

EVALUATION OF POWER REQUIREMENTS FOR BASIC AGRICULTURAL FARM
OPERATIONS (LAND PREPARATION) IN SOME SELECTED STATES OF THE SIX
GEOPOLITICAL ZONES OF NIGERIA.

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BEING A FINAL YEAR PROJECT SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF ENGINEERING
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FEBRUARY, 2010.

DECLARATION

I hereby declare that this project is a record of a research work that was undertaken and written by me. It has not been presented before for any degree or diploma or certificate at any university or institution. Information derived from personal communication, published and unpublished works of others were duly referenced in the text.



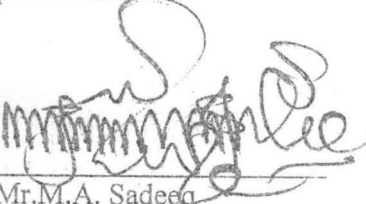
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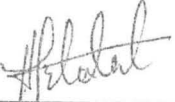
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CERTIFICATION

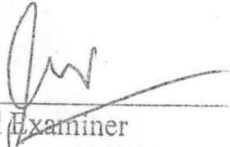
This project entitled "Evaluation of Power Requirements for Basic Agricultural Farm Operations (Land Preparation) in some selected States of the Six Geo-political Zones of Nigeria" by Ojukwu Chike Tochukwu, meets the regulations governing the award of the degree of Bachelor of Engineering (B.ENG.) of the Federal University of Technology, Minna, and it is approved for its contribution to scientific knowledge and literary presentation


Mr. M.A. Sadeeq
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16/03/2010
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22/03/10
Date


External Examiner

10/2/2010
Date

DEDICATION

This project work is dedicated to Almighty God.

ACKNOWLEDGEMENTS

I give honour to Almighty God for sparing my life and seeing me through the difficult periods and also for drawing the motor of my desire of further studies to success. When kindness can not be returned, it should be appreciated. In the course of writing this project work, my lecturers have been very kind to me, and it is in this regard that I express my profound gratitude to my lecturers for their support to the success of my project work.

My profound and heartfelt appreciation goes to my supervisor, Engr. M.A Sadeeq whose advice and effort helped in seeing this work through. I would also like express my gratitude to the Head of Department, Agricultural and Bioresources Engineering, Engr. Dr. A.A. Balami and the entire members of staff who have allowed me to draw from their wealth of knowledge.

My heartfelt appreciation to my mum, Mrs. F Ojukwu for her moral advice and financial support throughout the duration of my education.

Again, a big thanks to you all and God Bless.

ABSTRACT

The project emphasizes on the importance of sources of power i.e. human, draught animal and tractor power for some basic agricultural farm operations. Questionnaire was designed, two per ministry and as well as semi- structured interviews (SSIs) aided in gathering information for the analysis, obtained from the respondents of various Ministries of Agriculture and other related parastatals within the selected states shows that Human power is the predominant source of power for land cultivation with modest contribution from draught animal and tractor in Nigeria. Human power is the most significant power source in South South, South East and South West. It accounts for an estimated 72.7 percent, 77.7 percent and 76.9 percent respectively. Draught animal is significant source of power in North West and North East, they account for an estimated 40 percent, 55.5 percent and 30 percent for tractor power respectively.

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CHAPTER ONE

1.0. INTRODUCTION

1.1 Background of Study

The availability of power is a prerequisite for any agricultural farm operation whether the source is human, animal or mechanical. In developed countries agricultural system, the general availability of different forms of farm power is almost taken for granted. They are mostly focuses on internal combustion engine or electric motors, whereas the human is still the brain and control of the system.

Power is needed on the farm for a variety of operations, which may be either mobile or stationary. Examples of mobile operations include, the transportation of farm produce from farm to the store and many field operations such as tillage, ploughing, fertilizer application and harvesting. While stationary applications include operations like threshing, extracting and raising water for irrigation.

Human power is by far the earliest source of power and continues to be important. However, as civilization progressed, man harnessed other sources of power to supplement or replace the power he was able to produce and this reduced the drudgery of farm work. There are other sources of power available for farm operation such as, draught, animal power, wind power, water power, solar power, electric power and internal combustion engines. Some of these powers are limited in use (Kaul and Egbo, 1985).

In most developing countries (e.g. Nigeria), the human power is the major source of farm power. How significant is this and to what extent is human power used? How would this change in the future, and can the required farm product to feed the rural and urban population be produced from an agricultural system which rely to a large extent on human labour?. There is great variation in the proportion of use of

the three primary sources of farm power. In some areas there is a dynamic situation in which human and animal power is being replaced by mechanical power. In others, farmers are giving up mechanical and animal power and reverting back to human power. The dominant role of human energy (muscle power) input into Nigeria's agricultural production system at any stage of mechanization is overwhelming for now.

1.2 Objectives of the study

The main objective of this project is to assess the available power requirement for some basic agricultural farm operations and compare those sources of power.

1.3 Statement of problem

As population tends to increase globally, the need to improve on the available power sources arises. so as to Increase the level of food production through total power inputs to agricultural production, and secondary to take an area based approach focusing on the proportion of the total area cultivated by either humans, draught animals and tractor within the six geopolitical zones in Nigeria.

1.4 Justification of project

Some of the farm machineries are very expensive, such as self-propelled combine harvester and high power tractor and they are not economically viable for small scale farming. The choice of power source may be between human power, draught, animal power or mechanical power, if the cost difference is lesser in one than the other, the farmer would prefer to use the source with lesser cost.

1.5 Scope of the Study

This project work is limited to the evaluation and investigation of the importance of sources of power for a basic agricultural farm operation in some selected states of the six geopolitical zones in Nigeria.

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1. Manual Power

This is power produced by human beings. It is the earliest source of power and continues to be important. As civilization progressed, man harnessed other sources of power to supplement or replace the power he was able to produce and thus reduced the drudgery of farm work.

Manual power continues to be the main source of farm power in most developing countries. Human can develop 0.08KW but this, of course, varies with environmental conditions and they type of food intake. Men can serve as a source of power and as control device, but the extent of which they may be used as one and the other depends on the degree of mechanization. For instance, in parts of world where a high level of mechanization exists, men act more as control device than as sources of power. The reverse is the case for areas of low level of mechanization. However, human power is generally a source of supplementary power, in conjunction with other power sources. (Kaul and Egbo, 1985).

2.2. Animal Power

This is widely used in several countries and may be derived from oxen, buffalo, donkeys, camels and horses. Such power may be used for both stationary and mobile operations (Kaul and Egbo, 1985).

Animals generally have a capacity to be overloaded for short periods of time. They provide good traction even in difficult conditions and they can also pull loads that are heavier than those they can carry. A donkey can pull about 80 percent of his weight for a short period and about 10-15 percent of his weight for a long periods,

while an ox can provide a pull of about 15 percent of its weight (Clarke and Bishop, 2002).

Animal power has not been fully exploited in the African continent. In some countries, like Nigeria, there are certain ecological limitations imposed by the prevalence of the tsetse fly. In India, animal hauls more freight each year than railways. Animals provide an estimated 30.000MW of power:-1000MW more than the 29,000Mw provided by electricity.(Clarke and Bishop 2002).

The output available from animals depends on their food intake, the breed of animal, the training given and the yoke used for hitching them.

Table 2.1: Adapted from the Manual Employment of Raft Animals in Agriculture Published by FAO, Rome 1972.

