EVALUATION OF THE LEVEL OF MECHANIZATION IN SMALL SCALE FARMS IN NIGER STATE

BY

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DECLARATION

I Ikutegbe Shedrach, declares that this project work is solely the product of my research and work and has never been submitted anywhere for any degree. All the literatures cited have been duly acknowledged in the references.

..... 23-02-2010

Ikutegbe Shedrach Date

CERTIFICATION

This project entitled "Evaluation of the Level of Mechanization in Small Scale Farms in Niger State" by Ikutegbe Shadrach, meets the regulations governing the award of the degree of Bachelor of Engineering (B.ENG.) of the Federal University of Technology, Minna, and it is approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

I sincerely dedicate this project work firstly to Almighty God and then to my beloved mother, Ikutegbe Elizabeth. (In the realm not so worldly)

ACKNOWLEDGEMENTS

My profound gratitude goes to God Almighty, the one merciful God who has made this project a successful pact and that the attributes to the project work should easily come by.

I am sincerely thankful to my father Mr. Ikutegbe Lucky for the guide, lessons, financial and moral support. A good father has a good plan for his son; he is simply a loving father. And all these that he is, is greatly founded in the one that rests in the bosom of our God, my mother. My respect and honour.

I am also thankful to my project supervisor Mr P.A.Adeoye for his contributions that has been an effective input in this work and the outcome has been one, not to loose in a long run.

My dearly beloved thank goes to the rest of my family; Mr. Ikutegbe Bright, Ikutegbe Joyce, Ikutegbe Charles, for their love and warmth through the years that we have been a family and for always.

And then, my special thanks go to my one true and loving friend Saratu Musa Jai, for her vision and confidence in me. She has given me courage and solace. "I will always love you".

My grand reserved thanks to my humble Kross, Solomon Blackson, Chibix Anibude, Alh. Shehu Shagari, Bikers, Aminu Barcher, Abdulmajeed (typist), and mark

To the rest of my friends that are too Numerous to Mention, you are well registered in my life. God bless you all.

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ABSTRACT

The study presents an analysis of the present level of mechanization situation and recommendations, review of relevant documents, field surveys, interactive meetings and review workshop furnished necessary data information for the study. The survey in Minna zone was conducted using a questionnaire and personal observation, all 20 household farms belonging to different categories of farmers and key personnels representing relevant sectors were interviewed. The Agricultural sector in Minna, Niger State apply more of hand tool power than tractor and animal power. It is evaluated that the level of farm power available per hectare of cultivated land is only 0.51kw. Agriculture is heavily dependent on human power which constitute 67.7% of total farm power level. While animal and mechanical power constitute 8.5% and 23.9% respectively. A number of recommendations have been made for mechanization development which include electric mechanization for heavy operations like water lifting operations and threshing and also the government should create a congenial environment for indigenous manufacturers of tractor parts and farm implements.

CHAPTER ONE

1.0. INTRODUCTION

1.1. Background of the Study

The level of farm mechanization plays a significant role in every nation's economy. However it is often misconstrued to mean modernization, beneficial only to industrialized countries with highly mechanized agriculture. Developing countries often have to rely on a variety of imported farm machines, which are seldom appropriate for small scale farms (Food and Fertilizer Technology Center, 2005).

Agricultural mechanization is not merely the use of tractors and motorized equipment or farming but rather a process of improving and modernizing farm operations and farm structures by the use of hand-powered tools, animal-powered implements, engine-powered equipments and other technological devices such as electric motors, pumps, solar driers, silos, irrigation and drainage equipments (Anazodo et al, 1986) mechanization is a significant way of intensifying agriculture production. However, it should be pointed out that machines, inspite of their performances are only tools. The quality of work carried out depends upon the interaction between tools and man, the types and conditions of the soil.

With continued technology generation and the growing capability of our local machinery maintenance, it is being attempted to design and adapt small imported machineries, equipments and other technologies to suit our own needs and conditions. These proved to be an effective means of increasing the level of machinery use in the farms and gave birth to the concept of "appropriate technology" or in our own case, "appropriate agricultural mechanization technology". This has been a catch-all phase for all agricultural tools, machines and implements that are simple, cheap and can be locally serviced or manufactured. The main criteria which should be considered during the development are that these machines should be suitable for use in small

farms, easily repairable and maintainable, inexpensive and environmentally friendly. The word "appropriate" should be interpreted as appropriate to the farmers in terms of their needs and affordability (Salokhe, 2003).

There is no absolute guideline for transferring mechanization technology, nor is there a tailored set of strategy to promote the adoption of agricultural machines. Variability of the conditions and the needs of the farmers limit the creation of a standard approach to discriminate mechanization technologies. In order to suggest appropriate strategies for small farm in Minna, Niger State. A small-sized farm is a big issue when it comes to mechanization because this is against the principle of economics of scale. The mechanization of small, non-contiguous parcels of land may prove to be inefficient especially in operations like land preparation and harvesting.

Essentially, there are three levels of farm mechanization namely; the hand tool level, the draught-animal level and the mechanization-power level.

Agricultural mechanization embraces the operation of the hand tools, implements and machines for agricultural land development, production, harvesting and on-farm processing. It includes three main power sources: human, animal and mechanical. (Rijk, 1989).

1.2. Statement of the Problem

The total output of agricultural produce that would be accrued, if adequate application of mechanization is employed in the small scale farms, is being impeded due to lack/inadequate research and information.

1.3. Objectives of the Study

To access the level of farm mechanization of small scale farms in Minna Niger State.

To observe the effects of the low level of farm mechanization on the normal total output of farm produce.

1.4. Justification

This project work is aimed solely at the possibilities and guaranteed procedures in relation to the level of mechanization problems of small scale farms to satisfy the variability of situations and conditions surrounding the high demand for food in the state (Minna, Niger State) and population growth. Equally essential, is identifying mechanization needs and prescribing the appropriate level of mechanization necessary for small scale farmers to penetrate the barrier towards small scale mechanization.

1.5. Scope of the Study

This work is a survey that gathers information on the level of mechanization from different small sized farms in Minna, Niger State. It is based on handy information collected from the Minna Local Government Area.

