.	Lit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
" EC	"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Primagram	"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gramoxone	"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Karate	"	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	8
Cymbush	"	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	5
Nemolin	10G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Actellic	Lit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEEDS	Kg																
Maize		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rice		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sprayers	No.																
ULV Spr		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K/BACK		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE: 4.7b (Cont'd)

Input Type		(11) WASE			Cummulative Totals	(12) GAGDI		
	Unit	1986	1987	1988		1986	1987	1988
SUPA	50Kg	-	1700	3097	4797	N.A	N.A	N.A
NPK 15^3	"	-	1484	7885	9369	-	-	-
Sulphate	"	-	1000	1827	2827	-	-	-
CAN	"	-	-	5180	5180	-	-	-
UREA	"	-	-	1192	1192	-	-	-
TOTALS			4184	18681	23365			
Other Inputs:	Unit							
Knock. Fl.		-	-	-	-	-	-	-
" DC		-	-	-	-	-	-	-
Primextra		-	-	-	-	-	-	-
Gramozone		-	-	-	-	-	-	-
Karate		-	-	7	7	-	-	-
Cymbush		-	-	-	-	-	-	-
Basudin		-	-	-	-	-	-	-
Metallic Lit.		-	-	-	-	-	-	-
SUDD	KG	-	0	-	-	-	-	-
Maize	5KG	-	-	56	56	-	-	-
Rice		-	-	-	-	-	-	-
Sprayers	No.							
ULV SUR	"	-	-	-	-	-	-	-
Knapsack	"	-	-	-	-	-	-	-

SOURCE: The Commercial Section, PADP Jos 1989 (Field Work)

TABLE: 4.7[b] (Cont'd)

Input Type		(11) WASE			Cummulative Totals	(12) GAGDI		
	Unit	1986	1987	1988		1986	1987	1988
SUPA	50Kg	-	1700	3097	4797	N.A	N.A	N.A
NPK 15[3]	"	-	1484	7885	9369	-	-	-
Sulphate	"	-	1000	1827	2827	-	-	-
CAN	"	-	-	5180	5180	-	-	-
UREA	"	-	-	1192	1192	-	-	-
TOTALS			4184	18681	23365			
Other Inputs	Unit							
Ronst. Fl.		-	-	-	-	-	-	-
" EC		-	-	-	-	-	-	-
Primagram		-	-	-	-	-	-	-
Gramozone		-	-	-	-	-	-	-
Karate		-	-	7	7	-	-	-
Cymbush		-	-	-	-	-	-	-
Basudin		-	-	-	-	-	-	-
Actellic Liq.		-	-	-	-	-	-	-
SEEDS	KG	-	0	-	-	-	-	-
Maize	5Kg	-	-	56	56	-	-	-
Rice		-	-	-	-	-	-	-
Sprayers	No.							
UNV SPR	"	-	-	-	-	-	-	-
Knapsack	"	-	-	-	-	-	-	-

N.A. - Indicates not supplied (or Figures not available especially fertilizer).

'SOURCE: The Commercial Section, PADP Jos 1989 (Field Work)

the number of bags. The result is shown in Table 4.8.

Table 4.8. Demand and Supply (Distribution) of Fertilizer

Year	Crop	Hecterage	Type of Fertilizer	Quantity Required	Quantity Supplied	Surplus or Deficit
1. 1987	Rice	493.5	Urea	2467.5	7062	4594.
1988	Rice	732.3	Urea	3661.5	13349	9687.
2. 1987	Maize	432	*NPK_{15}^{3}	3456	35534	32085
1987	Maize	432	CAN	2160	14657	12491
1988	Maize	697.3	NPK_{15}^{3}	55578.4	75233	69654
	Maize	697.3	CAN	3486.5	37412	33925

*NPK_{15}^{3} Nitrogen phosphorus and Potasium.

CAN Calcium Amonium Nitrate.

Source: Fieldwork, 1989.

The records indicate surplus of fertilizer supply in the study area. Apparently, this is only a sample survey; it may not be a true reflection of reality. It could be bias because the sources of input records are official, so, one is not sure of the actual quantity that got to the centres. There may be instances of inflating the quantity supplied. The other short fall is that farmers might have either over or under-estimated their farm sizes. From this findings, hypothesis (i) which states that the demand for FSCs functions is not greater than the supply services provided

to the rural residents in the study area, may hold in terms of fertilizer supply. In this case one can say they are performing except for agro-chemicals and improved seeds.

According to (PADP) records only ₦500.00 worth of Agro-chemicals was procured in 1988 which is grossly inadequate. Also in 1987 improved maize seed of 155kg (31 bags of 5kg package) and in 1988, (86) bags of the same unit about 430kg were supplied. These supplies are grossly inadequate. Scientists recommend the application of 15-20kg/hectare. If we take the median value and multiply it by hecterage devoted to maize (Table 4.8) (432 x 17.5 = 7560kg) a clear picture of the quantity demanded will emerge. Thus, in 1987 farmers should have been supplied 7560kg of improved maize seed. It will not be out of order if FSCs try to reflect supplies on the population of farming populations in the rural areas (see Table 4.9).

Table 4.9. FSCs by LGA and Farming Families in the Study Area

	F.S.C.	L.G.A.	Population of Farming Families
1.	Amper	Pankshin	1325
2.	Wase	Wase	1959
3.	Garkawa	Shendam	940
4.	Kwalla	Shendam	1293
5.	Kallum	Shendam	1981
6.	Dokan Tofa	Shendam	487
7.	Kwanson	Shendam	105
8.	Gagdi	Kanam	1040
9.	Mabudi	Langtang	495
10.	Pil-Gani	Langtang	255
11.	Dengi	Kanam	1337
12.	Namu	Shendam	1864
	Total		13,081

Source: P.A.D.P. (Evaluation Section) Jos, 1989.

4.3 The Provision of Infrastructural Facilities or Services

The provision of infrastructural facilities such as feeder roads will no doubt play a great role in promoting agricultural production. FSCs have made very insignificant impact in this area. The only seasonal road that was constructed by Longkat, Federal owned FSC, is about 48klms from Baban Lamaba to link three districts, namely, Chip, Garram and Tal through Landgung. This road,

today, is assisting farmers to come to either Longkat, Dokan Tofa or Shendam to purchase farm inputs or sell their farm produce. As part of the Federal Government's commitment to promoting agricultural development in Nigeria, a simple earth Dam has been constructed in the village to assist farmers practice irrigation during the dry season. The centre is equiped with tractors and even a combined harvester to render services to farmers but many have been out of use for quite sometime now.

Another aspect of service provision being provided by Longkat FSC is land development or preparation for farmers especially for rice cultivation. Other services such as agricultural credit facilities, recreation, storage facilities, crop processing are not being offered by FSCs.

Respondents were asked to indicate whether they have access to agricultural loans in the region. The result indicates that a few farmers secured loans from various sources as shown in Table 4.10. None from FSCs.

Table 4.10: Sources of Agricultural Loan to Farmers in the Study Area

Sources	Number of Beneficiaries	Amount (₦)	Interest Paid (₦)	Duration
1. Local Govt.	7	1,200 each	200 each	1 year
2. Rural Bank	3	3000,75000, 5000	150,350,500	"
3. M.O.A.	3	2000,1500	200,150 each	"
4. Cooperatives	4	1,500	150 each	"
5. Fed. Government	-	-	-	-
6. FSC	-	-	-	-

Source: Fieldwork, 1989.

