

**ECONOMIC AND MAINTENANCE OF
MECHANIZED LAND CLEARING IN NIGER
STATE.**

BY

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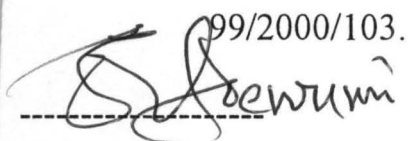
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ECONOMIC AND MAINTENANCE OF MECHANIZED LAND CLEARING IN NIGER STATE.

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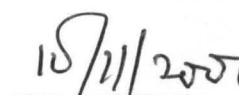
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DECLARATION

I hereby declare that this work, Economic and maintenance of mechanized land clearing in Niger state was conducted by me under the supervision and guidance of Dr, J.K. Adewumi of the department of Agricultural Engineering, Federal University of Technology, during the 99/2000 academic session.

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DEDICATION

This work is dedicated to my late father, Alhaji Adamu Mohammed.

ACKNOWLEDGEMENT

I am most grateful to Almighty Allah for his guidance and mercies. And who had made it possible for me to carry out this project successfully,

My profound gratitude goes to my supervisor, Dr. J.K. Adewumi who has helped immensely for the completion of this work and his suggestion, correction and material support through out this period.

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ABSTRACT

Land clearing plays a significant role in advancing agricultural production, and there has been considerable investment on agricultural equipment and mechanization generally.

However, the frequent breakdown of agricultural equipment shortly after purchase or after use for one or two seasons become a problem, and therefore, make the drive towards mechanization of agriculture in this country an unachievable task.

This effort is an investigating survey aimed at establishing the problems associated with economic and maintenance of land clearing in Niger State. The major findings from the study are: -

- (a) Low literacy level, unskilled machine operator
- (b) Fragment farm holdings.
- (c) Lack of planned and preventive maintenance culture
- (d) Poorly to near zero equipment workshops.

It is suggested that, proper attention should be given to both routine and preventive maintenance, establishment of workshop facilities and training of technical staff for the job, with recommendations giving, it is hoped, the outcome of this work will go a long way in helping the government in policy formation, implementation and managers of the private owned mechanized

farms in the state in adopting measures for the efficient and effective use of both human and material resources in their establishments.

CHAPTER ONE

1.0 INTRODUCTION

The standard of living in any nation of the world can not be raised unless total output increases more rapidly than population. Based on this premise the gross national product in many parts of the country would have to achieve unprecedented growth to match the Federal Government Proclamation of "Food For All" by the year 2000 (FGN Vision 2010).

Past Government in Nigeria over the last quarter of a century have always emphasized the fact that agricultural development is the key to achieving growth and stability in the national economy. Regrettably, most of the past governments had failed to match their oral commitments to agricultural development with well planned and effectively executed programs and strategies for increased agricultural production. The present government, both at the federal and state levels have like their predecessors, written and pronounced impressive programs for increasing agricultural production in Nigeria to the apparent delight of the Nigerian populace. The success of these programs, no matter acclaim and the huge budget proposals with which they were launched will depend on the judicious exploitation of the potential immense land and human.

he state lies in the rural areas and about 80% of the total labour force is engaged in agricultural production.

1.1 MECHANICS OF LAND CLEARING IN NIGER STATE

The definition of land clearing mechanization employed in this study, is, the removal of existing vegetation by mechanical means e.g. Bulldozers, Graders etc. The purpose of mechanization is to make man more efficient.

Land clearing mechanization is not always desirable but it is too often appeared to be the quick way to greater efficiency, particularly in Niger State where methods and equipment are primitive by the sophisticated typed of land clearing equipment.

Over a large part of Nigeria and Niger State in particular very primitive tools are still use. Agriculture is mainly in the hands of the peasant farmers the holdings are small and land of individual holding is widely scattered in very small plots. Hand tools are still used and for some time still likely to remain the prime equipment of peasant farmers.

