

**EVALUATION OF THE LEVEL OF AGRICULTURAL
MECHANIZATION IN KATSINA STATE**

BY

YUSUF, ABUBAKAR

PGD/AGRIC. ENG./2007/200

**DEPARTMENT OF AGRICULTURAL AND BIORESOURCES
ENGINEERING, SCHOOL OF ENGINEERING AND ENGINEERING
TECHNOLOGY, FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE**

NOVEMBER, 2010

TITLE PAGE

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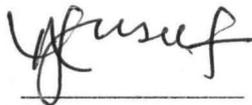
**BEING A POSTGRADUATE DIPLOMA (PGD) PROJECT REPORT
SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL AND
BIORESOURCES ENGINEERING, SCHOOL OF ENGINEERING AND
ENGINEERING TECHNOLOGY, FEDERAL UNIVERSITY OF
TECHNOLOGY, MINNA IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF POST GRADUATE DIPLOMA IN
AGRICULTURAL AND BIORESOURCES ENGINEERING**

NOVEMBER, 2010

DECLARATION

This Project work titled “Evaluation of the level of agricultural mechanization in Katsina State” was carried out by me under the guidance and supervision of Engr. Dr. A. A Balami, Head, Department of Agricultural and Bioresources Engineering, Federal University of Technology Minna.

Abubakar Yusuf
(Student)



Signature

02-11-10

Date

CERTIFICATION

This Project titled "Evaluation of the level of Agricultural Mechanization in Katsina state" was written by me under the guidance and supervision of Engr. Dr. A. A. Balami, the Head of Department Agricultural and Bioresources Engineering, Federal University of Technology, Minna. The entire work was read and corrected by the supervisor for presentation to meet the regulation governing the award of Post Graduate Diploma in Agricultural and Bioresources Engineering of Federal University of Technology, Minna.

Engr. Dr. A. A Balami
(Project Supervisor)



Signature

01-11-2010

Date

Engr. Dr. A. A Balami
H.O.D (Agric. and Bioresources Engineering)



Signature

01-11-2010

Date

DEDICATION

This Project is dedicated to my wife and children.

ACKNOWLEDGEMENTS

I wish to acknowledge the assistance from my supervisor Engr. Dr. A.A. Balami. He gave me courage, motivation and maximum cooperation throughout the period of this work. His objective suggestions and corrections enabled me to obtain reliable results. Therefore, the success of this work was based on his immense contribution. I am extremely grateful for his contributions.

My sincere appreciation goes to my lecturers and other staff in the Department of Agricultural and Bioresources Engineering for the various forms of assistance and words of encouragement. I also wish to acknowledge the assistance from the Ministry of Agriculture, Katsina State and Katsina Agricultural and Rural Development Authority. They assisted me throughout the work.

I cannot forget to acknowledge the various forms of assistance from the management of my employer, Federal College of Education Katsina for giving me the chance to further my education.

Lastly, my sincere appreciation goes to my childhood friend Salisu Suleiman Machika for the various forms of assistance he gave me throughout the program. This also extends to my wife and children for their understanding and support throughout the period of my absence.

ABSTRACT

The level of agricultural mechanization in Katsina State was evaluated by assessing the farmer's farm size, sources of power on the farm, type of agricultural implements and equipments used on the farm and the capital investment in agricultural production. There was 63.7% awareness of the farmers on the practice of agricultural mechanization in Katsina State. The data obtained from respondents within the area indicated that agricultural mechanization in Katsina State is at the level of intermediate technology with 30.6% hand tool technology (HTT), 20.6% draught animal technology (DAT) and 40.9% combination of the two in agricultural mechanization across Katsina State. These constituted 74% level of agricultural mechanization for agricultural operations in Katsina State. Low financial status of the farmers constituted a problem to 70.5% of farmers for the adoption of agricultural mechanization in Katsina State. Unavailability of relevant and simple engine power technology (EPT) for agricultural mechanization is the major constraint for a meaningful adoption of agricultural mechanization in the State.

TABLE OF CONTENT

Title page	i
Declaration	ii
Certification	iii
Dedication	iv
Acknowledgement	v
Abstract	vi
Table of content	vii
CHAPTER ONE	1
1.0 Introduction	1
1.1 Background of the Study	1
1.2 Aim and objectives of the study	2
1.3 Justification / purpose of the study	3
1.4 Significance of the study	3
1.5 Scope and limitation	4
CHAPETR TWO	5
2.0 Review of Related Literature	5
2.1 Historical pattern of Agricultural Mechanization	6
2.2 Meaning and defination of Agricultural Mechanization	7
2.3 Benefits of Agricultural Mechanization to practicing farmers	8

2.4 Power sources for Agricultural Mechanization	9
2.5 Available power sources and associated implements for Agricultural Mechanization in Katsina State	11
CHAPTER THREE	13
3.0 Methodology	13
3.1 Background of the study area	13
3.2 Sampling technique used	14
3.21 Procedure used	14
3.3 Method of data collection	17
3.4 Analytic tool used	18
CHAPTER FOUR	19
4.1 Presentation of Results	19
CHAPTER FIVE	30
5.0 Discussion of Results	30
5.1 Conclusion	31
5.2 Recommendations	32
Reference	33
Appendix	35

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Agricultural mechanization is one of the agricultural technologies for agricultural development. Therefore, it covers all aspect of agricultural productions. In Nigeria, adoption of agricultural mechanization was limited by economy, seasonality of operations, technical skills of the farmers and scale of operation (Jama'are 2000)

The level of Agricultural Mechanization can clearly be understood from the various forms of Technologies adopted in agricultural production. The earliest and lowest level of Agricultural Mechanization is the Hand Tool Technology(HTT). It involve the use of Tools and Implements which are developed and produced by Artisans and Blacksmith. This level of Agricultural Mechanization is associated with the following:

- i. Great time involvement in agricultural production.
- ii. Very low agricultural output.