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1. Concept of Mechanization

Agriculture mechanization refers to the development, manufactures and distribution of all types of machines, infrastructures and equipments for farm production, post harvest and processing. Agricultural mechanization aims at sustaining agricultural production by bringing in more lands under cultivation, saving energy and resources, protecting the environment and increasing the overall economic welfare to farmers. Machines and equipments are major inputs to agriculture. The use and application of these inputs to farm production is one of the management tools to maximize farm production and profit (Gun, 1976).

Agricultural mechanization is an inevitable consequence of any nation's desire to industrialize. It is often stated, and correctly too, that the spectacular achievements of agricultural mechanization in North America and Japan were largely due to the existence of viable industries and export economics. In the absence of such favourable conditions, agriculture becomes the base for industry and both must grow, each one complimenting the other (Chukwu, 2005).

Agricultural mechanization embraces the use of tools, implements and machines for agricultural land development, crop production, harvesting, preparation for storage and on-farm processing. It includes three main power sources: human, animal and mechanical. The manufacture, distribution, repair, maintenance, management and utilization of agricultural tools, implements and machines is covered under this discipline with regard as to how to supply mechanization inputs to the farmer in an efficient and effective manner (Rijk, 1989).

2.2. Importance of Farm Mechanization

The use of machines can make possible the job which the farmer could not otherwise undertake, such as rapid clearing of bush, land or forest, ploughing in dry season in order to plant with the early rains, measuring application on a field scale, carrying of farm yard manure from one place to another. The use of farm machines reduces the economic pressure that results from bad agricultural practices such as the complete burning of all vegetative cover on new lands and yet makes it possible for the farmer to cultivate many hectares of land during a single season. It also facilitates timely operations, thus making possible better yield from the crops. Mechanization thus causes and speeds up many farm operations (Michael, 1993).

The small farmer's first and greatest aim is to increase the size of his farm output without greatly increasing his demand for hired labour, this he can do by mechanization. The use of implements to replace his traditional hoe is the first thing to be considered in the way he can increase the output of work in each day from both himself and his family and also from hired help. Some crops are much more easily mechanized than others. For the small farmer, practically all the operations involved in their production have to be done manually. The growing of crops however can be mechanized, provided the farmer will change his systems of farming (Kuje, 2002).

In addition, farm mechanization facilitates production of more food produce and improves timely field operation, facilitates the execution of difficult jobs, reduces drudgery, speed up farm operations, provides higher standard of living for the farmers, increases efficiency, increases revenue, encourages specialization. Many farmers have realized that it is more profitable to embark on mechanized agriculture. For example one can produce one hectare of land in one hour from working tractor and modern implements, but using hand tools would take a man up to about seven hours work to produce on hectare of land. Tractor allows more land to cultivation

with less hard work. Furthermore, power is available to prepare land during the dry season, just prior to the first rain. This allows early planting to achieve higher yield (Ogieva, 2003).

Akinsami (1979) opines that mechanization enables farmers to deal with relative case of some difficult and unpleasant jobs such as treating sewage and utilizing it as water for cultivation of vegetation. The uses of machines can make possible some job, which the farmer could not otherwise undertake, such as rapid clearing of forest or bush land, ploughing in dry season in other to plant with the early rain, manufacturing of field soak, carry farm yard manure from one place to another. This may result to economy pressure and may cause the distribution of land and yet will make it possible for the farmer to cultivate many hectare of land during a single season. It also facilitates timely farm operation, it makes it possible to get better yield. Mechanization thus, accelerates and speeds up many farm operations. However it is very expensive in capital cost and as farms in West Africa are poorly cleared of stumps. Thus, operation costs are consequently high.

The growth of cities and the concentration of large non-food producing population, in these cities have had a very important effect on present agriculture in Nigeria. Massive indirect agriculture consumption creates substantial demands for agricultural produce in the urban areas of Nigeria, the response of the peasant farmer to his demand is of major important to the economy of the nation up to the present time. The increased demand for export of cash crops and for consumption in the urban areas of Nigeria has been met largely by the present cultivation. To meet the response to the creation of large scale mechanized agriculture on state forms and by individual entrepreneur such as, large scale mechanized agriculture are at presently being developed to solve the problems of farmer as well as the urban dwellers. A modern efficient agricultural industry must be mechanized to some degree, farm machines are

designed to help the hand apply force in the farm preparation and every nation seeks farm mechanization, because it is cheap. Mechanization helps to remove much of the unnecessary drudgery from farm operation and create incentive for young people to remain on the farm to produce for themselves, their families and the nation at large (Kuje, 2002).

2.3. Problems of Farm Mechanization

Agricultural mechanization occupies a special nook in the hearts and minds of people concerned with development. However, mechanization as an effective partner of progress and socioeconomic well being still has a long way to go a better understanding of its many ramifications can be likened to watching the interplay of the varying hues and shades of a rainbow that makes definite observation truly difficult (Latin, 1985).

2.3.1. Lack of Appropriate Machinery (Design and Quality)

Even it as much as 80% of the farm power is provided by human beings, there is still a need to develop simple, manual equipment for various farm operations. In most developing countries, the human labour force comprises as much as 60% women workers thus; the proposed appropriate machine design should be based on the economic limitations of the individuals (Salokhe, 2003).

Research and development (R & D) has a bias against the development of appropriate machinery for small farms. Scientist and engineers have a tendency to create something that is novel, without r[illegible]h regard to small farms applications. Recognition for developing appropriate ma[illegible]hinery for small-scale application is not as glorious and rewarding as it is with cre[illegible]ting a bigger, more complex machine or system.

2.3.2. Land Tenure and Lack of Technical Know-How

Large scale mechanization of farm in most tropical countries in uneconomic at present because agricultural predominantly in the land of peasant farmers who have only small scattered pieces of land because of the prevailing land tenure system. Economic mechanization requires large farm holding. The majority of the farmers cannot provide sufficient capital (first to pay for stopping them) to buy tractor and implement as well as operate them. Most farmers do no know how to operate these machines because they are illiterate and cannot even read the instruction on the machine concerning their operation because farmers cannot do these repairs when there is breakdown of these machines. If only some farm operations are mechanized and not all unbalanced mechanization may mean seasonal shortages and surpluses of labour. In many countries, there are real difficulties in getting enough people with high mechanical skill or attitude to operate, repair and maintain the equipment due to poor education on the parts of the farmer, land tenure system, soil types in Nigeria, lack of spare parts and poverty on the parts of the farmers (Ogieva, 2003).