1.2 STATEMENT OF PROBLEMS

The problems of maintenance of mechanized farming in Nigeria is enormous and these problems ranged from lack of maintenance of equipment, location topography, large hectare of land to profit making at the end of the exercised.

Niger State not an exception. The aim of this study is to look at away of solving those emanating problems.

1.3 JUSTIFICATION FOR THE STUDY

The principal aim of economic and maintenance of mechanized land clearing is to raise productivity in order to increase living standard of farming in Niger State.

If there is increase of agricultural production there will be increased in farmer's income and the general prosperity of the people is increased as such agricultural production may be raised by either bringing more land under cultivation or by increasing the productivity of land already under cultivation.

Land clearing is the first major step in bringing new land under cultivation.

1.4 OBJECTIVES OF THE STUDY

The general objective of this study is to investigate the economic and maintenance of mechanized land clearing in Niger State.

The specific objectives are:

- 1 To identify and analyze modern methods of land clearing and types of equipment now used.
- 2 To identify the problems or factors hindering various form of mechanized land clearing in Niger State.

- 3 To identify specific economic and maintenance problem requiring attention and suggest related investigation.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

Niger state covers a land area of 85.224sq.km with population of 2.5 million (1991 census). The terrain is flat and undulating with ranges of granite hills. Southern parts of the state are low and swampy forming the Niger State Basin. The significance of such fairly dense spatial distribution of Urban population in determining the pattern of agricultural needs and land development will be readily obvious.

However, it is clear that development in Niger State and socio-economic dispensations within the state are bound to strongly influence farming activities. There is neither rigidity of climate, as such vegetation of almost every kind of plant can be grown in this area. E.g. fruit, vegetable, field crops e.t.c. The soil is literate type of soil, full of stones and some parts are clay type. The farming system carried out mostly in Niger State depends on the local climate intensive crop production is possible during the rainy season. (Min. of agric. 1977).

Only a small fraction of the states land area about 11% may be considered arable, while less than 1/5 of the total land area is in permanent meadows and pastures the remainder is either in forest reserves or is not being used for productive purposes., (Min. of agric forest division 1977).

As agriculture becomes modernized, its dependence upon land as well as upon human labour decrease. Mechanical power now replaces animals power thereby reduces the used for land.

The relationship between land, population and farm productions have changed over a long period of time. The quality and quantity of land available and the number of people working on the land largely determine production.

Pursuance efforts have been made to encourage agricultural progress. The peasant who does not own his land or whose share of the crop is relatively small may have little incentive to invest capital or expend effort to improve the land and raised productivity.

2.2 MAINTENANCE OF EQUIPMENT

In the local govt. state government and federal agencies, the issue of implement maintenance pose the biggest constraints since it directly affect availability of the machinery for the use of farmers. The state ministries of agriculture and River basins development authorities, Agricultural development project tends to go about the maintenance of their machinery-in-house by establishing big workshops structures which are in most cases not sufficiently equipped. The local government handle maintenance through contractors, the national agricultural land development authority has an in between arrangement;

some repairs are done in house and major repairs are referred to experts garages (Zanna, 1997)

It must however, be noted that repair and maintenance no matter how basic would depend on location. A number of equipment breakdown as early as few days after purchase due to either ignorance, abuse or misuse. Other breakdown during use before the expecting life span due to lack of maintenance. For any new equipment purchased. The following must be observed in an attempt to overhaul the engine:-

- 1 Thorough checking for any possible leakage and greasing of necessary parts is required before it is started.
2. Running-in maintenance should actually be started in the factory and should be continued by the user according to specification given by the manufacturers. This aspect is normally ignored by many machinery/equipment owners in Nigeria thereby consequently leading to breakdown of newly equipped machines/equipment (Yisa, 1997)

2.2.1 Types of maintenance

Maintenance fall under the following categories: -

1. Preventive service maintenance
2. Running-in maintenance
3. Periodical maintenance

Preventive service maintenance has three main important factors: -

- (a) reduce failure
- (b) saves operational cost
- (c) saves the equipment from breakdown.