ANIMAL TYPE AND NUMBER	WEIGHT (KG)	AVERAGE EFFORT (N)	MAXIMUM EFFORT (N)	EFFECTIVE DAILY WORKING PERIOD (HOURS)
Donkey (one) Oxen (one Pair)	160	460	880	3.5
(N' Dama) Zebu bullocks (One Pair)	657	900	1700	5.5
Zebu bullocks (two pairs)	650	800	1500	4.4
Oxen (half braling) (One Pair)	1300	1600	1400	5.4
	1060	1470	3100	4.4

2.3. Internal Combustion Engine

This may be used on the farm for a wide variety of operations. When such an engine is self-propelled, it could form a nucleus of a tractor. Diesel engines are the most accepted type of power unit, countries where mechanization is advanced. Maximum and average tractor size and engine power have steadily increased, and along with these are some general use of 4-wheel-drive tractors. The "conventional" rigid frame and pivoting front axle are usually retained. The variety of special purpose vehicles continue to be enlarged notably for harvesting, mechanical handling and spraying or distributing fertilizers (Clauda Cuplin et al, 1986).

In the cause of development, many terms such as "row-crop" and "all-purpose" have indicated ability to do work in addition to the use of a draw bar at the rear. The improvements in 4-wheel-drive have removed many earlier limitations of conventional tractors in regard to operating implements and power-driven machines at the front as well as the rear.

Electronic monitoring and control of tractor and equipment functions is increasingly adopted with benefit to economy of fuel used and safety. Safety regulation designed for the protection of tractor drivers have been considered more fully and this has led to most new tractors been fitted with safety cabs. Others lead to necessity for cabs which reduce the intensity of noise at the tractor driver's ear. Driver seats are improved to reduce spinal and intestinal injuries caused by excessive vibration and controls designed to improve ergonomic aspects of tractor driving.

2.4. Food and Agricultural Organization's Activities

For the past few years FAO have been gathering information on different sources of farm power in developing countries (Clarks and Bishop, 2002). They are in processes of gathering a global picture and making projection as to how this might

change over the next 20-30 years identifying which factor will influence these changes. They only concentrate on the farm power used for field cultivation and not all the farm power, which is extremely complicated. Data is not readily available and manually based system field work is probably the most arduous.

In order to examine the contribution of different power source of agricultural production, two approaches were considered. The first was a base the discussion on the relative contribution of different power sources in terms of their total power input to agricultural production, and the second was to take an area based approach, focusing on the proportion of the total harvested area cultivated either by humans, draught animal and tractor. The first method starts with estimating the number of people, draught animal and tractor working in agricultural operation, converting each of the three power source to kW equivalent, aggregating the total power input to agriculture, and then expressing the contribution of each power source as a percentage of the total. There are four principal concerns with this approach. First, is the lack of availability and reliability of the base data and secondly, the conversion into KW equivalents which relies on estimates of the power equivalent of human beings, draught animals and engine powered machines. Thirdly, the expression of data as a percentage of total power equivalents (due to the fact that the power produced by human is so insignificant when compared to tractors). Finally, the difficulties in projecting over time particularly the substitution between power source which occur over time.

As a result of this problems in using KW equivalent and after a great deal of discussion, area based approach was adopted, initially focusing on the proportion of the total harvested area cultivated by either humans, draught animals or tractors at the country level and then aggregated at both sub-regional and regional levels.

2.5. Agricultural Mechanization

Mechanization aims at reduction of human drudgery associated with farm related work and enhancement of safety in farm operation, which will improve dignity of the farmer and farming as a full time occupation. It deals with the design, development, testing, manufacture, operation, maintenance and repair of all agricultural tools, implements, and their power requirement with respect to prevailing economical, human and social constraints. It includes land development, the improvement of productivity by ameliorating adverse condition like drainage other conservation measures.

Agricultural mechanization is usually classified into three interrelated levels, which often exist side by side, by distinguishable source of power and matching implements i.e. hand tool mechanization, animal draught mechanization and mechanical power. All these levels use human power either as secondary power for control.

2.6. Ergonomics in Agricultural Mechanization

According to (Sule, 1996) ergonomics refers to designing for human use just as agricultural mechanization seeks to improve the lot of the farmers (human user) from the stand point of the reduction of drudgery associated with farming operation. Ergonomics is a more specific sense therefore; cover all the aspect of agricultural mechanization. This could be clearly seen from the similarity of purpose when one considers the benefits derivable and objectives of ergonomics and agricultural mechanization. Ergonomics therefore must be an integral part of any agricultural operation for the realization of the benefits of purpose and any meaningful progress to be achieved.

With the over whelming dominance of human power on the farm, ergonomics application in agricultural mechanization becomes imperative. This is more so that human physiology, body configuration in relation to the tools being used to attain desired objectives and the environment in which work is accomplished, (Sule 1996).

Human physiological characteristic have a direct relationship with energy output for work. These characteristics include pulmonary ventilation rate, oxygen consumption, heart rate, skin electrical activity, sweat rate, and muscular tension. These parameters individually or collectively increase with work load (as on the farm) and vary from individual to individual. They have been successfully used to quantify human work load. (Sule 1996).

For continuous work, it was reported that a man conveniently exerts 75 watts or 4.5. KJ/Min (Sule, 1996). Most agricultural tasks using human power exceed this limit and therefore impose physiological strain on the farmer with the attendant drudgery.

Table 2.2: Dally Energy Levels of Male and Female

Description	Energy Levels (Kcal)	
	Male (70kg)	Female (60kg)
Basal metabolic rate	1700.00	1400.00
Leisure activities rate	600.00	500.00
Daily Caloric requirement	23000.00 to 2400.00	1900.00 to 2100.00

Source: (Sule, 1996)

2.6.1 Body Configuration (anthropometry): In relation to tools used, man exerts energy with which his tools is controlled and maneuvered to do work. A transfer of energy from the man (through the action of muscles) to the tool is accomplished in order to achieve this objective. For this energy transfer to be efficient there must be a

compatible link between the muscles of the hands by gripping, pushing or pulling for hands controlled tools. The tools must be such that it fits the human body dimension for maximum efficiency to be attained. Position during work and the manner of working have a considerable effect on work output. The constant use of digging hoes can lead to permanent abnormal curvature of the spine in adults and in children, it may arrest their development, estimated that 50% adults suffer back aches during at least one period of their lives due to improper designs of seats, work station, work tools and work methods. (Sule, 1996).

2.6.2 Environment of Work: The place where work is being performed is referred to as environment of work. The environment will include the temperature (cold or hot), relative humidity, dust level, wind velocity, ventilation, visibility, illumination, vibration and air pressure. The environment imposes a physiological load on the operator thereby, limiting the output irrespective of human physiological and work tool. It is also known that whole body vibration have hindered the effective development of agricultural machine e.g. small working tractor.

2.7. Draught Animal Power Implement

Conventional annual ploughing using an ox-drawn mould board plough is the commonest tillage practice for small holder farmers, and it was first introduced in the 1920, (Fraser et al, 1986). Most farmers used the mould board plough to do spring ploughing after the first rain. Annual conventional ploughing is considered an intensive technique and is associated with soil degradation, high draught force requirement, and loss of crop productivity. For this reason plough use was regarded as unsustainable, mainly because of the serious erosion it can cause, but, traditional farmers are still using it. The increasing effort towards sustainability has stimulated the need to explore alternative tillage techniques.

The work reported in 2000/2001 season by (Eimbanje et al, 2001) is part of a series on station field trial to assess the performance of a range of draught animal power implements available in Zimbabwe for crop establishment and mechanical weeding. The report was concentrated on the draught power characteristics and yield responses to a variety of animal drawn minimum implements that have been developed.