2.4. Level of Mechanization

The level, appropriate choice and subsequent proper use of mechanized inputs into agriculture has a direct and significant affect on achievable levels of agricultural production, the profitability of farming and the environment. In general, in a situation where the expansion of agricultural land is limited, the application of advanced tools and machines does not, by itself lead to increased unit yields. However, the full benefit achieved through the use of man advanced crop husbandry inputs such as improved seed, fertilizer and pesticides cannot be realized without the use of improved tools (Food and Agricultural Organization, 1997)

Mechanization in any area is characterized into three levels: low, fair, and high. Low Level Mechanization: Low level mechanization means that manual power used exceeded 33%.

Fair Mechanization Level: Fair means that animal power utilization ranges from 34% to 66%.

High Mechanization Level: High means that mechanical power utilization ranges from 67% to 100% (Rodulfo, et. al, 1998).

Essentially, there are three technological levels of mechanization: hand-tool technology, draught-animal technology, and mechanical-power technology, with different degrees of sophistication in each level of mechanization. Rijk (1989) states, agricultural mechanization embraces the operation of the hand tools, implements and machines for agricultural land development, production, harvesting and on-farm processing. It includes three main power sources: human, animal and mechanical. Natural power (wind and water) has been included under mechanical power, since a mechanical device is required to transfer this power into useful work. As a discipline, agricultural mechanization includes the manufacture, distribution and utilization of tools, implements and machines.

2.5. Historical Background of Mechanizati n

The small farmer's first and greatest ain is to increase the size of his farm and output without greatly increasing his deman for hired labour, this he can do by mechanization. The use of implement to repla his traditional hoe is the first thing to be considered in the way he can increase th output of work in each day from both himself and the family and also from hire elp. Some crops are much more easily mechanized than others. For the small fa er, practically all the operation involved in

their production have to be done manually the growing of crops however can be mechanized, provided the farmer will change his systems of farming (Kuje, 2002).

From what has been said above, it will be clear that if farming efficiency and production are to be increased in our country, there must be the introduction of many farm implement and small hand machines to speed up the heavy work of cultivating the farm and also to reduce the amount of hard work to be done and the lighter work of weeding which is at present largely done by women and children. There are machines which will carry out such operation as corn grinding and millet, groundnut shelling rice threshing, rice hulling, palm oil pressing, grain winnowing, cassava grating and it is important that the use of this type of machineries should be greatly increased in our country at large and out local areas, mechanizing the processing of crops is very similar processes of which great experience has been obtained in most parts of the world (Kuje, 2002).

There are many stages which mechanization could be classified, man in the early beginning of history started farming by collecting fruit in the farm and by hunting and fishing the settlement in our place saw the birth of planned agriculture, but was mainly subsistence. The subsistence farmer produces for himself for himself and for maintenance of his family but sell little or none of the farm product.

With the development, man started exploiting farm animals' power for draught purpose in the Farm land. The use of these animals was and is still highly restricted to place where the environmental ndition favour their area, later the introduction of tractors and farm implement nd presently developed countries use automatic power to replace the high cost and o availability of farm labour (Ojha and Michael 2003).

2.6. Mechanization in Crop Production

The mechanization in crop production can be viewed under the following heading.

2.6.1. Pre-Planting Equipment

2.6.1.1. Primary Tillage Equipment

Tillage is the preparatory of the soil for planting and the process of keeping it losses and free from weeds during the growth of crops. The primary objectives and fundamental purposes of tillage is to prepare a suitable seedbed, destroy competitive weed and improve the physical condition of the soil. The equipment used is disk, rotary chisel and subsoil plow.

2.6.1.2. Secondary Tillage Equipment

Means stirring the soil at comparatively shallow depth. In many cases, secondary tillage follows the .deeper primary tillage operation. It is possible to use some of the primary tillage tools to do secondary tillage operation. The objectives of secondary tillage are to destroy weeds on fallow lands, to improve the seedbed by greater pulverization of the soil, to conserve moisture by summer fallow operation to kill weeds and reduce evaporation.

2.6.2. Planting Equipment

Crop planting involves the placing of seeds in the soil a predetermined depth, dropping seeds on the soil surface or setting young plants or cutting in the soil. Seeds are planted mechanically by one of the following methods;

Broadcasting-seeds are scattered at random over the surface of the field.

Drill seeding-seeds are dropped and covered in furrows to obtain definite rows more seeds.

Hill dropping- two or more seeds at a time are placed at about equal interval in rows.

2.6.3. **Post Planting**

These equipment include, manure fertilizer spreading equipment. Fertilizer can be applied on the soil as manure. The way fertilizer is applied to the soil depends on the stage of development and of crop. Weed control and pest equipment; control of weeds and pest on established crop plants can be achieved by hand, mechanical, chemical or flame methods. Weeding with hand tools sprayer on of cultivator are effective mechanical implements control.

2.6.4. **Harvesting Implements**

In most tropical countries crops are harvested by hand using knives sticks sickles. However mechanical equipment is being introduced gradually to ensure that the crop is harvested at the exact time which is appropriate. This minimizes crop losses from bad weather and the effects of pest disease. Harvesting implement is classified by purpose, that is forage, cereals, roots and tuber, fruit are named according to the crops they are designed to harvest.

2.6.5. **Crop Processing and Storage Implement**

This includes machines that are used to dispose of crop residue after harvest and machines to process harvested material and put it into a more usable form. Machines that perform such treatment include shellers, feed grinder and crop dryers. Storage of farm produce is of great importance in agricultural production and consumption. Agricultural silos and bin are constructed of aluminum galvanized steel or reinforced concrete is commonly used in storing large quantities especially of cereals grain. Root crops can be stored in clamps which includes drains to protect the crops from rain and groundwater.