Periodical maintenance of equipment depends on the number of hours the equipment is put to use. These are in different folds, daily, weekly, fortnightly, monthly, quarterly and yearly.

Machinery/equipment failures especially during the peak period can result in inefficient utilization of equipment and serious losses in land clearing operation. In a bid to avoid this inefficient and timely repair, maintenance program for land clearing equipment would guarantee profit-oriented enterprises (Oni 1996).

The criteria for evaluating repair and maintenance requirements for land clearing machinery or equipment include:

- a. Annual use of the machinery or equipment
- b. Age of the machinery or equipment
- c. Annual repair cost (Oni 1996)

The reliability of land clearing equipment was also discussed by Oni (1996). He analyzed it on the basis of the equipment breakdown, lost time and repair cost. The study of field equipment reliability therefore is a study of its failure or lack of

it. The relationship between maintainability of equipment and its reliability is reciprocal, since preventive maintenance reduces the occurrences of failures.

The problems of inadequate maintenance are due to ignorance of how various factors and processes interact to affect maintainability and hence the reliability of equipment.

Adigun and Oni (1995) identified various factors responsible for short useful life of land clearing machinery and equipment in Nigeria to include: -

- (i) Inadequate maintenance personnel
- (ii) Unequipped repair and maintenance facilities
- (iii) Lack of spare parts

The problems are further worsened by the economic down turn, which makes requisition of new equipment and spares parts difficult. There is therefore, an urgent need to put on land clearing machinery and equipment maintenance, that would be consisted and adaptable at state, and local government levels.

2.3 LAND CLEARING METHODS AND EQUIPMENT

In general, five different methods can be employed in land clearing, namely: hand method, mechanical methods, chemical methods, explosive blasting and burning. (Nwuba 1979), reviewed these methods as they relate to land clearing in Niger State. The application of chemical and explosive methods are very limited

Table: - 1 Mechanical land clearing Methods and Equipment used in Niger State.

Clearing Method	Power unit (Trawler Tractor)	Equipment Knockdown	Raking	Remark.
1 Single Tractor	90KW more depending on tree diameter	Bulldozer blade, Tree Pusher, Clearing rake	Rake	Lighter power units will a transportation and traction
2 Single Tractor knockdown	200KW and above,	Bulldozer blade, Tree pusher, clearing blade	Rake Shearing	Tractor armed with shearing blade will aid in cutting Blade where necessary.
3 Single Tractor knockdown	13KW or less depend- ing tree diameter	Bulldozer Tree pusher Clearing rake	Rake Shearing Blade	In developing secondary forest chaining can be poss ble and is economical when the area is large.
4 Single Tractor knockdown	About 90KW	Bulldozer blade, Tree Pusher, Clearing rake Blade	Rake Shearing	For areas of 40% or less.
5 Chain Knockdown	Two crawler tractors 134KW or more	5cm link dia. anchor chain 92m or longer		less than 45cm tree population less than 2500
6 Single Tractor knockdown	About 65KW	Bulldozer Tree pusher Clearing rake	Rake Shearing Blade	Average tree dia slightly above 10cm.
7 Chopping and disking or root ploughing	65KW or less	Rolling chopper	Root rake	Average tree dia slightly above 10cm.

Source: - Field survey.(2001).

for medium to large scale land clearing, the mechanical methods are the most commonly applied, supplemented with land burning methods.

The choice of the particular method and equipment to use for any given land clearing and development project depends on several factors (Onuigbo 1982). Among the factors include the following: number of trees, tree size, wood density roots, vines and undergrowth. A "tree count" must be undertaken to determine these variable and thus decide on the equipment to be used.

The mechanical land clearing methods and equipment which being used for different vegetative zone in Niger State involves two main operations namely: knockdown and windowing and removal of debris. The knockdown is the process of pushing or pulling down the trees. The mechanical equipment that may be used to accomplish this process include the bulldozer blade, the clearing rake, the tree pusher, the shearing blades, the rolling chopper, the anchor chain and the winding cable.