Extension Service(s)

This aspect is very important as a service r system which assists farm-people, through educational procedures, improving farming techniques, increasing production efficiency and income, bettering their levels of living or socio-economic well-being. Extension deals with disseminating useful information, applying it to the analysis of practical problems and helping people use it to help themselves. Through extension, farmers can learn what alternatives exists in farming so that the best choice can be made in agricultural production. As at now, the extension aspect has been separated from FSCs schedule of duty but an assessment was made to know whether farmers did benefit from this service in the past years or even now (see Table 4.11).

Table 4.11: Frequency of Extension Visit by F.S.C. Staff in the Study Area.

Years	Frequency	Number of Times Visited				Row Totals
		0 - 1	1 - 2	3 - 4	5 - 6	
1984		109	42	17		168
1985		60	37	15		112
1986		45	39	1		85
1987		64	35	28		127
1988		36	24	20	1	70
Total		314	177	71	1	562

Source: Field work, 1989.

From this table, extension services seem to be declining over the years. The inadequacy of extension service(s) may be responsible for farmers poor agricultural crop production in the study area.

4.4 Impact on Agricultural Production

The impact of FSCs may be measured mainly in terms of yields and outputs which can be presumed to be positively correlated with farmers incomes. The realised crop yields by farmers who acquired FSCs fertilizer and those who did not for maize and rice is shown in Tables 4.12-15.

Table 4.12: Maize Production (Output in Bags) Those who Acquired FSCs Fertilizer

Frequency	Years and Number of Producers					Row Totals
	1984	1985	1986	1987	1988	
1. 0 - 25	167	175	179	184	183	888
2. 26- 50	11	14	15	10	11	61
3. 51-100	2	2	1	2	2	9
4. 100	-	-	-	-	-	0
Totals	180	191	195	196	196	958

Source: Field Survey, 1989.

Table 4.13: Rice Production (Output in Bags) Those who Acquired FSCs Fertilizer

Frequency	1984	1985	1986	1987	1988	Row Totals
1. 0 - 25	119	123	133	145	121	641
2. 26- 50	11	15	18	17	19	80
3. 51-100	-	1	2	-	1	4
4. 100	-	-	-	-	-	-
Totals	130	139	153	162	141	725

Source: Field Survey, 1989.

Table 4.14: Maize Production (Output in Bags) Those who Did Not

Frequency	Years and Number of Producers					Row Totals
	1984	1985	1986	1987	1988	
1. 0 - 25	51	77	41	49	68	
2. 26- 50	1	-	-	-	-	
3. 51-100	-	-	-	-	-	
4. 100	-	-	-	-	-	
Totals	52	77	41	49	68	

Source: Field Survey, 1989.

Table 4.15: Rice Production (Output in Bags) Those who Did not

Frequency	1984	1985	1986	1987	1988	Row Totals
1. 0 - 25	25	37	27			
2. 26- 50	1	-	-			
3. 51-100	-	-	-			
4. 100	-	-	-			
Total	26	37	27			

Source: Field Survey, 1989.

Hypothesis (ii) which states that existing FSCs have no significant impact on agricultural production of the rural residents (farmers) in the eastern part of Plateau State was tested. The Pearson's 'r' was used in the computation. The parameters used were fertilizer (x) and crop output (y) for maize and rice. The machine formula for calculating 'r' value was adopted (see appendix D and E) for details of the workings.

$$'r' = \frac{\Sigma xi \Sigma yi - (\Sigma xi)(\Sigma yi)/n}{\sqrt{(\Sigma xi^2 - (xi)^2/_n)\ (\Sigma yi^2 - (\ yi)^2/_n)}}$$

The following results were obtained.

1, Maize 0.76

2. Rice 0.78

Test of significance was done using the formula mentioned earlier in Section 4.1. Thus, calculated 't' values were 15.06 for rice and 22.17 for maize. As a rule, if calculated value of 't' is not greater than theoretical level of significance 1.96 or $\angle$ -1.96, it is significant. All the values are above the range(s). It implies that the hypothesis holds and conclude that there is a significant variation among respondents who acquired FSCs fertilizers and those who did not. This can be inspected in Tables 4.12-15 and 17. For instance, the mean crop production of rice for those who acquired FSCs fertilizer in 1987 was 9.8 bags while it is only bags for those who did not (see Table 4.16).

The yearly products are shown in Figures 4.3 and 4.4.

Table 4.16: Impact of FSCs Fertilizer on Agricultural Production in the Study Area

(1) Respondents who acquired FSCs Fertilizer				(2) Respondents who Did Not			
Year	Crop	Mean	Variance	Year	Crop	Mean	Variance
1987	Rice	9.8	85	1987	Rice	2	4
1988	Rice	11.9	228.29	1988	Rice	1.6	10.8
1987	Maize	11	102.35	1987	Maize	3	2.9
1988	Maize	10.8	103	1988	Maize	3	2.8

Source: Fieldwork, 1989.

The standard deviation statistical tool was also used to assess the variation with this formula:

$$S = \sqrt{\frac{\sum(x-\bar{x})^2}{n}}$$

Respondents in the study area were grouped into two. The first group consist of those who acquired FSCs fertilizer and the second those who did not. The 't' value(s) was obtained using this formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{(S_1^2/n) - (S_2^2/n)}}$$

(a) For the two groups producing rice in 1987 calculated t = 11.5. Theoretical 't' from the table with 166df is 1.645. Calculated 't' therefore, it implies that there is a significant variation between the two for groups. The same applies to 1988, 't' value = 9, Maize, 't' value in 1987 was 8 and 9.94 in 1988. Although, the hypothesis holds, fertilizer application alone is not sufficient to guarantee high production. One needs to examine the roles of other factors such as climate, labour, soil fertility (farm sizes) or agro-chemicals.

4.5 Impact on Existing Institutional Organizations

From field investigations, FSCs have not made any impact on existing institutional organization in the study area. About 56% of the respondents opined that although, they have or belong to organizations such as farmers co-operative societies or young farmers club FSCs do not relate with them. They went on to say that, what they enjoy from these associations is mainly labour in terms of group farming or 'Gayya' during any growing season.

The issue is that one is not expecting too much from FSCs because at least they have the machinery to channel their resources to assist the

peasant farmers in the villages.

4.6 Role in Adoption of Innovations

Some of the farmers in the study area have been and are still adopting modern techniques of farming. About 79% of the farmers contend that FSCs have encouraged them to use or apply fertilizer on their crops, also, 60% practice relay cropping, 17% use improved seeds, 13% herbicides, 12% insecticides and 20% practice sole cropping.

It is also on record that FSCs have tried to encourage the adoption of a few crops. For instance rice, maize, cow pea, sorghum and groundnut. The percentages of adopters are however very low. FSCs have encouraged about 25% of the rural residents to adopt the growth of hybrid maize and 18% rice of different varieties in the study area.

CHAPTER FIVE

SUMMARY AND CONCLUSION

5.1 Principal Findings

The principal findings can be discussed or considered under the following headings:

Utilization

Awareness affects the utilization of existing FSCs in the study area by the rural residents. The study also revealed that accessibility constitutes an important element in influencing ruralites (farmers) movement to patronise FSCs in the region.

The utilization of FSCs by the rural residents have very little to do with their educational background or literacy.

Input Distribution

The distribution of inputs to FSCs was found to be quite commendable because surpluse(s) were recorded when compared to the farmers demand nature in the region (study area).

Provision of Infrastructures and Services

The investigation showed that FSCs have not made any significant impact on these aspects. There was no indication by the returns of the

respondent on whether they even gave advise on crop processing or intervene in produce marketing as necessary, as part of their schedule of duty.