2.8. Power Requirement for Weed Control

Hand weeding is the major labour activity in direct seeded upland and rainfall low land rice in West Africa. Delayed weeding results in serious yield reduction. (Thomas and Joshua, 2000), carried out a test on weed control option that would allow earlier, more rapid and repeated weeding in direct seeded rice. This option included; row seeding rice with animal drawn and manual seeder: mechanical inter row cultivation with animal drawn equipment; and within row weed control with herbicides or by hand pulling.

The animal drawn super ECO seeder proved superior to the hand-pulled casamance seeder, within row weeds were effectively controlled by broadcasting oxadiazon (Ronster) herbicide at 0.7kg active ingredient/ha one day after seeding.

Herbicide use was profitable in upland rice and only slightly profitable in rain fed low land rice. Complete hand pulling of within row weeds in upland rice required 89day/ha and was not profitable. Selectively removing larger weeds reduce hand weeding time to 37 days/ha and increase yield by 11%.

The result of this two years study indicated that effective weed control without external input can be attained by row seeding with donkey-drawn super ECO seeder, cultivating twice with the Hoe Occidentale and selectively removing within-row weeds by hand pulling.

2.9. Power Requirements and Performance

Several types of subsoilers have been manufactured which adequately shatter the soil to break up compaction. Subsoiler shanks may be parabolic shape or straight and with or without wings. In general, the power required to pull a parabolic shank is less than a straight shank. The addition of wings to either parabolic or straight shanks increases the power requirement.

A straight shanked subsoiler without wings has been used in Nebraska studies. The power requirement per shank for different soil is illustrated in Table 3 for several compacted soil, the power requirement to break up compaction can be as high as 45 draw bar Hp per shank.

Table 2.3: Speed, Power Requirement and Depth of Subsoiling for Nebraska soils

Soil Series	Speed	Hp/Shank		Depth of		Country		
	MPH	PTO		Drawbar		Subsoiling		
	MIN	MAX	MIN	MAX	MIN	MAX	Inches	
Hastings	2.7	3.23	6	4.7	27	35	15	Platte
Moody	2.6	3.8	3.7	60	27	45	20	Madison
Shapsburg	3.1	4.0	44	54	33	41	16	Lacaster
Laretto	2.0	3.3	30	33	23	25	16	Madison
Hastings	3.0	3.8	35	51	26	38	15	Filmore
Pownee	2.4	3.7	39	53	29	40	15	Johnson
Wymore	2.1	3.0	37	51	27	38	20	Lacaster

PTO x 0.75 = Drawbar Hp

Source: (Alice et al, 2002)

Research funded by the Nebraska Soybean Development, Utilization and Marketing Board and the University of Nebraska.

CHAPTER THREE

3.0. METHODOLOGY

3.1. Area-based Approach Method would be used to Evaluate the Contribution of Different Power Sources of Agricultural Production in Nigeria

The first task would be to base the discussion on the relative contribution of different power sources to the total power input to agriculture.

This method will start estimating the number of people, draught animals and tractor used as a source of farm power converting each power source into KW equivalent and expressing the contribution of each power source as a percentage of the total.

Nigeria is divided into six geopolitical zones which include South South, South East, South West, North Central, North West and North East. Two states from each zone will be selected randomly for statistical analysis.

There are quite considerable number of methods that can be used to obtain the necessary information, and the procedure will entail some extensive research work before arriving at desired result.

These methods include

- (a) The use of Questionnaire
- (b) The use of historical research

3.1.1. Questionnaire

This is a method by which questionnaires are sent out to different states in order to obtain necessary information about different sources of power. Total number of twenty-four copies will be printed, and sent out to various agricultural establishment and Ministry of Agriculture of each state, because the centre of

information relating or pertaining to agriculture usually have their source from the state Ministry of Agriculture and other establishment collated at the Ministry level. For example, in Kwara State, there is Ministry of Agriculture, Kwara Agricultural Development Project, Niger River Basin Development Authority, National Centre or Agricultural Mechanization and Federal Ministry of Agriculture. Each copy of the questionnaire was sent to different State's Ministry of Agriculture in each geographical zone. The other copies will be sent to other agricultural establishment that are much involved in farm mechanization.

Table 3.1: Selected Sample States

Zone	State
South South (A)	Rivers State Bayelsa State
Southern East (B)	Imo State Enugu State
South West (C)	Osun State Ogun State
North Central (D)	Kwara State Nassarawa State
North West (E)	Sokoto State Katsina State
North East (F)	Adamawa State Yobe State

3.2. Method of Data Analysis

Expressing the contribution of each power source as percentage of the total in each state.

Hypothetical Analysis

Zone G, State 1

Let Human = a, Draught Animal = b, Tractor = c, Total = T

Human as % of total = $a/T \times 100$ 3.1

Draught Animal % = $b/T \times 100$ 3.2

Tractor = $c/T \times 100$ 3.3

3.3. Conversion of Power Requirement into Kilowatt Equivalent

Assumption has to be made in conversion of human power and animal power into kW equivalent (Clarke and Bishop, 2002).

For a man working at the peak of his power, for short period of time about 2 to 3 hours, it has been found that he can input at average of 2kW.

However, if he has to work consistently for longer hours, the power input could be much less as low as 0.08kW.

If 1 Hp = 0.745kW, the following assumption can be made within reasonable limit or error.

- (a) 1 horse is equivalent to 1 big healthy animal
- (b) Three (3) strong healthy men are also equivalent to 1 horse power.

3.4. Presentation of Results

Farm Power Zone and State	Contribution of each Power Source as a Percent of Total Power (From Questionnaire)		
	Human	D. Animal	Tractor
(A) River State	X1	Y1	Z1
Bayelsa State			
(B) Imo State	X2	Y2	Z2
Enugu State			
(C) Osun Sstate	X3	Y3	Z3
Ogun State			

(D) Kwara State	X4	Y4	Z4
Nassarawa State			
(E) Sokoto State	X5	Y5	Z5
Katsina State			
(F) Adamawa State	X6	Y6	Z6
Yobe State			

X, Y and Z are the number of human, draught animal and tractor recorded from the questionnaire.

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P.M.B. 65, NIGER STATE

PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC
AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT:

NAME/POSITION:

SECTION A

1. List various sources of power commonly used for farm operation in your area?
.....
.....
2. Which of these sources of power, listed above is predominantly used in your area?
.....
.....
3. What are the reasons for your choice?
.....
.....
4. From you past experience, will you say that a particular source of power perform a specific operation better than the other? Yes () No ()
5. Give reasons for you answer
.....
.....
6. What are the types of human source of power commonly used in your area? (Sex, Size, Age)?
.....
.....
7. What are the types of drought animal source of power commonly used in your area?
.....
.....
8. What are the types of tractor commonly used in your area?
.....
.....

9. From available data, what is the estimation of the total number of people used as source of power for farm operation in your area?

.....
.....

10. What is the estimation of the total number of animal drought used as a source of power for farm operation?

.....
.....

11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?

.....
.....

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)

(i) How many hours or days will it take a specific number of people to prepare the land:

.....
.....

(ii) What are the cost of their feeding and the cost of the power used:

.....
.....

(iii) What are the factors that can affect the performance of these people working on the farm?

.....
.....

(iv) What are the side effects that can challenge the use of human labour in feature?

.....
.....

(v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes () No ()

(vi) Give reason for the answer

.....
.....

2. If the same one hectare of land is to be prepared for seed planting (clearing & tillage)
- (i) How many hours or days will it take a specific type of animals to prepare the land?
.....
.....
 - (ii) What are the cost of their feeding and cost of the power used?
.....
.....
 - (iii) What are the factors that can affect the performance of those animals working on the field?
.....
.....
 - (iv) What are the side effects that can challenge the use of the drought animal in future?
.....
.....
 - (v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes () No ()
 - (vi) Give reason for the above answer
.....
.....