2.3.1 BOLLDOZING

Mechanical land clearing involved simple modifications of earthmoving techniques using standard earthmoving equipment, the crawler tractor with its ordinary straight or angling bulldozer. The bulldozer blades are still used through out the world because of there economic and intermediate size areas of upland woods and bush country when the small size of the area to be cleared does not

warrant purchase or rental of a specialized tool. Bulldozer blades are available for all size track-type tractors and many wheel-type farm tractors.(Allan, T.G.et al 1976).

2.3.2. RAKING

Rake is designed for all heavy-duty land clearing including small tree and rock removal. It can also be used for jungle clearing, road pioneering, dam site clearing, industrial and agricultural clearing. Rakes have the advantage of permitting the soil to pass between the teeth as it is pushed through the soil, ripping out and pushing the rocks, stumps, brush etc. They work best in extremely soil but, sometime they found it difficult to work in clay soils or wet soils because of clogging between the rake teeth when this happens the rakes are effect converted into a bulldozer blade.

Rakes are used successfully and are almost universally recommended for repealing burned or burning material. The ash residue sifts through the teeth and cleaner, (E.C.C. Akwanda et al 1976).

2.3.3 TREE PUSHING

This is entirely removal of tree, the tree pusher is a highly effective tool when the land clearing project requires that no stamps be left in the ground. The Tree Pusher is extremely useful in chaining operations where the chain can not fell a large tree or when help is needed in maneuvering the chain. Even though the tree

pusher may be considered a highly specialized tool with limited application, it has proven to be very efficient in many areas when working with other felling methods.(E.C.C Akwanda et al 1976).

2.3.4 CHAINING

The chain is dragged behind two-crawler tractor the outside tractor travels along the edge of the uncleared area. The inside tractor travels through the uncleared area voiding any large vegetation to be left or vegetation it cannot knock down. The distances between the two tractors will vary with the size of tractors and the size of vegetation, the tractor should be close enough to allow travel in an almost continuous forward direction, the chaining passes should be made as long as possible to minimize tractor maneuver time.

Chain clearing is most economical in arid or semi-arid type of vegetation where only limited or no undergrowth occurs. However chaining can be very difficult when extremely heavy undergrowth conditions are present because they reduce the operator's visibility. This in turn will impede the operator's ability to maneuver the tractor around larger trees. The terrain should be well-drained, level to gently sloping without large gullies and ant-hills, stone outcropping or other obstructions which prevent free passage and maneuverability of the tractors and chain.(E.C.C Akwanda et al 1976).

2.3.5 ROOT PLOWING

The root plow is another tool for removing vegetation below the soil surface. It is designed for killing brush and growth by undercutting vegetation at the crown or bud ring large roots are forced to the surface by fins welded to the horizontal blade. Root plows also shatter hard surface crusts and hard pan which result in better water retention and prepares a good seedbed.

One advantage of the root plow is that it cuts the vegetation below the bud ring killing brush that would normally resprout if cut at ground level. Since depth is easily set and controlled. It is easy to operate and does an effective job.

The main disadvantage of the root plow are that size of vegetation is limited and does not work well in sandy soils.(Allan, T.G et al 1976).

2.3.6 GRUBBING

This is a variation of the root plow, but generally smaller and mounted on track-type or wheel. The application of the grubber is for use in medium to high brush of average density where the tractor can move from one plant to another. The grubber can be a highly efficient tool in areas suitable for its application.(Allan, T.G. et al 1976).

2.3.7 HAND CLEARING

Clearing with hand tools is probably the oldest and most widely used method of clearing. Hand tools are adequate for small areas that do not warrant investment in mechanical equipment. The availability of labor versus capital and the degree of clearing desired will effect their economical use in larger areas.