Increase in power requirement on the farm led to Draught Animal Technology(DAT). This is the immediate level of Agricultural Mechanization involving the use of domestic animals like Bulls, Camels and Horses. These animals are used to operate and power variety of implements and equipments for agricultural production. Advancement in Technology and the need to increase agricultural productions resulted in the use of modern machines and equipments to carry out agricultural operations (Odigbo and Onwualu, 1994).

This is referred to as engine power technology(EPT) and is the highest level of agricultural mechanization today. Engine power technology was introduced to meet higher demand of power for agricultural production and also to speed up agricultural operations with increased efficiency. The machines and equipments are powered by an internal combustion engine (Kaul and Egbo, 1985).

The adoption of Agricultural Mechanization was classified into two categories (Culpin, 1975). These are :

- i. Selective (Partial) Mechanization; where labour support was employed in agricultural production to substitute the use of machines in some operations.
- ii. Appropriate (Complete) Mechanization; where there is total adoption of mechanized operation in agricultural production without labour support.

These categories were used as direct measure that determine the level of Agricultural Mechanization based on the following indices:

- i. Source of power for agricultural production.
- ii. Agricultural operations under the practice of agricultural mechanization.
- iii. Capital involved in agricultural mechanization.

1.2 Aim and Objectives of the Project

The aim of this Project is to evaluate the level of agricultural mechanization in different agricultural operations practised by farmers in Katsina State. The following are the objectives of this work :

- i. To determine the extent of practicing mechanized agricultural operations in Katsina State.
- ii. To identify the sources of power for agricultural mechanization in Katsina State.
- iii. To identify the problems encountered on the adoption of agricultural mechanization by farmers in Katsina state and suggest possible solutions.

1.3 Justification of the study

Agricultural mechanization has been introduced and practiced in Katsina State for a very long period of time to improve individual small holder farmer's productivity, thus, increase his income thereby raising his standard of living.

Despite all effort by Government in the State, increase in food production and agricultural raw materials for the industries were yet to reach a significant level of satisfying the demand within the State. It is therefore necessary to study and investigate the practice of agricultural mechanization in the State. This would allow for proper evaluation and or assessment of the level of agricultural mechanization in Katsina State.

1.4 Significance of the study

Agricultural mechanization plays a very vital role in food supply and poverty alleviation, thus enhance overall National Development. A study on the level of agricultural mechanization would be used to develop relevant Technology for agricultural production . Also the significance of this project include :

- Provide knowledge on awareness of the farmers with respect to agricultural mechanization in Katsina State.
- Provide vital information on the level of agricultural technology available to the farmers
- Provide information on the appropriate level of agricultural technology to be provided.
- Indicate areas of agricultural operations that farmers in Katsina State are familiar with under agricultural mechanization.

1.5 Scope and limitation

Agricultural mechanization covers wide range of areas in agricultural production such as agronomy, livestock engineering, poultry production, material processing and handling, fishery and forestry engineering, agro – allied processing, and storage. But for the purpose of this study, agronomic operations like land clearing and preparation, planting, management activities, harvesting and processing operations would be considered. Thirty-four (34) Local Governments in Katsina State would be sampled to have only fifteen (15) local Governments representing the population. These Local Governments were used as working sample so as to ease data collection and simplify analysis.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

Agriculture is the main source of food and the major source of raw materials to industries in both the developed and developing countries (Akinsanmi, 1975) as such regarded as one of the sources of wealth. Therefore, agricultural production systems all over the world have undergone changes to achieve high level of production, in order to satisfy these demands. These changes involve all agricultural practices and operations. They include changes in cropping systems, livestock husbandry, material handling and processing, and the application of inputs. The principal change was in the type of power source and the associated implements, equipments, and machines for various operations. These were achieved by the introduction of agricultural mechanization.

According to Culpin, (1975) agricultural mechanization is one of the agricultural technologies applicable to agricultural development. It has a progressive development which began with simple devices for harnessing the power of man himself, developed with a construction of implements and machines designed to make use of the greater power of domestic animals, and continue with the exploitation of the use of mechanical and electrical power for almost every agricultural operation. Therefore, agricultural mechanization is a visible and easily recognized form of technological change in Agriculture, which has been so successful in helping to increase agricultural production.

2. 1 Historical Pattern of Agricultural Mechanization

According to Odigboh and Onwualu (1994), the history of Agricultural mechanization can be traced back through early civilization to the stick and stone tools used by farmers in prehistoric times. The first agricultural hand tools were made from selected timber or stones and used for soil preparation.

As early as 6000 BC, in the ancient Egypt and masopotamia, a Y-shaped stick was used to prepare the land for seed. This hand tool technology (HTT) was made available for agricultural operations during this period.