As regards infrastructural facilities, not much has been done. Only a few kilometers of roads have been constructed and an earth Dam to facilitate dry season irrigation by farmers. In a few instances, farmers land have been prepared for them in readiness for the next planting season.

Agricultural credit loans whether in cash or in kind were not being offered.

Impact on Agriculture

FSCs in the study area deserve a pat on the back because farmers who acquired fertilizer from the centres experienced higher crop yields than those who did not. For instance, for the first group mean rice yield in 1987 was 9.8 bags and the second group had 2 bags.

A few farmers have benefited from adoption of new innovations especially in their cropping systems - 60% practice relay cropping, Furthermore, only a negligible percentage of the farmers have access to a variety of improved or high yielding seeds in the study area.

5.2 Problems Identified

The major problems facing rural farmers is that of delayance in the supply of inputs and the accute shortage of agro-chemicals and improved seeds at the centres.

Complementary services such as tractor services or supply of simple farm machinery such as, rotary weeders, groundnut lifter kits, ox-ploughs are not made available.

Agricultural credit loans are not being offered to the farmers. It is usually difficult to secure agricultural loans. There are stringent conditions attached to loans which must rural residents do not have. A major factor is lack of collaterals. Field research interview results confirmed that about 16% of the farmers could not secure loans because of this problem.

The commercial section of PADP, that runs the programme, also complained of problems affecting the discharge of their functions. Top on the list of the problems are inadequate delivery vans, shortage of manpower, lack of capital to procure and distribute farm inputs to farmers on timely bases. Other problems include inaccessibility of certain villages and political leadership manipulations within the system (much to do with bureaucratic tendencies) also affects the rural

farmers.

5.3 Recommendations

The following recommendations are made to improve upon the deficiency of FSC and also to promote rural development.

From the foregoing account of problems of farm input supply, it is evident that these problems are inherent in regional development concept of planning (by the government). The government tends to maintain a monopoly for fertilizer procurement from overseas manufacturers. The villagers are allienated in the whole programme in that they are mere receivers. The following measures are being offered to tackle their problems.

Rural farmers input problem can be tackled by creating a reliable source of input production, procurement and distribution. This can be done by involving agricultural research institutions and industrial establishments in input manufacture, using local resources obtainable in any part of the study area. If done, farmers can make request or buy through their associations. Increased productivity calls for improved technology being the life-blood of the "Green Revolution" or "Operation Food First" campaigns of late 1980's. New crop varieties can be produced for instance, with the help of fertilizer simple water pump

machine or irrigation services.

Agriculture is the main occupation of the rural residents, so requisites and facilities for agriculture naturally occupy an important space in programmes for rural communities. In a developing economy such as the study area, where majority of farmers are small-holders and rural infrastructures are grossly inadequate, input delivery strategies must be aimed at providing a package of inputs to the farmers at the village level to ensure accessibility and effective use.

Farmers can also employ the services of educated elites in agricultural science or any related discipline to produce organic manure for use in the villages. This can be done with extension staff or with the co-operation of universities or colleges of agriculture. This forum, can then continue with production-oriented research with a view to adapting local technology to rural peoples farming systems.

On the issue of the problem of securing agricultural credit facilities, farmers should organise themselves into producers co-operatives societies so that they can have a base to apply for loans either from the government or private sector. They can even contribute money among themselves in order to buy farm inputs or enjoy services such as,

tractor services. To assist the farmers, FSCs should identify these institutions and distribute fertilizer or other farm inputs through them.

There should be a forum and even seminars to discuss various ways of crop production, storage, processing or marketing with the peasant farmers. It is in these meetings and discussions that FSC staff could encourage farmers to air their views and thereby involving them more meaningfully not only in agriculture but in the rural development programme(s).

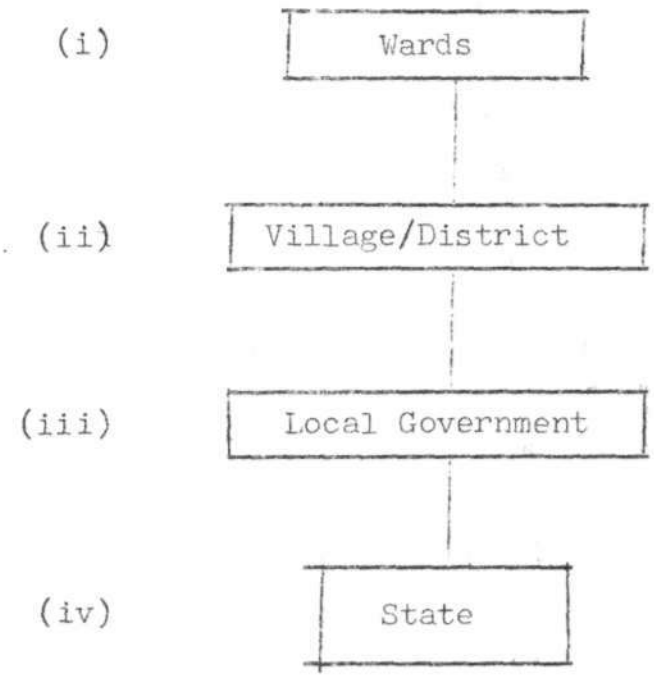
Supply services can be in hierarchy form. Four stages are recommended as a strategy for input distribution. These are as follows:

1. ward(s)
2. village(s)
3. LGA
4. State.

The criteria to be used will depend on the range and threshold of these four stages. The first order of supply pattern should focus on farm family compounds within walking radius range of 5-10 kilometers. Farmers in this group may be around 25-50. The second hierarchy, village, walking radius could be 15-20 klms, with about one hundred people. Thirdly, the range should be within 25-30 to serve about 1000-2000 because of

the availability of resources and the fourth group can have a range of 50 - 100 kilometres. In other words, the agro-politant approach or "bottom-up" model, is being advocated for input supply. This is illustrated with a diagram (see figure 5.1).

Figure 5.1: Input Supply



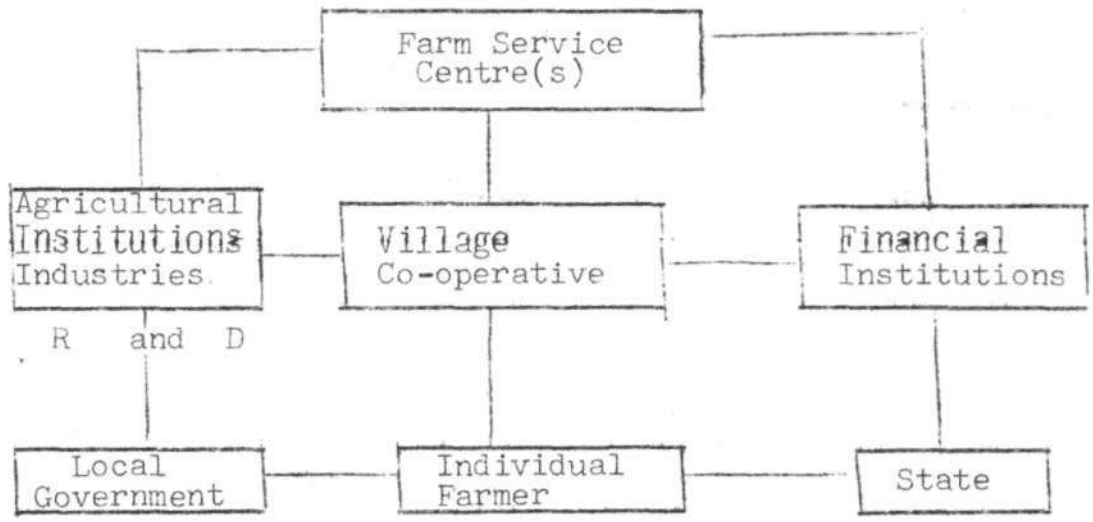
Source: Fieldwork, 1989.