Single or double bitted axes can be used to cut most top growth. They become less efficient in very small or very large growth. Axes can also be used as an aid in grubbing roots. They must of course, be properly sharpened to be used effectively.

Machetes can be used in smaller stems and branches that are, commonly cut with under brushing that proceeds tree felling during hand clearing jungle areas. Machetes can be sharpened with a whetstone or file.

Brush hooks are useful in cutting small vegetative growth. The brush hook is swung like a scythe, it is sharpened by grinding with an abrasive wheel or curve grubs hoes and mattocks can be used to chop off small brush near ground level or to chop off small roots. They are not effective in large vegetation. (Allan, T.G. et al 1976).

Table: - 2 Inventory of Land Clearing Equipment used in Niger State.

S/N0	EQUIPMENT-TYPE	MODEL	H.P	SIZE OF BLADE.
1	KOMATSU	D9	400	3.7
2	CATERPILLAR	D8	300	3.7
3	KOMATSU	D7	200	3.7
4	CATERPILLAR	D7	200	3.7
5	CATERPILLAR	D6B	140	3.5
6	CHALLENGER TRACT.	D6E	140	3.5
7	TRACT MARSHAL	D4	125	2.7
8	TEREX	D4E	125	2.7
9	LOW LOADER	STYEYR		
10	LOW LOADER	LEYLAND		

Source: - Field survey (2001).

**Table: - 3 Estimated And Actual Rate And Coast Of Land Clearing Operation In
Niger States. (2000).**

Equipment	Initial coast	Estimated life (hrs)	<u>Annual use (hrs)</u>		<u>Rate of operation (Ha/hr)</u>		<u>Coast of operation</u>	
	N		Estimated	actual	Estimated	actual	(N/hr)	Estimated actual
Komatsu D9	90,000	12,000	1,250	2,050	0.62	0.36	331.52	275.81
Komatsu D7	70,000	12,000	1,250	1,920	0.38	0.25	254.35	211.11
Cat. D6	50,000	12,000	1,250	1,900	0.30	0.20	194.19	169.35
Challeager 33D6	45,000	12,000	1,250	1,900	0.31	0.20	176.61	169.35
Mershel 14	25,000	12,000	1,250	1,850	0.30	0.20	101.29	231.19

Estimated operating coasts included fixed and variable coast items.

Actual coasts of operation were based on only variable coast item, including coast of repairs.

Sources: - Field survey (2001).

2.4

FACTORS TO CONSIDER IN DETERMINING METHODS AND EQUIPMENT

Many factor can be consider in determining methods and equipment for land clearing in Niger State among these are:

1. Vegetation
2. Soil condition
3. Topography
4. Rainfall and climate
5. End use of land

2.4.1 Vegetation: -

In clearing operation, the soil is often disturbed in felling and piling the vegetation. In areas where there is very shallow layer of topsoil it is imperative to ensure that the land will be productive after being cleared. The method and equipment choice will determine the degree of soil disturbance that can be expected.

2.4.2 Soil Conditions: -

The type of soil will also play a part when tree-felling production is considered. In sandy loam soil felled roots often pop out of the soil scale is hard clay which often hold roots so tightly they have to be dug or uprooted with special tools or cut off at ground level and left.

Moisture content of the soil in another factor that effects the choice of method and equipment. In heavily wooded areas sunlight seldom is in contact with

the soil for long periods of time. This frequency causes the soil to be damp that it will not support the weight of equipment in the felling and stacking operations.

If embedded rocks or stony outcroppings are present in the area to be cleared equipment which serves the vegetation at ground level is severely hampered in its operation and maintenance becomes a problem therefore other types of equipment could be used in these areas.

2.4.3 Topography: -

Grade and terrain can greatly affect the normal operation of some equipment such factor as steep slopes, ditches, swampy areas out wills, and the like can decrease production increase maintenance costs and thus influence the choice of methods and equipment considerably.