In about 3000 BC, man learned to harness the animals for power and the era of draught animal technology (DAT) in agriculture commenced. At about the same time, agricultural production operations were made easier and more efficient with 2-wheel carts pulled by man or animal power.

In the 18th and 19th centuries numbers of draught animal were increased to meet higher demands for power on the farm with the draught equipment being improved. During the same period, power was developed from steam and finally steam traction engine was developed to provide mobile power for the heavy operations on large scale farms (Odigbo and Onwualu,1994)

By 1990 a higher level of agricultural mechanization was becoming a necessity. Therefore, in the mid 1930's, a diesel engine was introduced in farm tractors. Towards the end of 1936, the hydraulically controlled 3-point hitch was introduced and a new era in farm machinery began.

The 20th century brought a new dimension to agricultural mechanization, machinery became more sophisticated and requires special materials for construction. This resulted to the establishment of the farm machinery manufacturing enterprise such as John Deere, to mark the new era of engine power technology (EPT) in agriculture. To date, this is the highest level of agricultural mechanization practiced in agriculture.

2.2 Meaning and Defination of Agricultural Mechanization

Agricultural mechanization has been interpreted in various ways. Generally, it is a form of modern agricultural practice. It goes beyond tractorization as it was considered by many, to involve the provision and use of all forms of power source and mechanical assistance to agriculture, from simple hand tools to animal draught power and mechanical power. Also, it has been referred to as the manufacture, distribution and operation of all types of tools, implements, equipments and machines and their associated power source, for Agricultural operations.

Jama'are (2000), define agricultural mechanization as "a method of agricultural production that embrace the engineering profession in the area of research and development in tools, equipments and machines as well as their design, manufacture and use to improve agricultural production".

Kaul and Egbo (1985), define agricultural mechanization as "the use of modern implements and machines to carryout agricultural operations".

Yohanna (1986), gave a similar definition as "the application of agricultural machinery, equipment and tools economically and effectively to remove drudgery from farm operations.

Michael and Ojha (2000), gave the definition of agricultural mechanization as “a means of increasing agricultural production per hectare through the use of modern sources of power”.

According to Culpin (1986), the most popular and quite appropriate definition of agricultural mechanization is “the application of engineering principles and technology to agriculture”.

FAO (2000), gave the definition of agricultural mechanization on the following:

- i. TRACTORIZATION – Refers to application of any size of tractor to activities associated with agriculture.
- ii. MOTORIZATION – Refers to the application of all types of mechanical motor or engine regardless of energy source, to activities associated with agriculture.

From these definitions, agricultural mechanization aimed at increasing agricultural output and minimizing or eliminates the drudgery and fatigue in agricultural operations, through the use of suitable and most appropriate technology.

2.3 Benefits of Agricultural Mechanization to Practicing Farmers

The practice of agricultural mechanization is to increase income and improve living standard through accelerated and increased agricultural output, than is possible with the traditional farming techniques. When properly practiced, agricultural mechanization generally contributed to poverty alleviation as stated by Jama'are (2000) and thus:

- i. Increase food production.
- ii. Generate employment through primary processing activities.

- iii. Promote land utilization.

But Culpin (1975), pointed out some direct benefits of agricultural mechanization to the practicing farmers. These include:

- i. Saving labour.
- ii. Timeliness and improved farming practice.
- iii. Increased output of improved quality.
- iv. Eliminate drudgery.
- v. Reduction of operation cost.

2.4 Power Sources for Agricultural Mechanization

Agricultural mechanization involves the use of three main power sources that are commonly available. These are human, animal and mechanical. Based on these power sources, Gifford (1992) classified the technological level of agricultural mechanization into three:

- i. Hand tool technology (HTT).
- ii. Draught – animal technology (DAT).
- iii. Engine power technology (EPT).

The engine power technology (EPT) is the common power source for virtually every agricultural operation in the developed countries. A wide range of tillage, harvesting machinery and processing equipment that use engine power are available in these countries.