2.6.6. Suitable Equipment for Crops and Types of Farming

The two major crops systems are row crops and broadcast crops. The principal row crops are corn, soya-beans and potatoes. Rice, wheat and small grains are broadcast crops. Farm machinery can profitably used with both systems both the more uses to which a machine can be adapted, the less the initial investment in equipment. Combine are adapted in harvesting some row crops such as corn, sorghum, soya-beans.

2.6.7. Growing Crops to Suit Machinery

Certain crops do not readily lead themselves o machine harvesting. Originally grain sorghum had dropping heads which made it difficult to head than without cutting excessively long stems. Plant breeders have developed varieties of sorghum with straight, erect heads of uniform height that are well adapted to combining.

2.6.8. Selection of Farm Machinery

Machinery can never compensate for bad planning or bad farm management. The first requirement in planning farm mechanization is detailed study of the management of the individual arm and suitable adjustment of management policy. To under mechanization successfully, the farmer must; choose a set of equipment suited to the particular needs of the farm. Learn the most efficient techniques for operating all the equipment. Ensure effective maintenance of machinery

Effective selection of field machinery requires the availability of power service; spare parts labour and calculation of time use and cost in order to achieve an optimum economic return.

2.6.9. Crop Production Operations

The various operations carried out in the production of crops is represented below

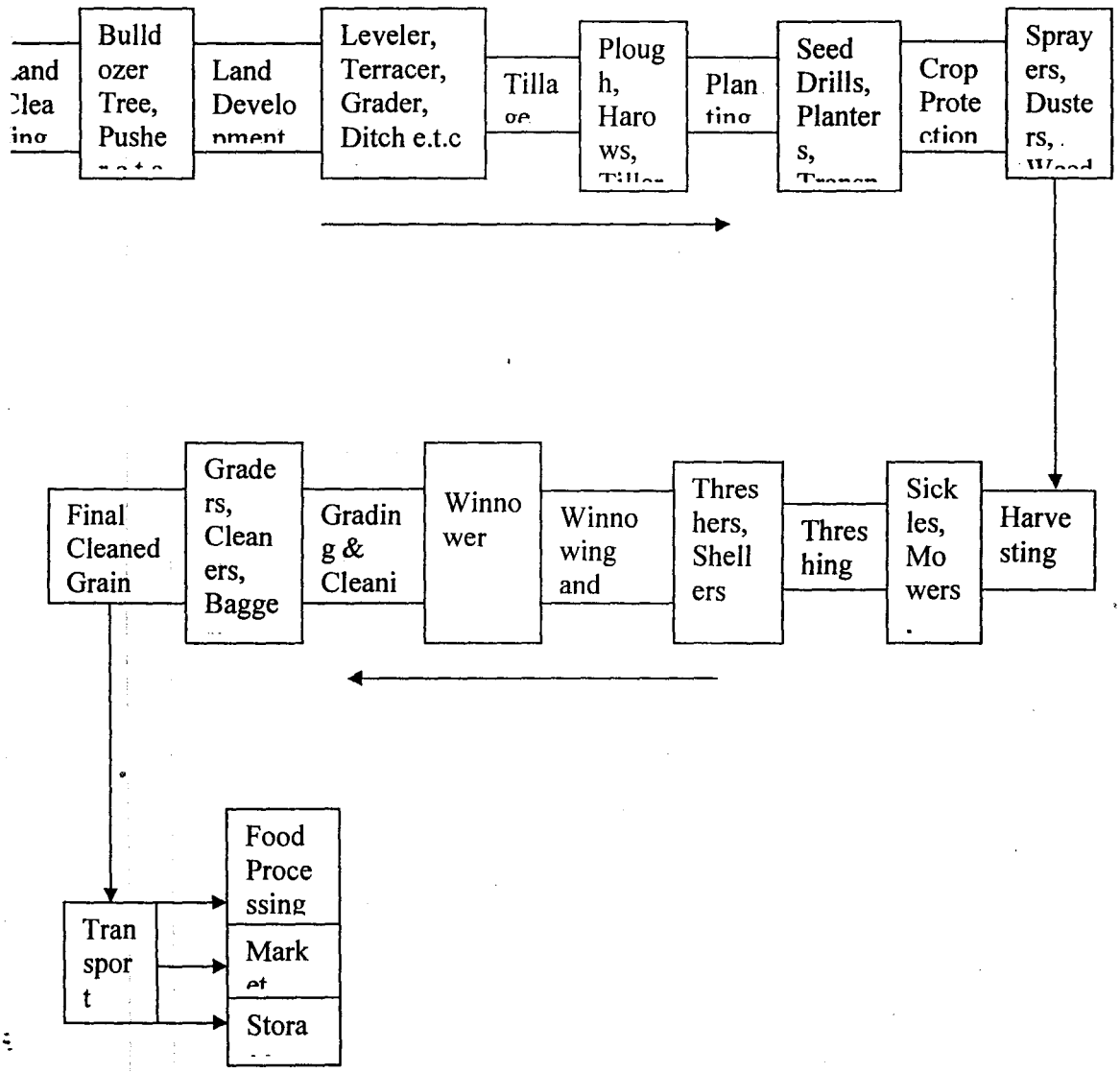

FIGURE 2.6TYPICAL MECHANIZED CROP PRODUCTION OPERATION SHOWING THE EQUIPMENT INVOLVED AT EACH STAGE

2.7. Possible Solution to Farm Mechanization

The use if machines can make possible job which the farmer could not other wise undertake, such as rapid clearing of bush land or forest, ploughing in dry season in other to plant with the early rains, measuring application on a field scale, carry farm yard manure from one place to another. The use of farm machines reduces the economic pressure to resort to bad agricultural practices such as the complete burning of all vegetative cover on new land and yet make it possible for the farmer to cultivate many hectares of land during a single reason. It also facilitates timely farm operations, thus making possible better yield from the crops. Mechanization thus causes and speeds up many farm operations (Ojha and Michael 2003).

The problem of land tenure system by which a farmer work a few hectares of land scattered here and there must be change. Effective mechanization requires many hectares in a single field to meet the demand of the nation or society. Government should supply simple and less expensive machines to do the same work as present expensive ones are doing. If possible, machines should be developed to perform different jobs at different seasons of the year (Ogieva, 2003).