2.4.4 Rainfall and Climate: -

Usually all phases of land clearing from cutting to burning are concerned to some degree by temperature changes and the amount of rain that falls during a clearing project. Rainfall and the result water table also affects flotation, due to the amount of rain in some areas of the state. Conventional track-type tractors will some times sink into the ground. Therefore low ground pressure tractor should be considered.

2.4.5 End use of Land: -

The end use of the land is an important factor when choosing the method and equipment for example, if the land is used for highway or dam construction total removal of vegetation is necessary. On the other hand if the land is to be planted in crops such as soybeans or rice, cutting the tree and brush flush to the ground or three to four inches (7.5-10.0cm) below ground or three is all that is required. If the land will be used for grazing, certain large trees may be left standing on the ground along with the stumps of other trees.

CHAPTER THREE

3.0 METHODOLOGY

The methodology adopted in this study is the investigative survey approach. The framework involves data collection and analysis.

In this study the twenty-five local Government. areas of Niger State were taken into consideration the study involved administering questionnaire to the officers in charge of land clearing. Heads of Engineering and maintenance section operators and mechanics of land clearing equipment were interviewed.

The information in this study were also obtained from thesis, dissertations, books, reports, journals, seminar papers and other published material on mechanized land clearing particularly on Niger State.

3.1 PROCEDURE FOR DISTRIBUTION AND COLLECTION OF DATA

The distribution of these questionnaires posed a little problem as some people thought of what might likely be the legal implication of expressing their views. However, other categories of people indicated their own views to the best of their understanding without any fear, but majority of the people who answered the questionnaires did not indicate their names. Some people collected the questionnaires and filled them at the point of collection while some people collected and filled later before submitting.

The questionnaires were administered to all the establishments surveyed, personal interview were also conducted to get some vital information's necessary for this study. The head of engineering services and officers in charge of land clearing were in the best position to give the required information by virtue of their position and experience.

The establishments visited apart from the various local governments department are Agricultural Development Project (ADP) H/Q Minna. ADP Bida National Agricultural Land Development Authority (NALDA), Minna. Upper River Niger Basin Zone 'B' wushishi.

The total number of questionnaires distributed is seventy-three (73) and from this the number retrieved is fifty four (54) of which the highest number of retrieved were from Suleja, Bida, Chanchaga, Bosso and Wushishi Local Government Area. The response of the people generally can be said to be fairly satisfactory. A sample of questioners administered is reproduced in appendix 1.

3.2 PROBLEMS ENCOUNTERED

In an effort to gather these data, I encountered certain set backs due to some uncontrollable circumstances, however, many establishment drawn from all the local government of the state were visited out of this some gave complete information while others did not and some misunderstood the questions. It was easier to get information at the state government establishments than in the Local

Government Areas as some thought that it was a way of bringing out their problems and negligence so they were not willing to give out information.

In some other cases I was denied entry even after presenting the relevant letters from my school not until confirmations were made before permission was granted for me to proceed. That notwithstanding, I even had to work some distance not less than a kilometer from the main gate, to get to the main office or the site.

Finally on several occasions I had to visit such site more than twice before I was able to retrieve the questionnaires and in some cases I had to present a fresh questionnaire after the previous one must have been misplaced.

3.3 METHOD OF ANALYSIS

The type of data, required for the achievement of the objectives of the study has influenced the choice, the use and type of analysis and method of presentation.

Data are in general terms factor and pieces of information which constitute the raw material of the subject to which they relate. Some are precise mechanical facts, which gives quantitative rather than qualitative information on the project under study.

These characteristics may be highlighted through description and summarization in statistic forms or diagrammatic or graphical illustrations.

There is however a vital quality of the data that dictates the mode of presentation.

For the purposes of analysis in this project work our objective is to classify data into like groupings and to uncover relationships whether correlative or casual. This has helped in employing classification associations and relationships form of analysis with techniques of cross tabulation.

The questionnaires were analyzed in a tabular manner using the following format.

Question No	Response (s)	Frequency	Percentages.