An integrated FSC system is being proposed for the study area. This proposal is to ensure that FSCs have to liaise with all agricultural institutions to reap the benefits of research and development programmes in agricultural pursuits, (which can be

shared with farmers). Financial institutions for loans, industries for chemical or biological farm input production. All these require capital. The government's role is to maintain surveilance and also protect public interest.

The results of many researches are yet to be put into practice. New inventions have been made like the grain processing machine produced by Agricultural Engineering Dept. of A.B.U. in late 1980's, which threshes maize, sorghum and millet with 98% efficiency, has not reached the grassroots. FSCs can liaise with institutions and get such items or information communicated to the villages. Figure 5.2 illustrates the linkages of the proposal.

Figure 5.2: Integrated FSC System



*R and D = Research and Development.

Source: Field work, 1989.

Increased production has to start with proper diagnosis of the problems rural farmers face in order to find practical solutions. It is envisaged that the joint participation of all parties as illustrated in Fig. 5.2, farmers productive capacity will be improved.

The specificity of FSCs mandate is too narrow in scope. It should be broadened to include other aspects such as, agricultural credit facilities for agro-chemicals and improved seeds like in the case of Nigerian Tobacco Company's FSC at Maigana 25klms away from Zaria (Soba LGA, Kaduna State) discussed in Chapter Two.

As mentioned earlier, the involvement of institutions will facilitate the offer of complementary services to farmers through their experienced staff by tackling important issues, like determining farmers farm sizes, soil surveys, irrigation water problems, erosion and flood controls which usually damage farmers crops during growing seasons.

Also with the contribution of the government, the farmers and institutions, more rural feeder roads can be constructed to link peasant farmers through FSCs organization.

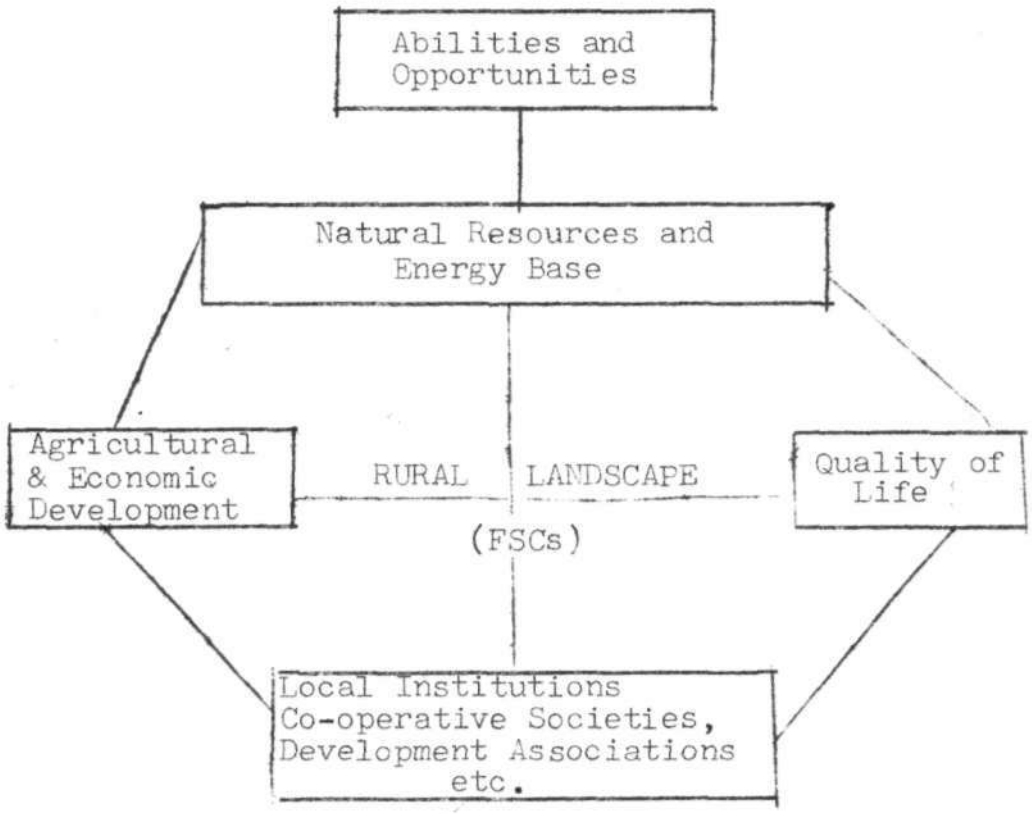
Having recognised that accessibility constitutes an important factor in FSCs operations, I recommend

that Bashar Centre to be operational and Gagdi Station to be made autonomous and three new centres be created at Gomlar, Garrom, and Tukur to reduce the degree of deprivation and minimise transport cost of the rural farmers in these villages (refer to Figure 5.4). The radius range proposed is 20 klms.

One important factor which is always overlooked by planners or government is the issue of acceptability. That is, how legitimate is the FSC function in the area? Patronage and interaction should be considered in service provision. There is a need for rural clientele to be involved in their formation, operations and staffing. This is very crucial because development rests solely upon the energetic and willing participation of the people who must carry the load. Since Nigeria is advancing towards democracy, villagers should have a say in the system.

Abilities are nourished by opportunities. This is important for rural or national development. An interaction model is therefore being made for the study area.

Figure 5.3: Interaction Model for Rural Development



Source: Modified after El-Ghonemy et al (1984, p.63).

5.4 Conclusion

I have tried to evaluate the operations and performance of FSCs in the study area. The efficacy of the system depends on its organizational framework. It has also been observed that the rural clientele are aware of the existence of FSCs in their villages.

For effective coverage or provision of services, issues of accessibility are very crucial

because it influences patronage or access to input supply. The study also revealed that only 14% of the residents travel beyond 10 klms.

The study showed that about 68% of the respondents were educated, that is attempted or passed primary, secondary, koranic or post-secondary school. About 30.5% were those who could not read or write (illiterates).

Provision of inputs, especially agro-chemicals and improved seeds is inadequate. For instance, the quantity of improved maize seed supplied in 1987, was only 585kg adequate for application on 4.3 hectares of land instead of 756kg for 432 hectares of land devoted to maize cultivation by the farmers.

FSCs impact on agriculture is fairly impressive because those who acquired fertilizer, experienced high crop yields. For instance in 1987, mean average rice production was 9.8 bags while those who did not had only 2 bags.

Finally, F.S.Cs have made very insignificant impact on provision of credit facilities, crop processing, produce marketing, extension service and infrastructural facilities. On the whole, FSCs functions have not been a total failure, especially with regards to fertilizer supply.

5.5 Suggestions for Future Study

Similar studies should be carried out in other localities in Nigeria. This will provide data for planning FSCs systems especially adopting it to farmers' farming systems and priorities.

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APPENDIX 'A'

DEPARTMENT OF GEOGRAPHY - ABU/ZARIA
FIELD SURVEY QUESTIONNAIRES (1988/89)
SESSION

GENERAL INFORMATION

(i) Date:.....Time:.....AM/PM.

(ii) L.G.A.:..... Village:.....

(iii) Farm Service Centre (Name):.....