Mechanization should be gradually starting in the area where it is economically feasible and with crops that farmers can obtain considerable benefit form higher production, for example the drying storage of crops as maize, rice, tobacco, cocoa and groundnut. The farmer should be taught to develop the practices of owning and operating farm collectively. The government should establish agricultural engineering station in all town and villages where machines for all kinds of farm operation may be stocked. These machines could be given to the farmers at subsidized loans (Ugochukwu et al 2002).

CHAPTER THREE

3.0. APPROACH AND METHODOLOGY

The general approach of this study is substantial as it engulfs feasible information covering the engineering, social, economic, political industrial and business management aspects. The objective of the approach is to extract information regarding the subject matter by using the household questionnaire and personal observation tools to produce a study in a multi-disciplinary mode ensuring that the whole agricultural system was covered.

3.1. Description Of The Study Area

Niger state is located between latitude 8°20′N and 11°3′N and longitude 3°30′E and 7°20′E. the state is bordered to the North by Kaduna State, to the West by Kebbi State, to the South by the Federal Capital Territory, to the South by Kwara State.

Furthermore, for easy and effective administration, the twenty five local government areas have been divided into five administrative zones which include minna the state capital, Bida, Suleja, Kontangora and New Bussa

Generally, agricultural activities form the main stay of the people's economy and engage directly or indirectly, more than 80% of the population

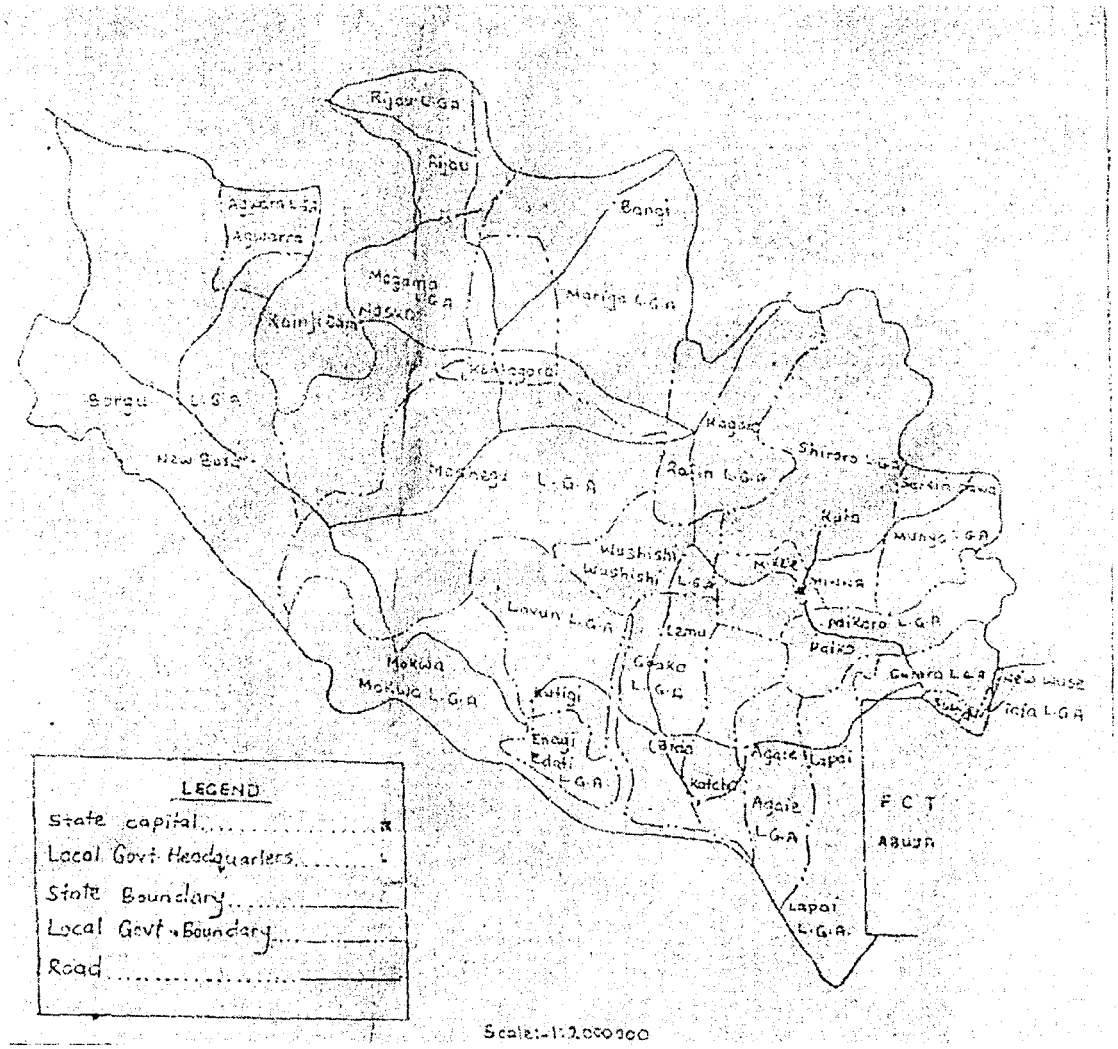

Fig. 3.1: Map of Niger State

3.1.1. Geology

Niger state is covered by two major rock formations. The sedimentary and basement complex rocks. The former to the south is characterized of sandstones and alluvial deposits, particularly along the Niger valley.

3.1.2. Climate

The state experiences two distinct seasons. The annual rainfall varies from about 1600mm in the north. The duration of the rainy season ranges from 150 to 10 days or more from the north to the south. Mean maximum temperature remains high throughout the year, hovering about 32°F particularly in March and June. However

the lowest minimum temperatures occur usually between December and January when most parts of the state come under the influence of the tropical continental air mass which blows from the north .the dry season in Niger State commences in the October.

3.1.3. Soils and Vegetations

Three major soil types can be found in the state.these include the ferrugineous tropical soils, hydromorphic soils and ferrosols.the most predominant soil type is the ferrugineous tropical soils which are ideal for the cultivation of guinea corn, maize, millet and groundnuts.

3.2. Information and Source

The information regard for the study was obtained from both secondary and primary sources.

3.2.1. Secondary Sources

This information entails that from an extensive review of available documents/reports including statistical and literature, pertaining to mechanization (published and unpublished). This information constitutes the fundamental basis for general conceptualization and understanding of various issue of mechanization.