The various responses to each question are tabulated under the column of response and the percentage of each response to the total number of questionnaire indicated in the appropriate column. An inference from the general response to the question is made.

CHAPTER FOUR

4.0 ECONOMIC ASPECTS OF MECHANIZATION

In land clearing operation, labour and machinery present half of the total cost operation. If efficiency of land clearing mechanization is improved, there will be a lot of saving. Improvement will only be achieved if there is an increase in output with minimum of labour force.

If we have to assess the importance of land clearing mechanization we must consider some aspects. These include machinery repairs and maintenance, building of farm shop and management in general.

To introduce land-clearing mechanization we must take into consideration the existing economic frame of the local people concerned. All the resources must be available. Further more, not all the farmers have equal understanding and skill of operating machines.

Purchasing of machinery will not pay for the work expected of it. Therefore, the success of mechanization depends more on the ability to use the machinery, also consideration should be given to the availability of land, labour and capital. (Zubairu Z. 1977).

4.1 FACTORS TO CONSIDER IN LAND CLEARING

Factors that effect land use can be grouped into four major areas, namely: environmental, social or institutional, cost price and the end user.

4.1.1 Environmental Factors: -

The environmental factors can be subdivided as follows: -

- (i) Land – soil topography, size and shape of land.
- (ii) Temperature: annual extremes and length of growing season or seasons
- (iii) Water control – rainfall amount and distribution, availability of irrigation water, and distribution of natural watersheds.
- (iv) Location – access roads, markets and services areas.
- (v) Vegetative cover-type and density possibility of regrowth after initial clearing.

4.1.2 Social or Institution factors:

The social or institutional factors to consider in land clearing include the following:

- (i) The place accorded land development in the overall scope national growth.
- (ii) Willingness and/or ability of the governments to support agriculture through fiscal and at tax policy; adequate transportation facilities; favorable policies on land tenure, land reform and settlement and project development.

- (iii) Willingness and/or ability of the government to conduct research, interpret finding of land development.
- (iv) Availability and willingness of the government to provide training at all levels to foster extension programs and to use mass media such as radio and the press in helping to attain these objectives.

4.1.3 **Cost-Price Factors: -**

The economic considerations to be borne in mind in land clearing operations are as follows: -

- (i) Return on investment i.e. – price received by the farmer or rancher for the crops and livestock's he produces.
- (ii) Cost of input required such as: land clearing machinery and tools, hired labour, buildings and taxes on land.
- (iii) Availability and cost of credit, which may either be a long-term credit to finance land purchase or construction of major buildings or be intermediate term credit to finance establishment of the crops major land preparation such as clearing and leveling, specialized market facilities.
- (iv) Availability and cost of transport, storage, processing and marketing facilities.

- (v) Benefit available from the state such as subsidies price supports and assumed markets.

4.1.4 The End User: -

Another important factor to consider is the ability of the end user, owner manager of the project to make proper use of newly cleared land. Closely related to the end user's ability is the level of his specialized training in the area of his venture (crop production; reforestation programs; highway construction etc.). Moreover, success of project be it large or small, depends on favorable costs/price relationship, favorable skills. Since a wide range of factors must be considered by those involved in any land development project, a sufficient amount of information must be gathered before undertaking project.

4.2 CARE AND MAINTENANCE OF EQUIPMENT

When a newly machine is purchased, it is expected to be used for a number of years efficiently.

In order to obtain the maximum useful life of a machine/equipment therefore, the machines must be properly maintained and cared for.

Maintenance of equipment for land clearing in good order includes protection from weather by housing, corrosion, regular attention to lubrication, daily servicing and periodic maintenance, adjustment and replacement of worn parts are also important.

A highly mechanized land-clearing workshop will require the following tools in addition to a wider range of the usual hand tools. Valve grinder decarbonizing tools stock taps and dies, pillar drills, portable hand drill, oxy-acetylene or arc welding set, simple forge anvil, air compressor, small lather, press and pipe bender well trained personnel with technical knowledge are needed to mind the workshop, trained mechanics are needed to carry out services and major repairs in the shop. Proper care of using the tools and machines are necessary.