(iv) Respondents Number:.....

(v) Gender (Sex) (1) Male ☐ 2 Female ☐

(Tick one only)

SECTION A - Respondents, Farmers/Rural Residents within FSC's/ASC's - (Adults/Household Heads).

(Please tick one only)

1. What is your main occupation during the rainy season?
   (i) Farming ☐ (iii) Government work ☐
   (ii) Trading ☐ (iv) Craft work ☐
   (v) Others/specify.....

2. What is your main occupation during the dry season?
   (i) Farming ☐ (iii) Government work ☐
   (ii) Trading ☐ (iv) Craft work ☐
   (v) Others/specify.....

3. Educational Qualification: (Tick one only)
   (i) No formal education - illiterate ☐
   (ii) Attempted Primary School:
   (a) Primary 1 ☐ (d) Primary 4 ☐
   (b) Primary 2 ☐ (e) Primary 5 ☐
   (c) Primary 3 ☐

(iii) Completed Primary School ☐

(iv) Attempted Secondary School:

(a) Secondary School One ☐

(b) Secondary School Two ☐

(c) Secondary School Three ☐

(d) Secondary School Four ☐

(v) Completed Secondary School ☐

(vi) Arabic/Koranic School:

(a) Two years ☐

(b) Three years ☐

(c) Four years ☐

(d) Five years ☐

(e) Between 5-10 years ☐

(f) Over 10 years ☐

(vii) Post-Secondary Education:

(a) Ordinary National Diploma (OND) ☐

(b) Higher National Diploma (HND) ☐

(c) National Certificate of Education (NCE) ☐

(d) Degree (B.A./B.Sc./B.Ed.) ☐

(e) Others/specify.....

4. Patronage: Perception/Interaction of Rural Residents with FSC's/ASC's:

(a) Are you aware of the farm service/Agro-service centre in your village? (Tick one only.)

(1) Yes ☐ (2) No ☐

(b) If No, is it as a result of insufficient flow of

(i) Information from FSC's/ASC's - Staff ☐

(ii) Personal disinterest in finding out what FSC/ASC's can do - to Farmers? ☐

(iii) Any other reason/specify.....

5. If yes to (4a) above, name the town(s)/villages

(a) where the FSC's/ASC's you patronise are located.

(i) ..... (iii) .....

(ii) ..... (iv) .....

(b) indicate the type of serives you benefit from the FSC/ASC's (Tick appropriate No - under Yes or No).

Types of Service(s)	YES	NO	YEARS OF CONTACT/SUPPLY QUANTITY				
			1984	1985	1986	1987	1988
1. Fertilizer							
2. Improved Seeds							
3. Agro-chemicals							
4. Tractor Hiring							
5. Extension Service							
6. Agric Loan/Credit							
7. Land Development							
8. Other/specify...							

6. (a) Which of the following modern farming techniques do you use on your farm? (Tick the ones you use)

(i) Sole cropping ☐

(ii) Relay cropping ☐

(iii) Tractorization ☐

(iv) Herbicides ☐

(v) Insecticides ☐

(vi) Improved seeds ☐

(vii) Fertilizer(s) ☐

Mode of Advice	Years				
1. Fertilizer Application ☐	1984	1985	1986	1987	1988
2. How to use tractor to plough ☐					
3. Tending new crop rariety ☐					
4. How to procure Agric. Loan ☐					
5. Land use-planning for sowing ☐					
6. Others (specify)..... ☐					

(Tick appropriate boxes please)

(b)

	1984	1985	1986	1987	1988
1. Fertilizer Application ☐					
2. How to use tractor to plough ☐					
3. Tending new crop rariety ☐					
4. How to procure Agric. Loan ☐					
5. Land-use plan.for sowing ☐					
6. Others/specify..... ☐					

9. In your own opinion what do you think discourage(s) extension staff visits to your village?

(a) People's unwillingness to adopt

(1) Changes ☐

(2) Poor conditions of road(s) ☐

(3) Far distance ☐

(4) Lack of large extend of suitable Arable land for Agriculture ☐

(5) Others/specify..... ☐

(b) What factors encourages extension staff to visit you?

(1) Good accessible roads ☐

(2) The presence/proximity to FSC/ASC ☐

(3) Farmers sustained curiosity to experiment and interest in change of Techniques to Agric. production ☐

(4) Others/specify ☐

10. How have the FSC/ASC influenced farming activity in your village? (Tick only those that apply)

1. Encouraging the adoption of improved seeds to boost production capacity of rural farmers ☐
2. Bringing more arable land under cultivation with the held of tractor hiring service ☐
3. Helping to store and market excess crops produced by farmers ☐
4. Opening up feeder roads to peasant farms ☐
5. Relieving farmers from complete dependency on manual labour weeding techniques by introducing the sale of herbicides at affordable price ☐
6. Helping farmers to buy or find ways of storing their crops, using insecticides/fungicides to protect their crops ☐

11. Why have the FSC's/ASC's not been able to influence your farming activity? (Tick one only).

1. Complexity of advice and language barrier ☐
2. Infrequent supervision by staff ☐
3. Inability to grasp our local technique(s) ☐
4. Farmers unwillingness to take risk(s) ☐
5. Others (specify)..... ☐

12. How can the FSC/ASC's be made more effective? By:-

1. Involving farmers at the innitial stage of locating FSC/ASC's ☐
2. Intergrating rural farmers/extension staff in conducting research on input substitution - local sourcing - especially for fertilizer, insect/pest and week control. ☐

3. Advising farmers to endeavour to form farmers co-operative and marketing co-operative, so that FSC/ASC services can reach them easily and timely. ☐

4. FSC/ASC - extension staff should try to understand the local farmers problems when introducing new techniques - inputs/services; and also be ready to learn from them. ☐

5. Others (specify)..... ☐

13. How can FSC/ASC's have long lasting effect on rural residents? This can be done through any of the following level of participation in their innitial location.

1. Individual farmers level ☐
2. Household level ☐
3. Community level ☐
4. Neigh bourhood level ☐
5. Village head level ☐
6. Village representative level ☐
7. Co-operative member level ☐

14. (a) Have you ever bought or used improved seedings?

(1) Yes ☐ (2) No ☐ (Tick one only)

(b) If Yes, name the seeds eg. (i).....

(ii) ..... (iii) .....

(iv) ..... (v) .....

(Tick one alternative)

(c) If Yes to (14a) from where did you obtained them?

(Tick one only)

1. Village market ☐
2. Local Government Agric. Department ☐

3. M.O.A. - Office ☐
4. Neighbour ☐
5. FSC/ASC ☐

15. If No why? (Tick one alternative)

(i) If available is always too costly ☐
(ii) Delayance of supply during appropriate planting season ☐
(iii) I don't know how to tend the new crop ☐
(iv) The new seed can not grow well in my local environment ☐
(v) Only those who have connections or god-fatners have access to improved seeds ☐
(vi) Not aware of such services ☐

16. Are you aware that Tractor service can be secured through FSC/ASC? (Tick one only).

(1) Yes ☐ (2) No ☐

17. Have you adopted the use of tractor on your farm?

(Tick one only)

(a) Yes ☐ (2) No ☐

(b) If Yes, name the years in which you used tractors.