Estimates of the distribution of Engine power technology is presented in fig. 1

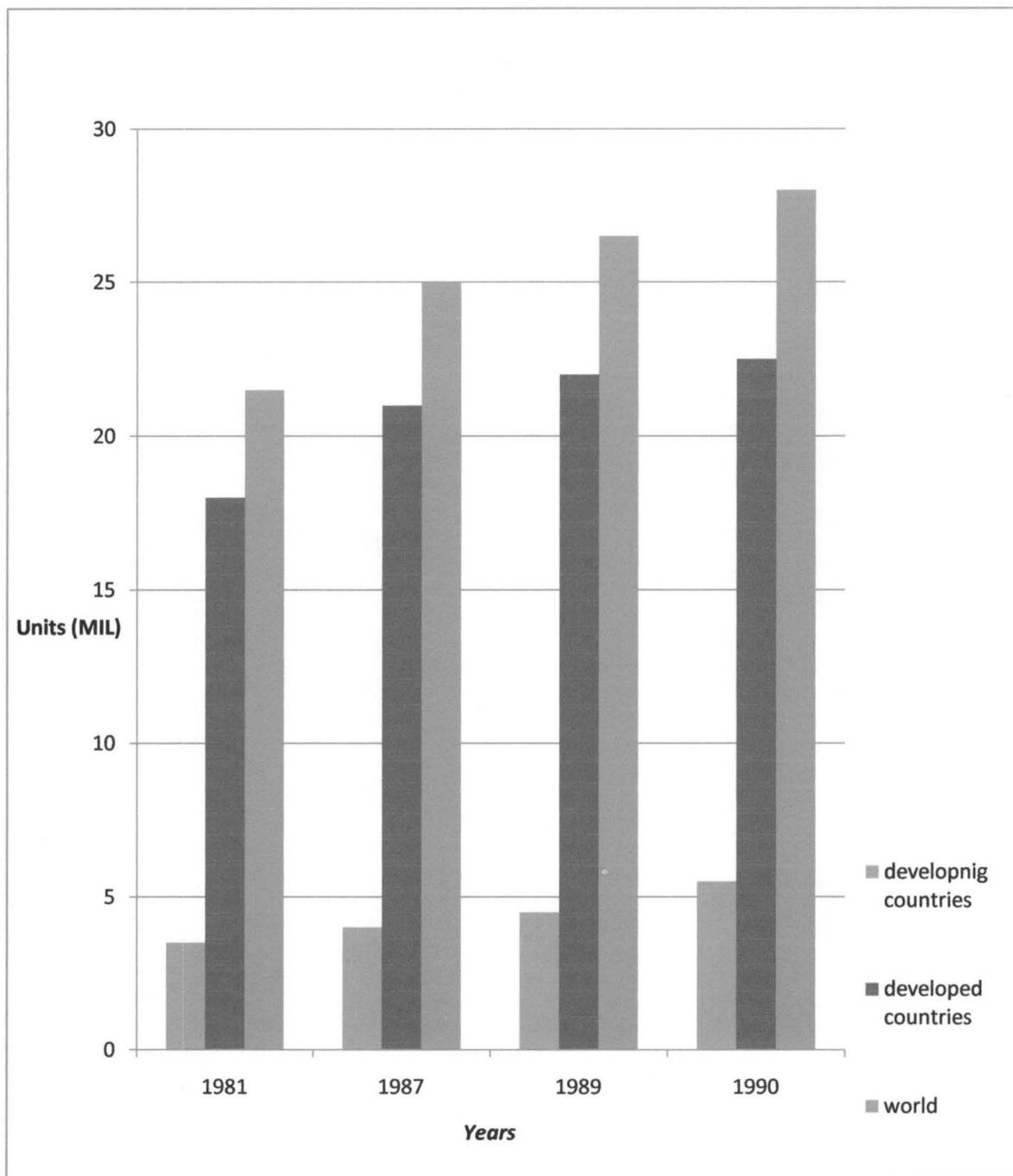


Fig. 1 Shows the distribution of engine power technology in the developed and the developing countries.

2.5 Available Sources of Power and associated Implements for Agricultural Mechanization in Katsina State

The major power source for agricultural mechanization in Katsina state is from the combination of human and draught animal power. The engine power sources were used only by few large scale farmers, mostly in the southern part of the state. However, the choice of power source for agricultural mechanization in the state depends on the following factors as pointed out by the state Ministry of Agriculture (M.O.A, 1992):

- i. Scale of production.
- ii. Type of agricultural operation to be carried out.
- iii. Availability and cost of power source.
- iv. Familiarity on the adoption and use of the power source.
- v. Tradition and literacy level of the farm families.

Table 2.1 shows the average percentage increase in power sources to agricultural mechanization in Katsina State for 5 years period 1995 – 2000 (K.A.M.A, 2001).

Table: 2.1: Percentage increase in power sources to agricultural mechanization in Katsina State

Power sources	Katsina Zone % Increase	Daura Zone % Increase	Funtua Zone % Increase
Human power	9.4	17.8	12.9
Animal power	13.8	27.6	14.2
Engine power	3.2	1.5	5.3

There are various types of implements and equipments used by the farmers in their effort towards mechanizing agricultural operations in Katsina State. Distribution of agricultural implements in Sampled Local Government areas in Katsina State is shown in table 2.2

Table 2.2: Distribution of agricultural implements in five (5) Local Governments areas each of the three zones of Katsina State

Agricultural implements	Number of implements			Total
	Katsina Central	Katsina North	Katsina South	
4-wheel tractor	33	24	46	103
Trailers	24	17	32	73
Ridgers	54	39	77	170
Disc plough	76	55	107	238
Harrows	49	35	68	152
Animal drawn mould board	764	550	1076	2390
Grain Threshers	17	12	23	52
Sprayers	61	44	86	191
Irrigation pumps	1020	734	1436	3190
Modern storage structure.	3	2	4	9

CHAPTER THREE

3.0 METHODOLOGY

3.1 Background of the area under Study

Katsina State is in the northern part of Nigeria. It was carved out of the old Kaduna State in September 1989. The state has thirty four (34) local Government areas. It has an estimated population of 5,792,578 (2006 Census) and covers a total land area of 23,938 sq. km. Katsina State is bounded by Niger republic to the North, by Jigawa and Kano States to the East, by Kaduna State to the south and Zamfara State to the West (M.O.I, 2006).