3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).

- (i) How may hours of the day will it take a specific type of tractor to prepare the land?
.....
.....
- (ii) What are the cost of power used and fuel consumption?
.....
.....
- (iii) What are the factors that can affect the performance of the tractor working on the farm?
.....
.....
- (iv) What are the side effects that can challenge the use of tractor in future?

.....
.....
(v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes () No ()

(vi) Give reason for the above answer
.....
.....

SECTION C

1. Which of these sources of power will you consider as the best source, human power, animal power and tractor power?
.....
.....

2. Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?
.....
.....

3. What are the contribution of each sources of power mentioned in number 1 to over all Nigerian Agricultural Production?
.....
.....

4. How will you assess the contribution of each source of power to overall Nigeria agricultural production?
.....
.....

5. How will you assess the contribution of each source of power to overall Nigeria agricultural production?
.....
.....

6. What is your general remark?
.....
.....

CHAPTER FOUR

4.0. RESULTS AND DISCUSSION

4.1 Area Based approach Method

Area-based approach method was used to assess the available power source for basic agricultural farm operation, and compared to other sources of power available.

Information and necessary data were obtained from the respondents of different Ministries of Agriculture and related establishments in Nigeria through the questionnaires. Total estimation of the number of people, draught animals and tractors used as source of power in each state were tabulated out from those questionnaires. The contribution of each state's power source was expressed as the percentage of total, converting each power used into kW equivalent.

Table 4.1: Total Estimation Number of Human, Draught Animal and Tractors Working in Each Zone (From the Questionnaire)

Zone	State	Human	D. Animal	Tractors	Total
A.	River State	400	N/A	150	550
	Bayelsa State			100	300
B.	Imo State	700	N/A	200	900
	Enugu State	500		150	650
C.	Osun State	500	N/A	150	650
	Ogun State	300		200	500
D.	Kwara State	800	200	350	1350
	Nassarawa State	500	400	100	1000
E.	Sokoto State	800	500	200	1500
	Katsina State	400	100	1000	
F.	Adamawa State	500	300	200	1000
	Yobe State	300	500	100	900

4.2. Analysis of Data

Zone A, River State

Human = 400m D animal = 0, Tractor = 150, Total = 550

$$\text{Human} = \frac{400}{550} \times 100 = 72.7\%$$

Bayelsa State

Human = 200m D animal = 0, Tractor = 100, Total = 300

$$\text{Human} = \frac{200}{300} \times 100 = 66.6\%$$

Draught Animal is not applicable to this state

$$\text{Tractor} = \frac{100}{300} \times 100 = 33.4\%$$

Zone B, Imo State

Human = 700m D animal = 0, Tractor = 200, Total = 900

$$\text{Human} = \frac{700}{900} \times 100 = 77.7\%$$

Draught Animal is not applicable to this state

$$\text{Tractor} = \frac{200}{900} \times 100 = 22.3\%$$

Enugu State

Human = 500m D animal = 0, Tractor = 150, Total = 650

$$\text{Human} = \frac{500}{650} \times 100 = 76.9\%$$

Draught Animal is not applicable to this state

$$\text{Tractor} = \frac{150}{650} \times 100 = 23.1\%$$

Zone C, Osun State

Human = 500m D animal = 0, Tractor = 150, Total = 650

$$\text{Human} = \frac{500}{650} \times 100 = 76.9\%$$

Draught Animal is not applicable to this state

$$\text{Tractor} = \frac{150}{650} \times 100 = 23.1\%$$

Ogun State

Human = 300m D animal = 0, Tractor = 200, Total = 500

$$\text{Human} = \frac{300}{500} \times 100 = 76.9\%$$

Draught Animal is not applicable to this state

Human = 300m D animal = 0, Tractor = 200, Total = 500

$$\text{Human} = \frac{300}{500} \times 100 = 60\%$$

Draught animal is not applicable to this state

$$\text{Tractor} = \frac{200}{500} \times 100 = 40\%$$

Zone D, Kwara

Human = 800m D animal = 200, Tractor = 350, Total = 1350

$$\text{Human} = \frac{800}{1350} \times 100 = 59.2\%$$

$$\text{Draught Animal} = \frac{200}{1350} \times 100 = 14.8\%$$

$$\text{Tractor} = \frac{350}{1350} \times 100 = 26\%$$

Nassarawa State

Human = 500m D animal = 400, Tractor = 100, Total = 1000

$$\text{Human} = \frac{500}{1000} \times 100 = 50\%$$

$$\text{Draught Animal} = \frac{400}{1000} \times 100 = 40\%$$

Zone E, Sokoto State

Human = 800m D animal = 500, Tractor = 200, Total = 1500

$$\text{Human} = \frac{800}{1500} \times 100 = 53.3\%$$

$$\text{D. Animal} = \frac{500}{1500} \times 100 = 33.4\%$$

$$\text{Tractor} = \frac{200}{1500} \times 100 = 13.3\%$$

Katsina State

Human = 500m D animal = 400, Tractor = 100, Total = 1000

$$\text{Human} = \frac{500}{1000} \times 100 = 50\%$$

$$\text{D. Animal} = \frac{400}{1000} \times 100 = 40\%$$

$$\text{Tractor} = \frac{100}{1000} \times 100 = 10\%$$

Zone F, Adamawa State

Human = 500m D animal = 400, Tractor = 100, Total = 1000

$$\text{Human} = \frac{500}{1000} \times 100 = 50\%$$

$$\text{Draught Animal} = \frac{300}{1000} \times 100 = 30\%$$

$$\text{Tractor} = \frac{200}{1000} \times 100 = 20\%$$

Yobe State

Human = 300m D animal = 500, Tractor = 100, Total = 900

$$\text{Human} = \frac{300}{900} \times 100 = 33.4\%$$

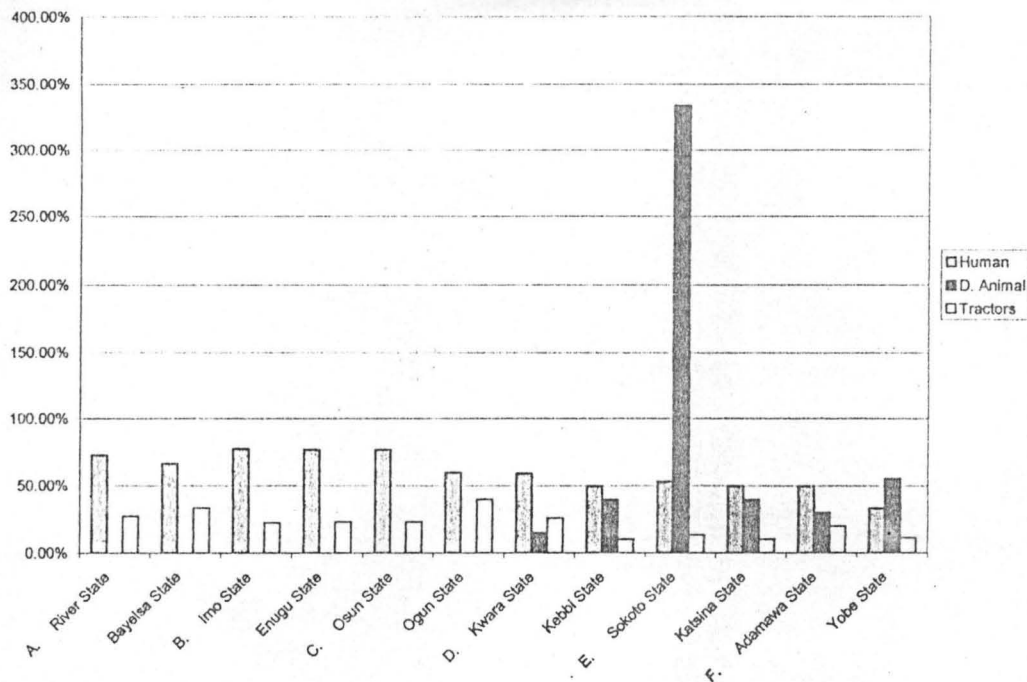
$$\text{Draught Animal} = \frac{500}{900} \times 100 = 55.5\%$$