YEARS	HA-CULTIVATE
1984	
1985	
1986	
1987	
1988	

18. If No to (17) above, state why? (Tick one of the following)

1. Expensive cost ☐

2. Nature of land area ▱

3. Non-availability of tractor(s) ▱

4. Others (specify)..... ▱

19. Shift up if Yes to (No.17) through which source did you get the tractor? (Tick one only)

1. State Government ▱
2. Federal Government ▱
3. Local Government ▱
4. Private Sector ▱
5. FSC/ASC ▱

20. Have you ever secured Agric. Loan from any FSC/ASC? (Tick one only)

(1) Yes ▱ (2) No ▱

21. (a) If Yes to Number (20) what is/are the source(s) of the loan? (Tick one only)

(i) State M.O.A. - Agric. Loan ▱

(ii) Rural Bank ▱

(iii) Co-operative Organization ▱

(iv) Federal Agric. Bank (NACB) ▱

(v) FSC/ASC ▱

(or Tabulate)

	Source of Loan	Amount Received	Interest Paid
1.			
2.			
3.			
4.			
5.			

(b) Again, if Yes to (No.20) after how many attempts did you secure agric. loan? (Tick one only).

(i) First attempt in one farming season ☐

(ii) Two attempts after two farming season ☐

(iii) After three to four farming seasons ☐

(iv) After over five years ☐

22. How often do you secure a loan? (Tick one only)

(a) 1. During every farming season ☐

2. Only after two farming seasons ☐

3. Sometimes after three farming seasons ☐

4. After interval of between four-five years ☐

(b) How many times have you applied for Agric. Loan? (Tick one only)

1. Once ☐ 4. Four times ☐

2. Twice only ☐ 5. Five times ☐

3. Three times ☐ 6. Never applied ☐

23. What problem(s) do you encounter in securing a loan?

(a) 1. I have nobody to assist me ☐

2. I don't have collateral deposits ☐

3. Fear of risk taking ☐

4. Others (specify) .....

(b) In what other ways do you think FSC/ASC have helped rural farmers in your area? (Tick appropriate box only).

(i) Supply of Fertilizer ☐

(ii) Tractor Hiring service(s) ☐

(iii) Extension services ☐

(iv) Improved seeds ☐

(v) Supply of Agro-chemicals ☐

(vi) Others (specify).....☐

24. How regular do farmers secure help in terms of the input and service(s) above?

(i) Yearly ☐

(ii) Every two years ☐

(iii) After three years ☐

(iv) After 4-5 years ☐

25. Over the past five years have you been getting regular input supply and services? (Tick one only).

(1) Yes ☐ (2) No ☐

26. <u>Accessibility of FSC/ASC's - to Rural Residents</u>:

(a) What is the approximate distance of the nearest FSC/ASC to your village? (Tick one only).

1. ∠ 1Km ☐ 3. 6-10Km ☐

2. 2-5 Km ☐ 4 10Km ☐

(b) How do you normally travel to the FSC's?

(1) Walk ☐ (2) Bicycle ☐ (3) Personal Car ☐

(4) Official Vehicle ☐ (5) Commercial Vehicle ☐

(c) How many hours does it take you to reach the nearest farm service or Agro- service - centre?

1. Just one hour ☐

2. Approximately two hours ☐

3. Between 3-4 hours journey ☐

4. Over five hours journey ☐

(d) How much does it cost you to reach the nearest FSC/ASC in your village?

1. Less than one Naira ☐

2. 2-5 Naira ☐
3. 6-10 Naira ☐
4. Over 10 Naira ☐

(e) Does distance serve as a disincentive to you in purchase of farm inputs? (Tick one only)

(1) Yes ☐ (2) No ☐

27. How do you transport Fertilizer from FSC/ASC to your village? (Tick one only).

1. Head potterage ☐
2. Bicycle ☐
3. Motor Vehicle ☐
4. Motor Cycle ☐
5. Others (specify) ..... ☐

28. Which other factors serve as a disincentive to your close interaction and utilization of FSC/ASC? (Rank your answer e.g 1,2,3 etc).

1. Irregularity or delayance of inputs supply ☐
2. Transport cost ☐
3. Staff in different attitude ☐
4. Distance ☐
5. Others (specify)..... ☐

29. Do you have any farmers organization in your village? (Tick one only)

(1) Yes ☐ (2) No ☐

30. If Yes to (Number 29) what services do you benefit from such an organization? (Tick appropriate box).

1. Purchase/supply of farm inputs ☐
2. Farm Labour ☐
3. Agric. Credit ☐

4. Tractor Service(s) ☐

5. Others (specify)..... ☐

31. Does FSC/ASC attempt to use existing farmers organization to serve rural residents? (Tick one only).

(1) Yes ☐ (2) No ☐

32. If Yes, indicate among any of the following, the type of services you get from the FSC/ASC - through the farmers - co-operative organization. (Tick appropriate box).

1. Agric. Loan ☐
2. Farm inputs ☐
3. Tractor Hiring service ☐
4. Technical/Extension service ☐
5. Others (specify)..... ☐

33. Characteristic of Rural Residents:

(a) What other alternative source(s) of labour do you employ on your farm? (If tractors/ploughs are difficult to secure)?

1. Family member(s) labour ☐
2. Neighbour ☐
3. Community ☐ (Tick one only)
4. Intra-Community labour ☐

(b) How many wives and children do you have?

1. Number of wives:..... Ages range:.....
2. Number of children:.....Ages range:.....

34. What are the major crops you normally grow every year? Indicate whether production has decreased or increased.

	FSC/ASC ASSISTANCE		YEARLY CROP OUTPUT IN BAGS/SACKS					
CROP TYPE	Yes	No	QTY/TYPE of Fertilizer	1984	1985	1986	1987	1988
1. Maize								
2. Beans								
3. Rice								
4. Yam								
5. Ground Nuts								
6. Cotton								
7. Cassava								
8. Guinea Corn								
9. Others (specify....								

(Total).....

N.B.

Correction: Question above indicate in the table below, how many bags of fertilizers, (50Kg type) you used and the quantity of crops harvested.

35. With the establishment of FSC/ASC in your village has the size of farmers form increased or decreased?

Rate of Farm Increase/Decrease Acre/Hectare(s)

YEARS	CROP TYPE (4 major ones Maize, Rice, Yam, etc.	0.1 - 1.5	1.6-2.0	2.1-3.0	3.1-4.5	5
1984	"					
1985	"					
1986	"					
1987	"					
1988	"					

APPENDIX D

TABULATION OF DATA FOR CALCULATING PRODUCT-MOMENT CORRELATION COEFFICIENT

(Rice-Production)

Serial No.	X	Y	X^2	Y^2	XY
1.	10	43	100	1849	430
2.	10	161	100	25921	1610
3.	12	123	144	15129	1476
4.	5	138	25	19044	690
5.	6	121	36	14641	726
6.	12	44	144	1936	528
7.	12	41	144	1681	492
8.	15	145	225	21025	2175
9.	7	212	49	44944	1484
10.	4	37	16	1369	148
11.	8	43	64	1849	344
12.	12	47	144	2209	564
13.	4	36	16	1296	144
14.	20	46	400	2116	920
15.	12	38	144	1444	456
16.	8	35	64	1225	280
17.	12	66	144	4356	792
18.	4	45	16	2025	180
19.	9	148	81	21904	1332
20.	8	32	64	1024	256
21.	12	162	144	25600	1920
22.	8	109	64	11881	872
23.	15	215	225	46225	3225
24.	12	49	144	2401	588
25.	6	115	36	13225	690
26.	7	30	49	900	210
27.	12	105	144	11025	1260

(Rice-Production)