The population is mainly of the hausa and Fulani ethnic groups. Over 80% of the populations are farmers with about 25% (598,450 ha) of the vast agricultural land under cultivation. The main food crops are guinea corn, millet, beans, and maize, while the cash crops include ground nut, cotton and sugar cane (M.O.A ,2007).

Katsina State is geographically located between latitude $11^{\circ} 08' N$ and $13^{\circ} 22' N$ and between longitudes $6^{\circ} 52' E$ and $9^{\circ} 20' E$. The state has two (2) geological regions, these are: the North and Southern part of Katsina State. The Southern part of the state experienced an average annual rainfall of 900mm and temperature between $30^{\circ}C - 35^{\circ}C$ while the northern part has 650mm average annual rainfall with temperature of $35^{\circ}C - 38^{\circ}C$ (M.O.I, 2006).

The State has two (2) distinct seasons. These are :

- i. Dry season, from late October to April.
- ii. Wet season, from may to September.

The weather varies according to the month and season. Generally, it is cool in the morning, humid in the afternoon and cool again in the evening.

3.2 Sampling technique

The method of Random sampling was employed in this project to have unbiased representation of the area under study (Abdulazeez, 2004). Using this technique, working sample of 15 Local Government areas were chosen.

3.21 Procedures used

The Local Government areas of the state were grouped into Three (3).

- i) Katsina zone (central part of the state) consisting of 14 local Government areas.
- ii) Funtua zone (Southern part of the state) consisting of 8 local Government areas.
- iii) Daura zone (Northern part of the state) consisting of 12 local Government areas.

Vehicle registration number index (V.R.N.I) for each local Government area was used as the identification mark of that local Government area. The V. R. N .I of all the local Government areas in each zone were written on a piece of paper, rolled and placed in a container separately; as follows:

Local Government areas from Katsina zone (container A)

Local Government areas from Funtua zone (container B)

Local Government areas from Daura zone (container C)

Five draws (picking only one paper) one after the other was drawn from each container. The Local Government area corresponding to the chosen V.R.N.I was then recorded.

Using this procedure, a random sample of five (5) Local Government areas were chosen from each zone. This gave a total of fifteen (15) local Government areas as the working sample.

From Katsina zone, the local Government areas chosen by random sampling are: Dan-musa, Musawa, Kankia, Dutsin-ma, Kankara.

From Funtua zone, the local Government areas chosen by random sampling are: Faskari, Bakori, Malunfashi, Dandume, Funtua.

From Daura zone, the local Government areas chosen by random sampling are: Mani, Katsina, Daura, Baure, Jibia.

Fig. 2 Shows the map of Katsina State with location of the fifteen Local Government areas used as working sample.



Fig. 2 : Map of Katsina State

3.3 Method of data collection

The method of data collection used in this research work is by questionnaire. The questionnaire consists of two (2) parts. Section A: Personal information and Section B: Research question. There were thirteen (13) questions in section B of the questionnaire. The questions were carefully formulated, relevant to the research and in accordance with the designed objectives.

One Hundred (100) number of questionnaire were distributed in each of the three (3) zones of the State (Central, Northern, and Southern zones of Katsina State). Therefore, 300 questionnaires were distributed among the local Government areas. The responses obtained were also recorded based on the three zones.

3.4 Analytic tool used

The data obtained were analyzed using the relationship (Robert, 1974):

$$\text{Percentage Response} = x/y$$

x is the sum of responses on a question in all the three zones.

y is the expected number of responses on a question in all the three zones.

The Analysis provide a level of response on percentage basis of each individual respondent.

CHAPTER FOUR

4.1 PRESENTATION OF RESULTS

Information obtain from questionnaires were inform of responses. These responses were presented on zonal basis in a tabular form.

Tables 4.1, 4.2 and 4.3 show the responses from three zones of Katsina State. These zones are Katsina central, Katsina north and Katsina south respectively. While Table 4.4 and Table 4.5 show the total responses and percentage responses from fifteen (15) Local Governments in Katsina State respectively.

Table 4.1: Responses from Katsina Central

Research Questions	Responses								Total Number of Respondents	Unretrived Questionnaires
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses		
Major Agric. Production within the research area	Crop production	59	Agro processing	1	Dairy farming	—	irrigation	36	96	4
Land size of respondent	Less than 1 ha.	28	Between 1-5 ha.	47	More than 5ha.	13	Unknown	08	96	4
Level of awareness for Agric. Mech.	High	66	Moderate	—	Low	20	Insignificant	10	96	4
Agric operation under Mech.	Land preparation	74	Planting operation	02	Application of chemicals	13	Agro processing	07	96	4
Source of farm power in the research area	Human power	24	Animal power	17	Engine power	05	Human and Animal power	50	96	4
Aquisition of farm power sources	Bank loan	10	Hired labour	43	Family labour	16	Tractor hiring services	27	96	4
Common Agric.Equipm ent in the research area	Land preparation equipment	69	Planting equipmnet	—	Spraying equipment	23	Harvesting equipment	04	96	4

Table 4.1 : Responses from Katsina Central (continuation)