3.2.2. Primary Sources

This conforms to the field studies which constitute to the building block of this study.

3.3. Information Collection Tool

Two types of information collection tools that were used are

3.3.1. Household Questionnaire

This was administered to the selected farms. It includes inquiry on various relevant aspects such as farm size cropping pattern, crop budgets, ownership, use of farm implements mechanization constraint, suggested solutions and advantages of farm mechanization.

3.3.2. Personal Observation

This involves the practical/physical analysis of what was seen the environmental and infrastructural farm building and machines, the size of workforce e.t.c.

3.4. Stages of the Study

The study was completed in three stages

3.4.1. Desk Stage

At the desk stage, the activities carried out were

- Collection of necessary secondary data and information
- Review of relevant documents/reports
- Consultation with key personnel involved directly or indirectly in mechanization
- Preparing survey questionnaire

4.2. Field Survey

At the field survey, the activities carried out are random

- Selection of farms as study area, which was based on the review of relevant documents and interactions with professionals, enabling criteria such as
    a. Farms where little information on mechanization was available so that more information can be added to existing database.

b. Farms, which are not too distant and inaccessible so that travel time was reduced.

- A field visit was done in order to contact the key informant of the selected farms for interviews. The total duration of the fields visit was two weeks.

3.4.3. **Data Processing and Analysis Stage**

The information gathered from the various farms were coded, complied, processed and analyzed, from the filled questionnaire and information was thoroughly check before processing.

The questionnaire that is use for the purpose of information collection from the various farms is presented on appendix A below.

CHAPTER FOUR

4.0. RESULTS AND DISCUSSION

Based on the result obtained from the questionnaire presented and filled from the randomly selected farms, namely; Mohammed Doma Farm, Jumik Farm, Sarkin Yaki Farm, Alh. Danjuma Sarkin Noma Farms e t c, in the Minna zone of Niger state, the following information on the level of farm mechanization was drawn.

Table 4.1: Farm Size and Major Crop Produce

NAME OF FARM	FARM SIZE (ha)	LOCATION	MAJOR CROPS
Mohammed Doma Farm	15	Garatu Bida Rd	Maize, Sorghum, Yam
Jumik Farm	7	Gbanganako	Maize, Cowpea
Sarkin Yaki Farm	6	Minna Fm Rd	Maize, Sorghum
Alh. Danjuma Farm	5	Gunu Rd minna	Maize, Sorghum
Kafinta Mai Unguwa Farm	7	Egwa vil.	Maize, Sorghum, Yam
Alh. Musa Farm	8	Tawalin Gwada	Maize, Sorghum, Yam
Yakubu Ibrahim Farm	5	Chiri vil.	Maize, Sorghum, Yam
anko Ibrahim Farm	9	Egwa vil.	Maize, Sorghum, Yam
damu Gurusu Farm	13	Tsohon Fm rd	Maize, Sorghum, Yam
haya Farm	9	Shakwata vil.	Maize, Sorghum, Yam
h. Galadima Farm	5	Tufa	Yam, Maize, Rice
va Ahmadu Farm	7	Makarantan	Yam, Maize, Rice

Alh Usman Farm	10	Shakpere vil.	Yam, Maize, Rice
Baba Dan Zaira Farm	11	Dan zaria Bida Rd	Maize, Sorghum, Yam
Audu Alkali Farm	10	Gbayiko	Maize, Sorghum, Yam
Alh Inuwa Farm	14	Duste Kura	Maize, Sorghum, Yam
Yusuf Gunduma Farm	9	Garatu vil.	Maize, Sorghum, Yam
Sarkin Zango Farm	6	Tunga Malam vil.	Maize, Sorghum, Yam
Jibrin Pada Farm	8	Farin Doki vil.	Maize, Sorghum, Yam
Bello Maku Farm	13	Gidan Maku	Yam, Maize, Rice

The table above shows that most of the farms visited were small-sized farms as they do not have adequate areas of land and apply less sophistication in farm operations (manually).

4.1. Socio-Economic Findings of Case Study

4.1.1. Educational status

The level of mechanization is greatly to some extent influenced by the level of education of the farm manager (farmer) as it affects his ability to apply modern technologies and skills of mechanization operations to boost or increase productivity on the farm land. Also this posses a constraint in other aspect such s book keeping, tatistics of farm activities, management and conditions of investment and returns.

ig. 4.1 shows the educational status of farmers in all 20 farms that were interviewed.

otal number of farmers =20

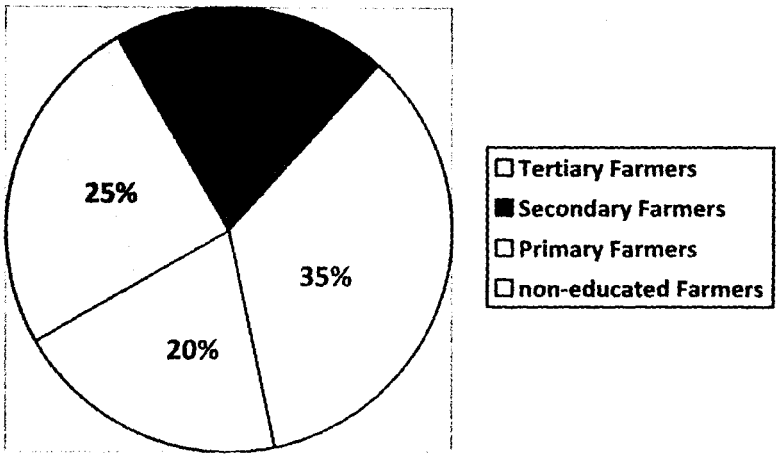

Fig. 4.1: Pie Chart Showing the Educational Status of the Farmers

The figure 4.1 shows that 35% of the farmers are in the primary level of education which implies less knowledge on mechanization and subsequently reduced production.

4.2. Power Sources/Farm Equipments

Based on the data collected from the information tools, it is observed that due to the various mechanization constraints such as lack of skill, high investment requirement, cheap labour e t c farm managers still fashioned within the confines of crude implements and various hand tools such as hoes, cutlasses, diggers, knives, sickles e t c in carrying out farm operations with a consequent stagnant effect on crop production.