S/No.	X	Y	X^2	Y^2	XY
28.	16	114	256	12996	1824
29.	20	93	400	8649	1860
30.	8	21	64	441	168
31.	6	134	36	17956	804
32.	8	107	64	11449	856
33.	12	173	144	29929	2076
34.	11	85	121	7225	935
35.	15	78	225	6084	1170
36.	10	119	100	18225	1190
37.	10	135	100	18225	1350
38.	20	295	400	87025	5900
39.	6	171	36	29241	1026
40.	12	57	144	3249	684
41.	20	60	400	3600	1200
42.	14	110	196	12100	1540
43.	5	102	25	10404	510
44.	12	109	144	11881	1308
45.	8	140	64	19600	1120
46.	9	104	81	10816	936
47.	15	79	225	6241	1185
48.	20	221	400	48841	4420
49.	21	101	441	10201	2121
50.	30	161	900	25921	4830
51.	10	73	100	5329	730
52.	10	98	100	9604	980
53.	13	73	169	5329	949
54.	11	80	121	6400	880
55.	7	83	49	6889	581
56.	6	61	36	3721	366

Appendix D. (Cont'd)

(Rice-Production)

S/No.	X	Y	X^2	Y^2	XY
57.	15	125	225	15625	1875
58.	9	143	81	20449	11583
59.	8	59	64	3481	472
60.	9	97	81	9409	873
61.	4	45	16	2025	180
62.	7	47	49	2209	329
63.	9	60	81	3600	540
64.	5	38	25	1444	190
65.	4	44	16	1936	176
66.	5	54	25	2916	270
67.	3	21	9	441	63
68.	5	23	25	529	115
69.	5	35	25	1369	185
70.	6	77	36	5929	462
71.	4	35	16	1225	140
72.	4	38	16	1444	152
73.	5	60	25	3600	300
74.	7	37	49	1369	259
75.	3	36	9	1296	108
76.	4	31	16	961	124
77.	2	22	4	484	44
78.	5	42	25	1764	220
79.	6	27	36	729	162
80.	10	59	100	3481	590
81.	1	$11\frac{1}{2}$	1	132.25	11.5
82.	4	35	16	1225	140
83.	4	119	16	14161	476
84.	3	16	9	256	48
85.	3	19	9	361	57

Appendix D (Cont'd)

(Rice-Production)

S/No:	X	Y	X^2	Y^2	XY
86.	5	31	25	961	155
87.	3	17	9	289	51
88.	7	17	49	289	119
89.	2	11	4	121	22
90.	1	4	4	16	4
91.	3	19	9	361	57
92.	4	16	16	256	64
93.	3	17	9	289	51
94.	1	4.5	1	20.25	4.5
95.	4	79	16	6241	316
96.	4	46	16	2116	184
97.	5	40	25	1600	200
98.	4	31	16	961	124
99.	3	13	9	169	39
100.	2	9.5	4	90.25	19
101.	1	14.5	1	210.25	14.5
102.	4	29	16	841	116
103.	10	45	100	2025	450
104.	3	33	9	1089	99
105.	2	16.5	4	272.25	33
106.	4	60	16	3600	240
107.	4	25	16	625	100
108.	3	30	9	900	90
109.	3	30	9	900	90
110.	4	26	16	676	104
111.	2	25	4	625	50
112.	7	14	49	196	98
113.	4	72	16	5184	288
114.	3	21	9	441	63

Appendix D (Cont'd)

(Rice-Production)

S/No.	X	Y	X^2	Y^2	XY
115.	2	75	4	5625	150
116.	3	33	9	1089	99
117.	5	47	25	2209	235
118.	1	26	1	676	26
119.	2	9.5	4	90.25	19
120.	3	25	9	625	75
121.	1	37	1	1369	37
122.	2	62	4	3844	134
123.	1	25	1	625	25
124.	5	18	25	324	90
125.	1	2	1	4	2
126.	6	39	36	1521	234
127.	18	126	324	15876	2268
128.	5	14.5	25	210.25	72.5
129.	5	26	25	676	130
130.	4	77.5	16	6006.25	310
131.	9	112	81	12544	1008
132.	3	23	9	529	69
133.	3	15	9	225	45
134	3	21	9	441	63
135.	6	10	36	100	60
136.	2	23	4	529	46
137.	2	10	4	100	20
138.	1	3	1	9	3
139.	2	$14\frac{1}{2}$	4	210.25	29
140.	5	108	25	11664	540
141.	2	27	4	729	54
142.	2	9	4	81	18
143.	3	21.5	9	462.25	43

Appendix D (Cont'd)

(Rice-Production)

S/No.	X	Y	X^2	Y^2	XY
144.	4	34	16	1156	136
145.	4	35	16	1225	140
146.	10	160	100	25600	1600
147.	3	41	9	1681	123
148.	2	5	4	25	10

TOTALS

Xi =	Yi =	X^2 =	Y^2 =	XY =
1021	9199	110250	975645.5	98594

$$r = \frac{\Sigma Xi\,Yi - (\Sigma Xi)\ (\Sigma Yi)\ /\ n}{\sqrt{\left[\Sigma Xi^2 - (\Sigma Xi)^2/n\right]\ \left[\Sigma Yi^2 - (\Sigma Yi)^2/n\right]}}$$

$$= \frac{98594 - (1021)\ (9199)/148}{\sqrt{(11025 - \frac{1021^2}{148})\ (975645.5 - \frac{9199^2}{148}}}$$

$$= \frac{98594 - \frac{(1021 \times 9199)}{148} = \frac{9392179}{148} = 63460.7}{(11025 - 7043.5)\ (975645.5 - 571767.7)}$$

$$= \frac{98594 - 63460.7}{3981.5 \times 403877.9}$$

$$= \frac{35134}{16080398.59} = \frac{31534}{40100.37} = \underline{\underline{0.786}}$$

r = 0.78 (strong positive correlation)

APPENDIX E

TABULATION OF DATA FOR CALCULATING PRODUCT-MOMENT CORRELATION COEFFICIENT

(MAIZE)

Serial No.	X	Y	X^2	Y^2	XY
1.	8	30	64	900	240
2.	12	81	144	6561	972
3.	8	66	64	4356	528
4.	8	115	64	13225	920
5.	4	66	16	4356	264
6.	8	27	64	729	216
7.	6	27	36	729	162
8.	8	27	64	729	216
9.	5	146	25	21316	730
10.	6	30	36	900	180
11.	6	26	36	676	156
12.	8	27	64	729	216
13.	6	22	36	484	132
14.	12	29	144	841	348
15.	4	26	16	676	104
16.	3	35	9	1225	105
17.	4	56	16	3136	224
18.	8	29	64	841	232
19.	15	112	225	12544	1680
20.	6	26	36	676	156
21.	6	74	36	5476	444
22.	7	111	49	12321	777
23.	25	208	625	43264	5200
24.	5	45	25	2025	225
25.	7	118	49	13924	826
26.	7	23	49	529	161
27.	10	54	100	2916	540

Appendix E (Cont'd)

S/No.	X	Y	X^2	Y^2	XY
28.	20	173	400	29929	3460
29.	15	106	225	11236	1590
30.	12	20	144	400	240
31.	4	75	16	5625	300
32.	6	70	36	4900	420
33.	10	138	100	19044	1380
34.	5	84	25	7056	420
35.	9	83	81	6889	747
36.	11	103	121	10609	1133
37.	7	93	49	8649	651
38.	18	251	324	63001	4518
39.	8	80	64	6400	640
40.	14	176	196	30976	2464
41.	12	75	144	5625	900
42.	10	109	100	11881	1090
43.	10	66	100	4356	660
44.	8	90	64	8100	720
45.	8	101	64	10201	808
46.	10	108	100	11664	1080
47.	12	100	144	1000	1200
48.	15	213	225	35369	3195
49.	9	103	81	10609	927
50.	27	190	729	36100	5130
51.	9	184	81	33856	1656
52.	9	142	81	20164	1278
53.	6	71	36	5041	426
54.	7	77	49	5929	539
55.	5	80	25	6400	400
56.	8	49	64	2401	392
57.	14	142	196	20164	1988