Research Questions	Responses								Total Number of Respondents	Unretrived Questionnaires
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses		
Common Agric implement	Animal drawn plough	29	Tractor mounted plough	20	Harrows and ridgers	39	Knapsack sprayer	08	96	4
Forms of training on Agric.Mech.	Demonstration	25	Formal training	30	Field visit	05	None	36	96	4
Capital Investment on Agric. production	N10,000 To N30,000	13	N30,000 To N50,000	41	N50,000 To N100,000	34	Above N100,000	08	96	4
Requirement of farmers for Agric Mech.	Finance	68	Adoptable power source	01	Training	09	Relevant Technology	18	96	4
Problem affecting Agric Mech.	subsistence farming	10	Ignorance on the benefit of AgricMech.	02	High cost of Agric Equipment	66	Lack of simple and relevant technology	18	96	4
Situation of farmers in the area	Cannot afford to use Agric. Mech.	12	Reluctant to adopt Agric. Mech.	02	Willing to adopt Agric. Mech.	49	Agric. Mech. is unprofitable	20	96	4

Table 4.2: Responses from Katsina North

Research Questions	Responses								Total No. of Respondants	Unretrived Questionnaires
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses		
Major Agric. Production in the research area	Crop production	63	Agro processing	04	Dairy farming	07	irrigation	21	95	5
Land size of respondent	Less than 1 ha.	44	Between 1-5 ha.	18	More than 5ha.	22	Unknown	11	95	5
Level of awareness for Agric. Mech.	High	52	Moderate	03	Low	15	Insignificant	25	95	5
Agric operation under Mech.	Land preparation	66	Planting operation	—	Application of chemicals	13	Agro processing	16	95	5
Source of farm power in the research area	Human power	32	Animal power	19	Engine power	11	Human and Animal power	33	95	5
Aquisition of farm power sources	Bank loan	10	Hired labour	43	Family labour	23	Tractor hiring services	19	95	5
Common Agric.Equipm ent in the research area	Land preparation equipment	75	Planting equipmnet	—	Spraying equipmnet	17	Harvesting equipment	03	95	5

Table 4.2 Responses from Katsina North (continuation)

Research Questions	Responses								Total Number of Respondants	Unretrived Questionnaires
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses		
Common Agric implement	Animal drawn plough	35	Tractor mounted plough	24	Harrows and ridgers	23	Knapsack sprayer	13	95	5
Forms of training on Agric.Mech.	Demonstration	29	Formal training	33	Field visit	07	None	26	95	5
Capital Investment on Agric. production	N10,000 To N30,000	17	N30,000 To N50,000	43	N50,000 To N100,000	24	Above N100,000	11	95	5
Requirement of farmers for Agric Mech.	Finance	71	Adoptable power source	-	Training	10	Relevant Technology	14	95	5
Problem affecting Agric Mech.	subsistence farming	12	Ignorance on the benefit of AgricMech.	-	High cost of Agric Equipment	68	Lack of simple and relevant technology	15	95	5
Situation of farmers in the area	Cannot afford to use Agric. Mech.	27	Reluctant to adopt Agric. Mech.	05	Willing to adopt Agric. Mech.	52	Agric. Mech. is unprofitable	11	95	5

Table 4.3: Responses from Katsina South

Research Questions	Responses								Total Number of Respondants	Unretrived Quetionnaires
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses		
Major Agric. Production within the research area	Crop production	52	Agro processing	03	Dairy farming	05	irrigation	30	90	10
Land size of respondent	Less than 1 ha.	31	Between 1-5 ha.	57	More than 5ha.	-	Unknown	02	90	10
Level of awareness for Agric. Mech.	High	61	Moderate	-	Low	08	Insignificant	21	90	10
Agric operation under Mech.	Land preparation	68	Planting operation	01	Application of chemicals	10	Agro processing	11	90	10
Source of farm power in the research area	Human power	30	Animal power	21	Engine power	07	Human and Animal power	32	90	10
Aquisition of farm power sources	Bank loan	12	Hired labour	41	Family labour	21	Tractor hiring services	16	90	10
Common Agric.Equipm ent in the research area	Land preparation equipment	71	Planting equipmnet	01	Spraying equipment	18	Harvesting equipment	-	90	10

Table 4.3 Responses from Katsina South (continuation)

Research Questions	Responses								Total Number of Respondants	Unretrived Questionnaires
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses		
Common Agric implement	Animal drawn plough	27	Tractor mounted plough	22	Harrows and ridgers	33	Knapsack sprayer	08	90	10
Forms of training on Agric.Mech.	Demonstration	26	Formal training	29	Field visit	11	None	24	90	10
Capital Investment on Agric. production	N10,000 To N30,000	15	N30,000 To N50,000	39	N50,000 To N100,000	32	Above N100,000	04	90	10
Requirement of farmers for Agric Mech.	Finance	73	Adoptable power source	-	Training	07	Relevant Technology	10	90	10
Problem affecting Agric Mech.	subsistence farming	11	Ignorance on the benefit of AgricMech.	02	High cost of Agric Equipment	64	Lack of simple and relevant technology	13	90	10
Situation of farmers in the area	Cannot afford to use Agric. Mech.	30	Reluctant to adopt Agric. Mech.	03	Willing to adopt Agric. Mech.	48	Agric. Mech. is unprofitable	09	90	10