$$\text{Tractor} = \frac{100}{900} \times 100 = 11.1\%$$

Table 4.2: Presentation of Result on Farm Power Zones and States

Farm Power Zone and State	Contribution of each Power Sources as a Percentage of Total Power (From Questionnaire)		
	Human	D. Animal	Tractors
A. River State	72.7%	N/A	27.3%
Bayelsa State	66.6%	N/A	33.4%
B. Imo State	77.7%	N/A	22.3%
Enugu State	76.9%	N/A	23.1%
C. Osun State	76.9%	N/A	23.1%
Ogun State	60%	N/A	40%
D. Kwara State	59.2%	14.8%	26%
Nassarawa State	50%	40%	10%
E. Sokoto State	53.3%	33.4%	13.3%
Katsina State	50%	40%	10%
F. Adamawa State	50%	30%	20%
Yobe State	33.4%	55.5%	11.1%

PERCENTAGE COMPONENT BAR CHART OF THE CONTRIBUTION OF DIFFERENT SOURCE OF POWER



4.3. Conversion of Power into Kilowatt Equivalent

Assumption has to be made in conversion of human and animal power into kw equivalent (Clarke and Bishop 2002).

MF Tractor (75 H.P) would spend 4 hours for clearing and tilting of 1 hectare of land. Human and animal power are very difficult to quantify in terms of the rate of power expended. Assumption can be made in quantifying them through series of intermediate process and subsequently convert them into kW equivalent.

Assumptions (Ref 3.3)

- (a) 1 horse power is equivalent to 1 big healthy animal
- (b) Three (3) strong healthy men are also equivalent to 1 horse power
- (c) 75 hp. MF tractor can clear and till 1 ha of land for 4 hours at the rate of N4,320/hectare.

4.3.1 Animal Power

From the above, if 1 hp. is equivalent to 1 big healthy animal (donkey, horse, bull and camel).

75 hp. MF Tractor = 75 x 175 Animals that can be used for clearing and tilling 1 ha in 4 hours. But 4 animals would spend 2 days to complete the operation (from questionnaire).

$$\begin{aligned}\text{Total cost of power (Hiring)} &= \text{N600 per Animal per day} \\ &= 600 \times 4 = \text{N2,400/day}\end{aligned}$$

For 2 days = 4,800

1 h.p. = 0.74569kW (Claud, 1986)

$$\begin{aligned}\text{Then the Power used for this operation} &= 75\text{hp} \times 0.745699 \\ &= 55.9\text{kW}\end{aligned}$$

4.3.2 Human power

If 1 hp. is equivalent to 3 strong healthy men

Therefore 75 hp. MF Tractor = 75 x 3 = 225 men clearing the tilling 1 ha in 4 hours. But 12 people would spend 2 days to complete the operation at an average working time of 2.4 hrs per day

Total cost of power (hiring) labour + feeding = (N400 + N100) per person x total number of labourers = N500 x 12 = N6,000.

1 h.p. = 0.74569kW (Claud, 1986).

The equivalent of human power used for this operation = 75hp x 0.745699 x 3 = 165.6kW

Table 4.3: Estimation of Human and Tractor Power (From Questionnaire)

S/No	State	Human Power (X)	Tractor Power (Y)
1	Rivers State	400	150
2	Bayelsa State	200	100
3	Imo State	700	200
4	Enugu State	500	150
5	Osun State	500	150
6	Ogun State	300	200
7	Kwara State	800	350
8	Nassarawa State	500	100
9	Sokoto State	800	200
10	Katstina State	500	100
11	Adamawa State	500	200
12	Yobe State	300	100

4.4 Discussion

Human power is the most significant power source in South South, South East and South West. It accounts for an estimated 72.7%, 77.7% and 76.9% respectively. In this area, a relatively high proportion of land is under cultivation, but crop intensity is low and incidence of tse-tse fly makes this area unsuitable for many types of draught animals. Problem of adequate feeding and well trained veterinary doctor affect the availability of animal in these zones. The major factors that affect the use of tractors in this zone are the availability, obsolesce, age of the tractor, fuel contamination and scarcity.

There are two zones in this country, where draught animal are significant source of power for farm operation. North West and North East, they account for an estimated 40% and 55.5% respectively. Draught animal (mostly camel, donkey and bull) are used mainly for primary tillage with limited use in secondary operation such as planting and weeding. They are also important in mountainous area where the terrain is not suitable for the use of tractor. The use of tractor is affected by its availability, topography of land, fuel contamination and fuel scarcity. Tractor are not significant power source in many parts of Nigeria. This is the cheapest source of power, but is not always readily available. Problem of fuel scarcity and contamination, spare parts, maintenance and repair, soil condition affect the use of tractor in Nigeria. These three important sources of power (human, draught animal and tractor power) are related to each other in many ways. For instance, in Northern area where the problem of fuel scarcity and contamination by series of dilution is common, this fuel scarcity will cause increase in the price of hiring tractor, and this will also induce the price of other source of power to increase. It was discovered that 75 H.P i.e. Massey Ferguson (MF) tractor would spend four hours in clearing and tilling on hectare of land at the rate of N4,320, irrespective of any vegetation that human and animal can handle. Whereas four animal would spend complete two days to finish the operation at the rate of N4,800. For human power, twelve healthy strong men would spend exactly two days to complete the operation at the rate of N6000. tractor is the cheapest source of power, but they are not readily available like other source of power (human and animal power). Tractor as sources of power for mechanize farming remains an indispensable

tool for large scale food production. It's effectiveness for increased food production and reduced labour requirement, has made farming operation more attractive and hence more lucrative.

Owing to the complex and variable nature of the soil, there are two terms commonly associated with general power evaluation i.e. Tractive power efficiency and co-efficient of traction.

Tractive power efficiency is the ration of draw bar horse power to the horse power input into the final driving axles. It is a measure of efficiency with which the traction device transforms the torque of the axle into linear draw bar pull. The coefficient of traction is the ration of the traction on draw bar pull to the dynamic load on the traction device. Those factors that are affecting the coefficient of traction tend to increase the rate of power required, such as type of traction device, soil type, soil state, soil moisture content, dimension of traction device and soil pressure distribution.

CHAPTER FIVE

5.0. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

Human power is predominant source of power for land cultivation with modest contribution from draught animal and tractor in Nigeria.

Availability and socio-economic factors are the main factors that caused the difference in farm power source of each zone. In areas dominated by human power, their economy is based on typical agricultural sector. Area using draught animal are not very different from those using human power, and animal is more available in these areas than others.

Areas dominated by tractor power have substantially different factors. Agriculture is no longer the dominant sector, it employs less than half of the work force in some areas. The absolute number of people working in agriculture has started to decrease, this is often considered to be one of the more significant turning point in process of economic development. The drive to change the composition of farm power inputs will come from either change in the demand for farm power or from supply or both.

Any increase in total agricultural output, either from area expansion, an increase in cropping intensity or an increase in yield requires additional power. Harvesting handling and processing also require additional demand on power.