This also accounts for the functions against the concept of "appropriate technology" which can be viewed as a catch-all phase for all agricultural tools, implements and machines. It involves designing small machines to suit our own needs and affordability while keeping production at its optimum level.

4.3. Mechanization Status

Table 4.2: Show the Level of Mechanization

OPERATIONS	*POWER AVAILABLE (kw)	LEVEL OF MECHANIZATION (kw/ha)
Land preparation	16.2	0.09
Planting	3.6	0.02
Weeding	9.0	0.05
Fertilizer application	3.6	0.02
Spraying	7.2	0.04
Harvesting	9.0	0.05
Threshing/shelling	14.4	0.08
Drying	11.5	0.064
Milling	18.0	0.10
TOTAL		0.51kw/ha

*Source: Average values from the Ministry of Agriculture and Land Development

No of farms = 20 farms

Total hectare of land = 180 ha

$$\text{Level of mechanization} = \frac{\text{Power available}}{\text{Total hectare of land}} \quad \text{(kW/ha)}$$

The agricultural/farm mechanization practice in the selected farms in minna, Niger state, has been in many different folds from the use of small hand tools to machine

and animal power. The figure 4.2 below shows the average power source (%) applied in the farm operations

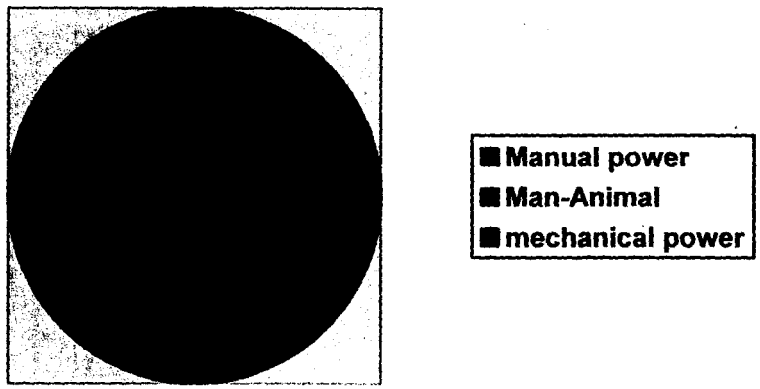

Fig. 4.2: Pie Chart Showing Different Power Source

This indicates that the productivity of major crops was higher in manual operations compared to man-animal and mechanical operations in the Minna zone. This is further dicussed under the following sub-headings

4.3.1. Cost Reduction

The study indicated that the cost of production of major crops was higher on manual power (hand tools) compared to mechanical and man-animal power in the Minna zone. Cost reduction due to the use of manual power was more. Cost reduction in mechanization farm was possible chiefly because tillage use/hiring mechanical power is cheaper compared to tillage, using animal power.

4.3.2. Changes in Cropping Intensity

The study showed that the cropping intensity was higher in the use of manual power. This was true across farm size and irrigation, which did not support the usual notion of the effect of farm mechanization. Likewise, cropping intensity was higher in manual farming compared to animal and tractor farming in Minna zone. Higher

cropping intensities in manual farming were mainly due to the use of cheap labour from unskilled and skilled workers. This has resulted due to lack of inexpensive application of mechanical power.

4.3.3. **Employment**

The analysis has reflected that although unskilled labour per hectare is more, adoption of mechanized technologies will be instrumental in generating employment for skilled labour in the farm activities through increased cropping intensity. Field survey information indicates that labor employment is more in hand tool farms compared to animal and tractor farming in Minna zone. Mechanization generates employment in allied activities such as operation of workshop, repairs and maintenance works, dealers and traders of farm equipments.

4.4. **Mechanization Limitations**

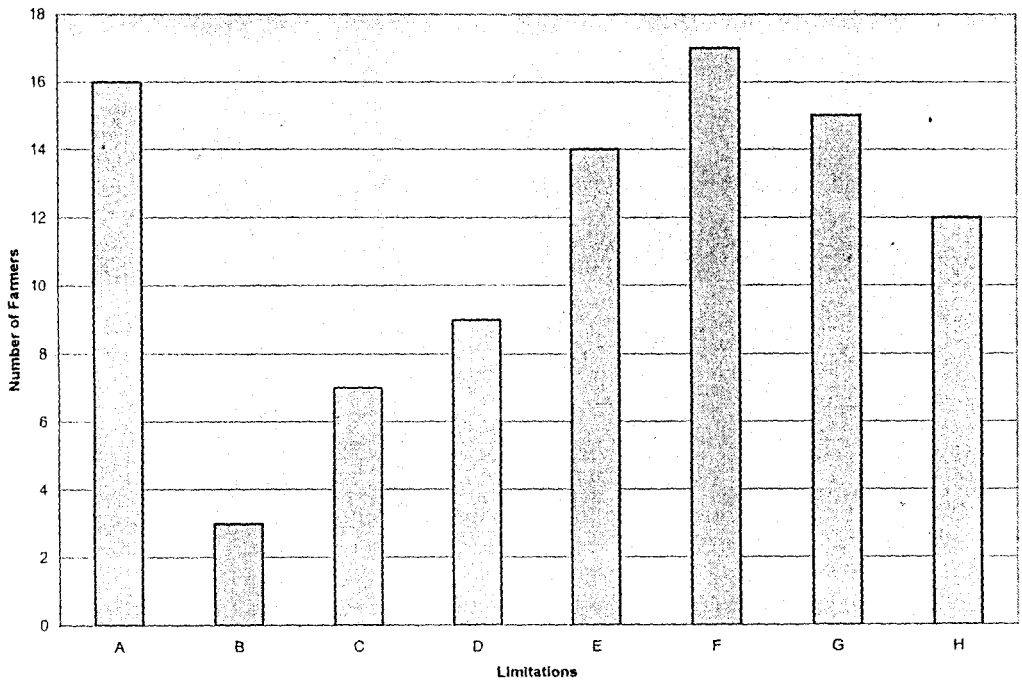

Fig. 4.3: Bar Chart showing the Mechanization Limitations

Keys

A= Lack of skill

B= Unavailability of Machines for purchase

C= Unavailability of custom hire

D= Government policies

E= High cost of operation

F= Cheap labour

G= Small farm plots

H= High investment requirements

From the above fig. the analyses shows that the level of mechanization is mainly due to the cost reduction in the use of cheap labour and lack of skill from the settlers (villagers) in the neiborhood/vicinity of farm land which constrains full application of mechanization.