Table 4.4: Total Responses from fifteen Local Governments in katsina State

Research Questions	Responses							
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses
Major Agric. Production within the research area	Crop production	174	Agro processing	08	Dairy farming	12	irrigation	87
Land size of respondent	Less than 1 ha.	103	Between 1-5 ha.	122	More than 5ha.	35	Unknown	21
Level of awareness for Agric. Mech.	High	179	Moderate	03	Low	43	Insignificant	56
Agric operation under Mech.	Land preparation	208	Planting operation	03	Application of chemicals	36	Agro processing	34
Source of farm power in the research area	Human power	86	Animal power	57	Engine power	23	Human and Animal power	115
Aquisition of farm power sources	Bank loan	32	Hired labour	127	Family labour	60	Tractor hiring services	62
Common Agric. Equipm ent in the research area	Land preparation equipment	215	Planting equipmnet	01	Spraying equipment	58	Harvesting equipment	07

Table 4.4 Responses from fifteen Local Governments in katsina State (continuation)

Research Questions	Responses							
	First Option	No. Of Responses	Second Option	No. Of Responses	Third Option	No. Of Responses	Fourth Option	No. Of Responses
Common Agric implement	Animal drawn plough	91	Tractor mounted plough	66	Harrows and ridgers	95	Knapsack sprayer	29
Forms of training on Agric.Mech.	Demonstration	80	Formal training	92	Field visit	23	None	86
Capital Investment on Agric. Production	N10,000 To N30,000	45	N30,000 To N50,000	123	N50,000 To N100,000	90	Above N100,000	23
Requirement of farmers for Agric Mech.	Finance	212	Adoptable power source	01	Training	26	Relevant Technology	42
Problem affecting Agric Mech.	Subsistence farming	33	Ignorance on the benefit of Mech.	04	High cost of Agric Equipment	198	Lack of simple and relevant technology	46
Situation of farmers in the area	Cannot afford to use Agric. Mech.	82	Reluctant to adopt Agric. Mech.	10	Willing to adopt Agric. Mech.	149	Agric. Mech. is unprofitable	40

Table 4.5 : Percentage Response for the fifteen local Governments in Katsina State

Research Questions	Responses							
	First Option	% response	Second Option	% Response	Third Option	% Response	Fourth Option	% response
Major Agric. Production within the research area	Crop production	61.9	Agro processing	2.8	Dairy farming	4.3	irrigation	31.0
Land size of respondent	Less than 1 ha.	36.6	Between 1-5 ha.	43.3	More than 5ha.	12.5	Unknown	7.5
Level of awareness for Agric. Mech.	High	63.7	Moderate	1.1	Low	15.3	Insignificant	19.9
Agric operation under Mech.	Land preparation	74.0	Planting operation	1.1	Application of chemicals	12.8	Agro processing	12.1
Source of farm power in the research area	Human power	30.6	Animal power	20.3	Engine power	8.2	Human and Animal power	40.9
Aquisition of farm power sources	Bank loan	11.4	Hired labour	45.2	Family labour	21.3	Tractor hiring services	22.1
Common Agric. Equipm ent in the research area	Land preparation equipment	76.5	Planting equipmnet	0.4	Spraying equipment	20.6	Harvesting equipment	2.5

Table 4.5 Percentage Response for the fifteen local Governments in Katsina State (continuation)

Research Questions	Responses							
	First Option	% Response	Second Option	% response	Third Option	% Response	Fourth Option	% Response
Common Agric implement	Animal drawn plough	32.4	Tractor mounted plough	23.5	Harrows and ridgers	33.8	Knapsack sprayer	10.3
Forms of training on Agric.Mech.	Demonstration	28.5	Formal training	32.7	Field visit	8.2	None	30.6
Capital Investment on Agric. Production	N10,000 To N30,000	16.0	N30,000 To N50,000	43.8	N50,000 To N100,000	32.0	Above N100,000	8.2
Requirement of farmers for Agric Mech.	Finance	75.4	Adoptable power source	0.4	Training	9.3	Relevant Technology	14.9
Problem affecting Agric Mech.	Subsistence farming	11.7	Ignorance on the benefit of Mech.	1.4	High cost of Agric Equipment	70.5	Lack of simple and relevant technology	16.4
Situation of farmers in the area	Cannot afford to use Agric. Mech.	29.2	Reluctant to adopt Agric. Mech.	3.6	Willing to adopt Agric. Mech.	53.0	Agric. Mech. is unprofitable	14.2

CHAPTER FIVE

5.0 DISCUSSION OF RESULTS

More than 75% of the farmers in Katsina State are small scale farmers, with 36.6% of them having less than one (1) ha on which to carry out agricultural production. Only 12.5% of them carry out agricultural production on more than 5 ha with as low percentage as 8.2% of them investing above N 100,000 in agricultural production.

Although there was 63.7% awareness of the farmers on the practice of agricultural mechanization in Katsina State, the adoption of engine power technology (EPT) for agricultural mechanization is mainly in the area of land preparation. Other agricultural operations are carried out using either draught animal technology (DAT) 20.6% or hand tool technology (HTT) 30.6% or combination of the two 40.9%.

The high cost of agricultural machinery and equipment constituted a problem for the adoption of agricultural mechanization to 70.5% of the farmers in Katsina State. However, 53% of the farmers across the state are willing to use agricultural mechanization practice in carrying out agricultural operations.