5.2. Recommendation

Farmers can either increase their power input through the use of improved tools and equipment. Alternatively, they can adopt different practices or changing cropping patterns that can lead to reduced power requirement, for example in

conservation agriculture, the use of direct seeding and elimination of conventional tillage means less time and drudgery for land preparation.

Broadcasting rice overcomes the labour intensive activity of transplanting seedling. The use of cover crops, residue management or herbicides can overcome labour associated with weeding.

Mechanized farming can only be encouraged by availability and improved productivity of farm power inputs, it will as well, as reduce the drudgery of farm work.

There should be a solution to all those factors that are affecting young people, animals and tractor working on the farm, for instance, young people for farm work are always influenced by other claims on their time, such as house hold task, schooling and opportunities for off farm work. The productivity of draught animals is affected by their health and nutrition, the training of the animal, operator skill and availability of appropriate implements. Productivity and sustainable use of motorized inputs is dependent on operator's skill and resources appropriate equipment and access to an infrastructure capable of providing timely and costly effective repairs and maintenance services.

Other sources of power, apart from the most commonly used, i.e. wind power, water power, solar power, and electric power should be developed and made available to supplement the existing power used.

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AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
SCHOOL OF ENGINEERING
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
P.M.B. 65, NIGER STATE

PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC
AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT: MINISTRY OF AGRICULTURE RIVER STATE

NAME/POSITION: SOLOMON TIMIPREYE

SECTION A

1. List various sources of power commonly used for farm operation in your area?

Tractor & human

2. Which of these sources of power, listed above is predominantly used in your area?

human power

3. What are the reasons for your choice?

Cheaper to use & swampy nature of the area.

4. From you past experience, will you say that a particular source of power perform a specific operation better than the other? Yes () No ()

5. Give reasons for you answer

Tractors get stuck in swamps so we prefer human power for effective cultivation

6. What are the types of human source of power commonly used in your area? (Sex, Size, Age)?

male & female, within 18 - 40 yrs

7. What are the types of drought animal source of power commonly used in your area?

NIL

8. What are the types of tractor commonly used in your area?

FORD FL90 & Steyr.

9. From available data, what is the estimation of the total number of people used as source of power for farm operation in your area?

human 400

10. What is the estimation of the total number of animal drought used as a source of power for farm operation?

Nil

11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?

150

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)

(i) How many hours or days will it take a specific number of people to prepare the land:

5 to 7 men per day.

(ii) What are the cost of their feeding and the cost of the power used:

#1050

(iii) What are the factors that can affect the performance of these people working on the farm?

nature of the land, inadequate feeding, drugery.

(iv) What are the side effects that can challenge the use of human labour in feature?

energy consuming nature of human labour can challenge tractor use in feature

(v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes () No (✓)

(vi) Give reason for the answer

Their input is only manual not technically based.

2. If the same one hectare of land is to be prepared for seed planting (cleaning and tillage)

(i) How many hours or days will it take a specific type of animals to prepare the land?

four well faced Bulls in a day

(ii) What are the cost of their feeding and cost of the power used?

(iii) What are the factors that can affect the performance of those animals working on the field?

(iv) What are the side effects that can challenge the use of the drought animal in future?

(v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes () No ()

(vi) Give reason for the above answer

3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).

(i) How many hours of the day will it take a specific type of tractor to prepare the land?

2 hours

(ii) What are the cost of power used and fuel consumption?

6,500 for 50 litres

(iii) What are the factors that can affect the performance of the tractor working on the farm?

Swamp nature of the area can affect the performance of the tractor.

(iv) What are the side effects that can challenge the use of tractor in future?

overpopulation
inadequate fuel supply
poor awareness

(v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes () No (✓)

(vi) Give reason for the above answer

Tractor increases efficiency of work done but not yield as it is a function of inputs

SECTION C

1. Which of these sources of power will you consider as the best source, human power, animal power and tractor power?

Tractor

2. Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?

Tractor tills soil properly and easily available on hire basis & effective for large hectares.

3. What are the contribution of each sources of power mentioned in number 1 to over all Nigerian Agricultural Production?

Tractor for commercial production, human for subsistence production

4. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

5. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

Tractor power is highly efficient and cultivates more hectares but is not to contribute a great deal as cost to power is expensive.

6. What is your general remark?

Subsidy by the government on the price of tractors for the development of the agricultural sector

AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
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PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT: OGUN STATE MINISTRY OF AGRICULTURE

NAME/POSITION: OMOJOSHO A. OLASHAYE TECH. OFFICER

SECTION A

- List various sources of power commonly used for farm operation in your area?
..... HUMAN AND TRACTOR POWER
- Which of these sources of power, listed above is predominantly used in your area?
..... TRACTOR POWER
- What are the reasons for your choice?
..... BECAUSE OF HIGHER AND MORE EFFICIENT OUTPUT
- From your past experience, will you say that a particular source of power perform a specific operation better than the other? Yes () No ()
- Give reasons for your answer
..... TRACTOR REDUCE DRUDGERY
- What are the types of human source of power commonly used in your area? (Sex, Size, Age)?
..... MALE (12 & ABOVE)
- What are the types of draught animal source of power commonly used in your area?
..... ANIMALS ARE NOT COMMONLY USED
- What are the types of tractor commonly used in your area?
..... FORD, FIML AND STEYR

9. From available data, what is the estimation of the total number of people used as source of power for farm operation in your area?

300 PEOPLE

10. What is the estimation of the total number of animal drought used as a source of power for farm operation?

NIL

11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?

NOT LESS THAN 200

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)

(i) How many hours or days will it take a specific number of people to prepare the land:

THIS DEPENDS ON HECTAREAGE
APPROXIMATELY 40 HRS / DAY

(ii) What are the cost of their feeding and the cost of the power used:

—

(iii) What are the factors that can affect the performance of these people working on the farm?

WAGES & DRUDGORY

(iv) What are the side effects that can challenge the use of human labour in feature?

INTRODUCTION OF NEW TECHNOLOGIES
EASY ACCESSIBILITY TO TRACTOR AT MINIMISED RATE

(v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes () No (✓)

(vi) Give reason for the answer

YIELD IS A FUNCTION OF FARM INPUTS
FERTILIZERS & VIABLE SEEDS

2. If the same one hectare of land is to be prepared for seed planting (cleaning and tillage)
- (i) How many hours or days will it take a specific type of animals to prepare the land?

- (ii) What are the cost of their feeding and cost of the power used?
 .. THIS DEPENDS ON LOCAL CUSTOM ..
- (iii) What are the factors that can affect the performance of those animals working on the field?

- (iv) What are the side effects that can challenge the use of the drought animal in future?
 .. INCREASED MECHANIZATION RATIO ..
- (v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes (✓) No ()
- (vi) Give reason for the above answer
 .. ANIMAL DUNG IS GOOD SOURCE OF MANURE FOR SOIL ..
 .. FERTILITY ..

3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).
- (i) How may hours of the day will it take a specific type of tractor to prepare the land?
 .. 1 HR APPROXIMATELY 2 HOURS ..
- (ii) What are the cost of power used and fuel consumption?
 .. FUEL & POWER IN 1000 - 15000 / HA / DAY ..
- (iii) What are the factors that can affect the performance of the tractor working on the farm?
 .. FUEL AVAILABILITY & ADEQUATE MAINTENANCE ..
- (iv) What are the side effects that can challenge the use of tractor in future?

(v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes (✓) No ()

(vi) Give reason for the above answer

TRACTOR CAN ALSO BE USED TO APPLY FERTILIZERS ON A WIDER RANGE OF FARMLANDS

SECTION C

1. Which of these sources of power will you consider as the best source, human power, animal power and tractor power?

TRACTOR POWER

2. Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?