The effects of the levels of mechanization on various socioeconomic parameters reflected by the case studies in the Minna zone are summarized in this sub-section. The detailed socioeconomic analysis is presented in

4.4.1. **Productivity**

The analysis showed that the productivity of major crops was higher in farm hand tools compared to mechanical farm in the Minna zone. In the Minna zone, productivity differences were high for the major crops produced using hand tools compared to the use of mechanical power. Field observations indicated that low agricultural productivity was due, inadequate timeliness of farm operation, inadequate use of tractors, farm implements and inappropriate use of farm inputs like manure and fertilizer.

4.4.2. **Social Life**

Introduction and adoption of mechanized technology has helped in saving time of the family labor, assisting in skill transfer and improving means of rural transportation system greatly.

Mainly, it was apparent that mechanization has led towards time savings from farming activities for family members and there are instances where such time was used for education and supplementary income generating activities. Further, introduction of such technologies has helped towards creating increased interest in modern technology, obtaining required skill on operation, repair and maintenance. Use of tractor and power-tiller has also assisted in improving rural markets by improving transportation means.

Tractor is the main means of transport in inner parts of Minna zone.

CHAPTER FIVE

5.0. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The various farms in the Minna community are small scale farms with small area available for cultivation and did ploughing of agricultural land, manually where they predominated. The human labour employement per hectare is very high.

Although, the government realized the need for the development in this field not much have been achieved so far to cater for the needs of the small scale farmers in Minna, Niger State.

From the average result the research and development in the field of agricultural mechanization in the Minna district is at a very low level (0.51kw/ha)

5.2. Recommendations

Minna, Niger state requires electric mechanization in order to fulfill the objectives to agricultural mechanization set for the earlier this means mechanizing the farm operation which require heavy energy requirement e.g. tillage, water lifting, threshing, and transportation e.t.c.

The government should provided a congenial environment for indigenous manufactures of tractors and farm implement. This may call for joint or collaborating countries with foreign countries.

The government should also conduct research that helps achieve societal goals and look for new technologies.

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APPENDIX A

A SURVEY QUESTIONNAIRE ON THE LEVEL OF FARM MECHANIZATION OF SOME FARMS IN NIGER STATE.

1. General Information
   - Name of Farmer: .....
   - Sex: Male ☐ Female ☐
   - Age: ..... Years
   - Educational Status: Tertiary ☐ secondary ☐ Primary ☐ Non ☐
   - Name of Village/Town: .....
2. Land Ownership Status

   Owned Land ☐ Rented ☐
3. Status of Irrigated

   Irrigated ☐ Un-irrigated ☐
4. Farm Size

   Small ☐ Large ☐
5. Source of Power

   Bullock ☐ Power-Tiller ☐ Tractor ☐ Manual ☐
6. List of Farm Equipments/Power Owned/Possessed

NAME OF EQUIPMENT/POWER SOURCE	NOS OWNED	SPECIFICATIONS	PROCURED FROM	COST (₦)	ANNUAL USAGE

7. Please provide information on production and sale of the agricultural commodities this year (2009)

S/N	AGRIC PRODUCT	TOTAL PRODUCTION		PRODUCE SOLD	
		Qty (kg)	Value (₦)	Qty (kg)	Value (₦)
1.	Yam				
2.	Maize				
3.	Sorghum				
4.	Other specify				

8. Details of farm equipments usage

FARM OPERATION	EQUIPMENT USED	DURATION OF USE	
		From	To
Tillage/land preparation i. Ploughing ii. Harrowing			
Sowing/Transplanting			
Weeding/Interculture			
Plant Protection			
Fertilizer/Manure Application			
Irrigation			
Harvesting			
Threshing			
Winnowing			

Grading			
Transportation			
Storage			
Others			

9. Percentage of yam, maize and sorghum farms vs. source of power

OPERATION	POWER SOURCE		
	MANUAL	MAN-ANIMAL	MECHANICAL
Land Preparation			
Planting			
Weeding			
Fertilizer Application			
Spraying			
Harvesting			
Threshing/Shelling			
Drying (Farm Level)			
Milling			
Average			

10. Please state your income source

S/N	INCOME SOURCE	INCOME (₦)
1.	Agriculture	
2.	Non Agriculture	

11. Is financing, a problem for owning farm power

Yes ☐ No ☐

12. If yes, is barrowing a problem

Yes ☐ No ☐

13. If yes, whom do you approach for borrowing

Local Money Lender ☐ Relative/Neighbours ☐ Banks ☐

Cooperative ☐ Others ☐

14. Please state accordingly

PURPOSE	AMOUNT BORROWED AND INTEREST RATE BY SOURCES									
	MONEY LENDER		RELATIVE		BANK		COOPERATIVE		OTHERS	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	
rm Implement										
gric Input										
her Specify										
TOTAL										

15. Is unavailability of financial services a constraining factor on ownership and use of farm implements for agric purpose

Yes ☐ No ☐

16. Reason of not using power operated equipment in your farm

Lack of skill ☐

Unavailability of machines for purchase ☐

Unavailability of custom hire ☐

Government policies ☐

High cost of operation ☐

☐

Cheap labour availability

Small farm plots ☐

High investment require ☐

17. What mechanization needs (tools, implement, machine) do you consider necessary for enhancing agric production

- ♦ .....
- ♦ .....
- ♦ .....
- ♦ .....
- ♦ .....

18. What type of problem do you face with mechanization and suggestion

MECHANIZATION PROBLEMS	SUGGESTION/SOLUTION

INTERVIEWER'S NAME	INTERVIEW DATE
.....	.....

APPENDIX B

Educational status

A=percentage of tertiary farmers	=5÷20×100%=25%
B= percentage of secondary farmers	=4÷20×100%=20%
C= percentage of primary farmers	=7÷20×100%=35%
D= percentage of non-educated farmers	=4÷20×100%=20%