Therefore, provision of capital is the immediate requirement by 75.4% of farmers for the practice of agricultural mechanization. Finally, the major problem affecting agricultural mechanization in Katsina State based on the result of this research are:

- i. Lack of proper assessment of agricultural mechanization inputs required by farmers, and
- ii. Inadequate provision of trained personels on agricultural mechanization to enhance farmers transition from hand tool technology and draught animal technology to engine power technology.

5.1 Conclusion

The level of agricultural mechanization in Katsina State was evaluated by assessing individual farmer's farm size, source of power on the farm and the type of agricultural implements and equipments employed by the farmers to carry out agricultural operations.

Percentage increase in power source to agricultural mechanization in the three (3) zones of Katsina State was estimated and the distribution of agricultural implements and equipments in five (5) Local Government areas each of these zones were obtained. These indicated that Hand Tool Technology (HTT) and Draught Animal Technology (DAT) are the common form of agricultural mechanization practiced by the farmers in Katsina State, while the adoption of Engine Power Technology (EPT) is limited to Ploughing and Harrowing operations.

Land preparation, application of chemicals and the use of water pumps in water supply for irrigation are the major agricultural operations carried out by the farmers with respect to agricultural mechanization in Katsina State. The present status of agricultural mechanization in Katsina State may be improved by adequate provision of agricultural mechanization inputs that reflect the need of the farmers at the rural level.

5.2 Recommendations

To improve on the present status of agricultural mechanization practiced by the farmers in Katsina State, the following are recommended :

- I. Proper and adequate assessment of agricultural mechanization inputs should be made so as to introduce the appropriate type and level of technology needed by the farmers.
- II. The areas of agricultural processing and storage are commonly not mechanized in Katsina State therefore, indigeneous technologies should be developed to reflect the level of agricultural mechanization in these areas.
- III. Most extension workers have little Knowledge on agricultural mechanization operations therefore, training programme on agricultural mechanization should be introduced for agricultural extension agents in order to have adequate personnel on agricultural mechanization who will assist farmers in the adoption of new technologies.

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APPENDIX

Sample of the questionnaire

I'm a student of Federal University of Technology Minna and conducting research on "The level of agricultural mechanization in Katsina State". Would you kindly answer the following questions by simply ticking the box provided. Your responses will be kept highly confidential.

I assure you that all your response would be highly confidential.

SECTION A – PERSONAL INFORMATION

- i. Local Government Area _____
- ii. Sex _____
- iii. Age

below 25 years 25 – 30 years above 30 years

SECTION B – RESEARCH QUESTIONS

Q1. What is your major agricultural production system that you practice in your area?

- | | | | |
|---------------------|--------------------------|---------------------|--------------------------|
| (a) Crop production | <input type="checkbox"/> | (b) Irrigation | <input type="checkbox"/> |
| (c) Dairy farming | <input type="checkbox"/> | (d) Agro-processing | <input type="checkbox"/> |

Q2. What is the approximate size of land on which you carry out agricultural production?

- | | | | |
|--------------------------|--------------------------|---------------------------|--------------------------|
| (a) Less than 1 hectare | <input type="checkbox"/> | (b) Between 1- 5 hectares | <input type="checkbox"/> |
| (c) More than 5 hectares | <input type="checkbox"/> | (d) Unknown | <input type="checkbox"/> |

Q3. What is the level of awareness of agricultural mechanization within your area?

- (a) High level (b) moderate level
(c) Low level (d) Insignificant level

Q4. Which agricultural operation is major under mechanization in your area?

- (a) Land preparation (b) Application of fertilizer
(c) Planting (d) Agro-processing

Q5. What is the common source of power employed for agricultural operation in your area?

- (a) Manual power (b) Engine power
(c) Animal power (d) Other source (specify) _____

Q6. How do you acquire the source of power for agricultural mechanization?

- (a) By purchase through Bank loan
(b) Hired labour
(c) Family labour
(d) Tractor hiring service

Q7. Which agricultural equipment is commonly used in your area?

- (a) Land preparation equipment (b) Planting equipment
(c) Spraying equipment (d) Harvesting equipment

Q8. State the type of equipment for your answer in question 7

- (a) Animal drawn plough (b) Tractor mounted plough
(c) Harrows & ridgers (d) Knapsack sprayer

Q9. What form of training do you receive for the practice of agricultural mechanization?

- (a) On-Farm demonstration (b) Field visit
(c) None (d) Organized formal Training

Q10. What is the approximate expenses incurred for agricultural production on your farm?

- (a) N 10,000 – N30, 000 (b) N30, 000 - N50, 000
(c) N50,000 – N100,000 (d) Above N100,000
(e) specify

Q11. What is the requirement by farmers in Katsina State for agricultural mechanisation?

- (a) Finance (b) Adoptable power source
(c) Training (d) Relevant technology

Q12. What is the problem that affects agricultural mechanization in Katsina State?

- (a) Practice of subsistence agriculture
(b) Lack of awareness on the benefit of Agricultural mechanisation
(c) High cost of Equipments and spare parts
(d) Unavailability of simple and relevant technology

Q13. What is the position of farmers in Katsina State with respect to adoption of agricultural mechanization?

(a) Reluctant to adopt agricultural mechanization operations.

(b) Cannot afford to use agricultural mechanization.

(c) Willing to adopt agricultural mechanization

(d) Agricultural mechanisation is unprofitable