INCREASE IN PRODUCTION AREA REDUCE DRUDGERY, TIMELINESS MORE OUTPUT & FASTER

3. What are the contribution of each sources of power mentioned in number 1 to over all Nigerian Agricultural Production?

4. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

5. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

TRACTOR POWER AVAILABILITY NEED TO BE MAXIMISED
HUMAN POWER, READILY AVAILABLE & CHEAPER

6. What is your general remark?

THE DESIRED FOOD REQUIREMENT IN NIGERIA NEEDS TO MEET ONLY BY MECHANISATION ES (TRACTOR)

SCHOOL OF ENGINEERING
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
P.M.B. 65, NICER STATE

PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC
AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT: AGRICULTURAL DEV. PROJECT ADAMAWA
NAME/POSITION: ALIYU AUDU (FARM POWER OFFICER)

SECTION A

1. List various sources of power commonly used for farm operation in your area?
Tractor, Human and Animal Power.
2. Which of these sources of power, listed above is predominantly used in your area?
Human Power and Animal Power
3. What are the reasons for your choice?
Cheaper Source of Power (Human)
Higher and more efficient Output (Tractor)
4. From your past experience, will you say that a particular source of power perform a specific operation better than the other? Yes (✓) No ()
5. Give reasons for your answer
Higher efficiency (Tractor)
Higher Output (Tractor)
6. What are the types of human source of power commonly used in your area? (Sex, Size, Age)?
Young males (18-20) yrs
40-50 yrs and above 58 (Few)
7. What are the types of drought animal source of power commonly used in your area?
Camel and Donkey
8. What are the types of tractor commonly used in your area?
MF Steyr and Ford tractors.

9. From available data, what is the estimation of the total number of people used as source of power for farm operation in your area?

Within the range of 500

10. What is the estimation of the total number of animal drought used as a source of power for farm operation?

300

11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?

200 tractors

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)

- (i) How many hours or days will it take a specific number of people to prepare the land:
For 15 people, it will take them one day to finish the job.

- (ii) What are the cost of their feeding and the cost of the power used:

\$ 150 Per-person

- (iii) What are the factors that can affect the performance of these people working on the farm?

Transportation Problem, Vegetation Cover.

- (iv) What are the side effects that can challenge the use of human labour in feature?

Lack of motivation.

- (v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes () No (✓)

- (vi) Give reason for the answer

Human Power is not efficient & it is slow.

2. If the same one hectare of land is to be prepared for seed planting (cleaning and tillage)
- (i) How many hours or days will it take a specific type of animals to prepare the land?
.....
.....
- (ii) What are the cost of their feeding and cost of the power used?
.....
.....
- (iii) What are the factors that can affect the performance of those animals working on the field?
.....
.....
- (iv) What are the side effects that can challenge the use of the drought animal in future?
.....
.....
- (v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes () No ()
- (vi) Give reason for the above answer
.....
.....

3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).

- (i) How may hours of the day will it take a specific type of tractor to prepare the land?
4 to 5 hours.
.....
.....
- (ii) What are the cost of power used and fuel consumption?
A4000 per hectare.
.....
.....
- (iii) What are the factors that can affect the performance of the tractor working on the farm?
TOPography, Fuel contamination, Shrubs and heater logg.
.....
.....
- (iv) What are the side effects that can challenge the use of tractor in future?

It will cause unemployment for those people used as human power.

(v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes (✓) No ()

(vi) Give reason for the above answer

More land are cultivated within short time and planting is efficient not peasant.

SECTION C

1. Which of these sources of power will you consider as the best source, human power, animal power and tractor power?

Tractor Power

2. Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?

Maximum tillage can be done by tractor. Tractor is more convenient than other sources.

3. What are the contribution of each sources of power mentioned in number 1 to over all Nigerian Agricultural Production?

They are the major source of power commonly used in Nigerian Agriculture

4. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

They can be assessed through the contribution of different power sources to the overall Nigerian Agricultural production.

5. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

6. What is your general remark?

Government should try to improve other sources of power to supplement those commonly used.

PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT: Kwara State ministry of Agric.

NAME/POSITION: J. O Aina (Farm Officer).

SECTION A

- List various sources of power commonly used for farm operation in your area?
Animal Power
Human Power & Tractor Power
- Which of these sources of power, listed above is predominantly used in your area?
Both human power and mechanical power (tractor)
- What are the reasons for your choice?
From practical and extension services over the year.
- From your past experience, will you say that a particular source of power perform a specific operation better than the other? Yes () No (X)
- Give reasons for your answer
Depending on interest of users and availability.
- What are the types of human source of power commonly used in your area? (Sex, Size, Age)?
Male 50-75kg (6-40 yrs old).
- What are the types of draught animal source of power commonly used in your area?
Majorly cow (Bull)
- What are the types of tractor commonly used in your area?
FIAT, STEIR, MF (Massey Ferguson), \$
JD (John Deere), New Holland.

9. From available data, what is the estimation of the total number of people used as source of power for farm operation in your area?
 Kwara Central (200 people) Kwara South (350)
 Kwara North (250 people) Total No is 800 people.
10. What is the estimation of the total number of animal drought used as a source of power for farm operation?
 Kwara North 120 Animal (Carmel)
 Kwara South 80 Animals (Cow) Total is 200 Animals.
11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?
 Kwara Central 200 tractors, Kwara North 50 tractors
 & Kwara South 100 tractors. Total 350 tractors.

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)
- (i) How many hours or days will it take a specific number of people to prepare the land:
 For clearing 12 men in one day.
 For cultivation, 18 men in one day.
- (ii) What are the cost of their feeding and the cost of the power used:
 Feeding = ₦120 person
 Cost of power = ₦500 per day.
- (iii) What are the factors that can affect the performance of these people working on the farm?
 Weather condition syndromical.
- (iv) What are the side effects that can challenge the use of human labour in feature?
 High cost of human labour
 Un-timeliness and inefficiency.
- (v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes () No (✓)
- (vi) Give reason for the answer
 Human power is inefficient and slow.

2. If the same one hectare of land is to be prepared for seed planting (cleaning and tillage)

(i) How many hours or days will it take a specific type of animals to prepare the land?

3-5 hours (for cow) - for every single operation.

(ii) What are the cost of their feeding and cost of the power used?

Cost of feeding borne by the owners.
Cost of power (varied between ₹ 700 - ₹ 800)

(iii) What are the factors that can affect the performance of those animals working on the field?

Feeding Fatigue, diseases and weather conditions.

(iv) What are the side effects that can challenge the use of the drought animal in future?

Availability (low)

(v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes () No (✓)

(vi) Give reason for the above answer

Improvement and yield depend on the management of the farm.

3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).

(i) How many hours of the day will it take a specific type of tractor to prepare the land?

For clearing and cultivation, it will take three and half hours.

(ii) What are the cost of power used and fuel consumption?

Five thousand rupees.

(iii) What are the factors that can affect the performance of the tractor working on the farm?

Topography, Fuel & Maintenance.

(iv) What are the side effects that can challenge the use of tractor in future?

Purchasing price and cost of spare parts.

- (v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes () No (✓)
- (vi) Give reason for the above answer
Improvement and yield depend on the management of the farm.

SECTION C

- Which of these sources of power will you consider as the best source, human power, animal power and tractor power?
Tractor power
- Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?
Tractor is readily available and more convenient than any other source of power.
- What are the contribution of each sources of power mentioned in number 1 to over all Nigerian Agricultural Production?
It increases the income of the farmer and provide employment for the youths.
- How will you assess the contribution of each source of power to overall Nigeria agricultural production?
They can be assessed through their distribution over the country.
- How will you assess the contribution of each source of power to overall Nigeria agricultural production?
Tractor is the most effective source of power. It increase food production.
- What is your general remark?
Tractor is the most effective source of power it increase food production.

AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
SCHOOL OF ENGINEERING
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
P.M.B. 65, NIGER STATE

PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT: Imo State Ministry of Agric

NAME/POSITION: Okonkwo Okachukwu Udemwa (Technical Off.)

SECTION A

1. List various sources of power commonly used for farm operation in your area?
Human Power Tractor

2. Which of these sources of power, listed above is predominantly used in your area?
Human Power

3. What are the reasons for your choice? Poverty and Ignorance

4. From your past experience, will you say that a particular source of power perform a specific operation better than the other? Yes () No ()

5. Give reasons for your answer
Tractor use reduces drudgery & cultivates more land.

6. What are the types of human source of power commonly used in your area? (Sex, Size, Age)?
Males 18 - 40 yrs

7. What are the types of drought animal source of power commonly used in your area?
No Animals used in these Areas.

8. What are the types of tractor commonly used in your area?
Fiat & Ford

9. From available data, what is the estimation of the total number of people used as source of power for farm operation in your area?

from 700 & above

10. What is the estimation of the total number of animal drought used as a source of power for farm operation?

All

11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?

200 registered tractors

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)

(i) How many hours or days will it take a specific number of people to prepare the land:

40 Men in 8 hrs

(ii) What are the cost of their feeding and the cost of the power used:

(iii) What are the factors that can affect the performance of these people working on the farm?

Wages and efficiency

(iv) What are the side effects that can challenge the use of human labour in feature?

Rural to urban migration and use of more tractors

(v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes () No (✓)

(vi) Give reason for the answer

good farm inputs in a year
not labour

2. If the same one hectare of land is to be prepared for seed planting (cleaning and tillage)

(i) How many hours or days will it take a specific type of animals to prepare the land?

Nil dist animals

(ii) What are the cost of their feeding and cost of the power used?

Nil

(iii) What are the factors that can affect the performance of those animals working on the field?

Nil

(iv) What are the side effects that can challenge the use of the drought animal in future?

Nil

(v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes () No ()

(vi) Give reason for the above answer

Ans for ploughing & harrowing

3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).

(i) How many hours of the day will it take a specific type of tractor to prepare the land?

At 6800 for 50 litres of fuel

(ii) What are the cost of power used and fuel consumption?

Fuel Security, Maintenance & topography

(iii) What are the factors that can affect the performance of the tractor working on the farm?

Inadequate finance & ignorance

(iv) What are the side effects that can challenge the use of tractor in future?

(v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes () No (✓)

(vi) Give reason for the above answer

Tractor increases rate of work done in field

SECTION C

1. Which of these sources of power will you consider as the best source, human power, animal power and tractor power?

Tractor power

2. Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?

More output with tractor

3. What are the contribution of each sources of power mentioned in number 1 to overall Nigerian Agricultural Production?

All complement each other but more needs to be done to dev. each

4. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

Human power sums most of the rural population

5. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

tractors cultivates large hectares mechanizing the process.

6. What is your general remark?

More agric loans to farmers for the purchase of more tractors.

AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT,
SCHOOL OF ENGINEERING
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
P.M.B. 65, NIGER STATE

PROJECT TITLE: EVALUATION OF POWER REQUIREMENT FOR BASIC
AGRICULTURAL FARM OPERATIONS

NAME OF ESTABLISHMENT: MINISTRY OF AGRICULTURAL KAISINA STATE

NAME/POSITION: HASSAN ABDULKADIR

SECTION A

- List various sources of power commonly used for farm operation in your area?
TRACTOR POWER AND HUMAN POWER
AND DRAUGHT ANIMAL
- Which of these sources of power, listed above is predominantly used in your area?
TRACTOR POWER AND HUMAN POWER
- What are the reasons for your choice?
It saves time and energy and is more efficient than any other source of power (TRACTOR)
- From your past experience, will you say that a particular source of power perform a specific operation better than the other? Yes (✓) No ()
- Give reasons for your answer
Using tractor more land can be cultivated than using human power
- What are the types of human source of power commonly used in your area? (Sex, Size, Age)?
male - 15 to 35 years
- What are the types of draught animal source of power commonly used in your area?
COW (BULL), CAMEL, DONKEY and HORSE
- What are the types of tractor commonly used in your area?
fiat, steyr, ford Tractor

9. From available data, what is the estimation of the total number of people used as a source of power for farm operation in your area?

500 people or 400 people

10. What is the estimation of the total number of animal drought used as a source of power for farm operation?

100

11. What is the estimation of the total number of tractor used as a source of power for farm operation in your area?

1,000

SECTION B

1. From experience, if one hectare of land is to be prepared for seed planting (clearing and tillage)

(i) How many hours or days will it take a specific number of people to prepare the land:

for clearing, cultivation, it will take five hours for ten people to complete the operation

(ii) What are the cost of their feeding and the cost of the power used:

Cost of feeding and power used is \$5.00 per person

(iii) What are the factors that can affect the performance of these people working on the farm?

weather condition, topography and transportation problem

(iv) What are the side effects that can challenge the use of human labour in future?

use of more tractor and the cost of human labour

(v) Using human as a source of power, does it have anything to do with improvement of crop and increase in yield? Yes (✓) No ()

(vi) Give reason for the answer

During ploughing, it is possible for human discard Spoilage seed and which is not possible for tractor

It will cost unemployment

(v) Using tractor as a source of power, does it have anything to do with improvement of crops and increase in crop yield? Yes (✓) No ()

(vi) Give reason for the above answer

more lands are cultivated within short time and ploughing is effective

SECTION C

1. Which of these sources of power will you consider as the best source, human power, animal power and tractor power?

Tractor power

2. Justify your choice of consideration, in term of their effect on soil, their availability, their convenience and cost?

maximum tillage can be done readily available and convenient compare with others

3. What are the contribution of each sources of power mentioned in number 1 to over all Nigerian Agricultural Production?

Economy growth of agriculture in Nigeria

4. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

Income either directly or indirectly

5. How will you assess the contribution of each source of power to overall Nigeria agricultural production?

6. What is your general remark?

Good and effective power management could be achieved through tractor power

2. If the same one hectare of land is to be prepared for planting (Clearing & tillage).
- (i) How many hours of the day will it take a specific type of animals to prepare for land clearing and tillage?
 four to five hours (Three animals)
- (ii) What are the cost of their feeding and cost of the power used?
 the cost of feeding is borne by the owner while the cost of power varies from one area to another
- (iii) What are the factors that can affect the performance of those animals working on the field?
 whether condition feeding rocky area
- (iv) What are the side effects that can challenge the use of the drought animal in future?
 lack of well trained veterinary doctors and lack of adequate training of the animals
- (v) Using drought animal power, does it have anything to do with improvement of crop and increase in crop yield? Yes () No (✓)
- (vi) Give reason for the above answer
 maximum tillage cannot evenly done by draught animal on even soil. Chords layer of soil particles.
3. For the same hectare of land, under the same environmental condition is to be prepared for seed planting (Clearing & tillage).
- (i) How many hours of the day will it take a specific type of tractor to prepare the land?
 for 75 HP EG MF tractor will approximately 2-30 hours for land clearing and tillage
- (ii) What are the cost of power used and fuel consumption?
 cost of fuel and power is ₹4-320 that day
- (iii) What are the factors that can affect the performance of the tractor working on the farm?
 contaminant fuel, stumpy, stony field and H₂O logging
- (iv) What are the side effects that can challenge the use of tractor in future?