Appendix E (Cont'd)

S/No.	X	Y	X^2	Y^2	XY
58.	10	91	100	8281	910
59.	9	40	81	1600	360
60.	7	72	49	5184	504
61.	3	88	9	7744	264
62.	3	24	9	576	72
63.	5	35	25	1225	175
64.	4	10	16	100	40
65.	3	41	9	1681	123
66.	3	38	9	1444	114
67.	3	30	9	900	90
68.	3	29.5	9	870.25	88.5
69.	4	24	16	576	96
70.	2	29	4	849	58
71.	6	50	36	2500	300
72.	5	34	25	1156	170
73.	3	31	9	961	93
74.	4	28	16	784	112
75.	4	75	16	5625	300
76.	4	25	16	625	100
77.	3	39	9	1521	117
78.	5	58	25	3364	290
79.	3	73	9	5329	219
80.	2	51	4	2601	102
81.	1	6.5	1	42.25	6.5
82.	2	11	4	121	22
83.	3	18	9	324	54
84.	8	22	64	484	176
85.	2	9.5	4	90.25	19
86.	2	9	4	81	18
87.	4	27	16	729	108

S/No.	X	Y	X^2	Y^2	XY
88.	1	14	1	196	14
89.	4	16.5	16	272.25	66
90.	6	27	36	729	162
91.	3	25	9	625	75
92.	1	7.5	1	56.25	7.5
93.	3	19.5	9	380.25	58.5
94.	5	25	25	625	125
95.	3	13	9	169	39
96..	5	29.5	25	870.25	147.5
97.	5	33.5	25	1122.25	167.5
98.	5	21.5	25	462.25	107.5
99.	10	112	100	12544	1120
100.	2	37	4	1369	74
101.	4	62	16	3844	248
102.	2	20	4	400	40
103.	4	30	16	900	120
104.	3	15	9	225	45
105.	3	34	9	1156	102
106.	6	38	36	1444	228
107.	4	20	16	400	80
108.	4	36	16	1296	144
109.	3	16	9	256	48
110.	5	17	25	289	85
111.	2	28	4	784	56
112.	1	17	1	289	17
113.	3	20	9	400	60
114.	4	15	16	235	60
115.	1	11.5	1	132.25	11.5
116.	2	10.5	4	110.25	21
117.	3	65	9	4225	195

Appendix E (Cont'd)

S/No.	X	Y	X^2	Y^2	XY
118.	3	20	9	400	60
119.	5	45	25	2025	225
120.	1	35	1	1225	35
121.	2	12	4	144	24
122.	1	18.5	1	342.25	18.5
123.	5	15.5	25	240.25	77.5
124.	1	41	1	1681	41
125.	2	30	4	900	60
126.	1	32	1	1024	32
127.	1	8	1	64	8
128.	1	2.5	1	15.6	2.5
129.	5	24	25	576	120
130.	8	29	64	841	232
131.	6	29	36	841	174
132.	7	35	49	1225	245
133.	11	41	121	1681	451
134.	5	67	25	4489	335
135.	7	38	49	1444	266
136.	1	13	1	169	13
137.	3	11	9	121	33
138.	5	11	25	121	55
139.	3	16	9	256	48
140.	4	18.5	16	34.2.25	74
141.	2	13	4	169	26
142.	7	58	49	3364	406
143.	4	37	16	1369	148
144.	1	7	1	49	7
145.	4	17	16	289	68
146.	5	25	25	625	125
147.	5	25	25	625	125

S/No.	X	Y	X^2	Y^2	XY
148.	1	28	1	780	28
149.	1	4	1	16	4
150.	1	7	1	49	7
151.	1	46	1	2116	46
152.	5	13	25	169	65
153.	7	87	49	7569	609
154.	8	86	64	7396	688
155.	1	5.5	1	30.25	5.5
156.	2	30	4	900	60
157.	2	9	4	81	18
158.	9	40	81	1600	360
159.	5	17.5	25	306.25	87.5
160.	5	17	25	289	85
161.	2	6	4	36	12
162.	5	39	25	1521	195
163.	7	28	49	784	196
164.	8	28	69	784	224
165.	7	18	49	324	126
166.	3	32	9	1024	96
167.	3	10	9	100	30
168.	14	73	196	5329	1022
169.	2	39	4	1521	78
170.	3	20	9	400	60
171.	5	32	25	1024	160
172.	3	25.5	9	650.25	76.5
173.	4	14	16	196	56
174.	7	52	49	2704	364
175.	4	61	16	3721	244
176.	2	33	4	1089	66
177.	4	26	16	676	104

Appendix E (Cont'd)

S/No.	X	Y	X^2	Y^2	XY
178.	2	18	4	324	36
179.	3	25	9	625	75
180.	4	52	16	2704	208
181.	2	13	4	169	26
182.	1	13	1	169	13
183.	4	10	16	100	40
184.	2	23	4	529	46
185.	10	35	100	1225	350
186.	3	33	9	1089	99
187.	4	46	16	2116	184
188.	4	18	16	324	72
189.	3	18	9	324	54
190.	10	58	100	3364	580
191.	4	21	16	441	84
192.	5	55	25	3025	275
193.	6	55	36	3025	330
194.	5	43	25	1849	215
195.	9	70	81	4900	630
196.	5	7	25	49	35
197.	10	135	100	18225	1350
198.	2	79	4	6241	158
199.	6	73	36	5329	438
200.	1	9.5	1	90.25	9.5
201.	1	9	1	81	9
202.	3	17	9	289	51
203.	4	25	16	625	100
204.	1.5	6	2.25	36	9
205.	1	15	1	1225	15
206.	2	12	4	144	24
207.	3	27	9	729	81

S/No.	X	Y	X^2	Y^2	XY
208.	3	11	9	121	33
209	4	29	16	841	116
TOTALS					

KEY - X = Fertilizer
Y = Crop (Maize)

Xi =	Xi =	Xi =	Xi^2 =	Yi^2 =	XiYi =
	1152.5	9698.5	9511.25	8229.95	79483.5

$$r = \frac{\leq XiYi - (\leq Xi)\ (\leq Yi)/n}{\sqrt{\left[\leq Xi^2 - (\leq Xi)^2/n\right]\ \left[\leq Yi^2 - (\leq Yi)^2/n\right]}}$$

$$= 79483.5 - \frac{(1152.5)\ (9698.5)}{209} = \frac{11177521.25}{209} = 53480.9$$

$$\sqrt{(9511.25 - (\frac{1152.5}{209})^2 \quad (822995 - (\frac{9698.5}{209})^2}$$

$$= \frac{79483.5 - 53480.96}{(9511.25 - \frac{1328256.25}{209})\ (823995 - \frac{94060902.25}{209}}$$

$$= \frac{26002.54}{(9511.25 - 6355.3)\ (822995 - 450052.2)}$$

$$= \frac{26002.54}{3155.95 \times 372942.8}$$

$$= \frac{26002.54}{1176988830} = \frac{26002.54}{34307.3} = \underline{0.76}$$

$$r = \underline{0.76}$$