The drivers should be encouraged to make regular daily services by checking, lubricating oil in the crank case, type pressure to see whether the pressure is correct, checking cooling system is necessary, clean the oil filter etc. The driver should be issued with logbook for keeping and recording things like, gallons of fuel consumed, number of hours worked and number of hectares cleared. These will, give the officer in charge to assess the efficient of the equipment being used.

By keeping the record up-date, it will enable the driver to detect faults in operation and performance of the equipment. The drivers should be able to operate the equipment as required by always follow operators manual for more instructions.

4.5 FUEL AND SPARE PARTS

Most maintenance workshops are lacking spare parts. Fuels are another problem, which is facing the operation of this equipment.

Fuels should be available at all time for efficient operation. It should be free from dust and store in a good container and also at a safety place. In storing fuel you have to consider the following: -

1. Protection of fuel quality
2. Safety
3. Convenience
4. Cost

Other equipment such as the amount of fuel to be used frequent. There should be enough spare parts available in stock for replacement of worn out parts. The first moving spare parts should be cared for because they are the necessary once needed, they should be ordered before operation start.

4.6 SAFETY PRECAUTION

Most operators are careless in handling machine in the farm workshop.

The drivers should remember that life may be endanger unless proper care is taken in handling power driven machinery.

All protective clothes must be worm when using workshop tools on the workshop the most important thing should be safety first before every thing.

CHAPTER FIVE

5.0 RESULTS AND DISCUSSION

5.1 Introduction:

Low literacy unskilled operator, fragmented farm holding, lack of maintenance and repair facilities poorly to near zero equipped workshops, inefficient tractor capacity utilization are some of the problems expected to contribute to the understanding of the unique nature of frequent break down of land clearing equipment in the state.

The major finding of the investigation survey shows that:

- Low literacy level and unskilled operator.
- Fragmented farm holding
- Lack of planned and preventive maintenance culture
- Lack of maintenance and repair facilities and unavailability of spare parts, -
- Poorly to near zero equipped work shop are some of the problems discovered from data analyzed.

5.1.1 Low literacy levy and unskilled operator.

This is the first finding on visiting any government. or private farm establishment. Most common in government. Establishment in which the operator initial when learning was under another operator (main) assisting him the latter goes about his normal field operation with other trainee and he (trainee) learns by observation of how the machine is operated and the field operation so that after some months the other operator begins to operate the machine and if eventually he is attached to a machine he in turn picks up a new trainee, which is not proper. This operator who is unskilled carries out field operation wrongly. The machine is handled poorly and there is inefficiency in field operation due to the time lost in turning, incorrect speed required for various field operations. It was quit default to the retrieved information from the management staff as there are lots of bureaucratic networks introduced in the Government establishment. They are either not keeping appropriate information due to the caliber of operator and their related experience in the management of such out fit or they are unwilling to do so because of certain hiding problems not meant for public consumption.

The observable pattern is that a large proportion are illiterates (80% of the operators), and only few about 35.55% attended primary or other schools.

**TABLE 5.1.1: - ESTIMATION OF THE ANNUAL UTILIZATION OF
TRACTORS IN THE STATE**

Tractor use (hrs)	Private Mechanized farms	%	Govt Estab.	%
Field operation	800hrs	88	552hrs	78
Transportation to the filed	100	11	160	22
Total	900hrs/year		712hrs/year	
Source From Data.				

**TABLE 5.1.2: - ANNUAL UTILIZATION OF TRACTORS COMPARISON TO
THE STANDARD ANNUAL UTILIZATION**

100 hrs/year operation	Private Mechanized farms	%	Government Govt Estab.	%
Field operation	800	88	552	78
Transportation to the filed	100	11	160	22
Total	900	10	712	
Source From Data.				

5.1.2 Fragmented Farm Holdings:

Most of the lands in our rural areas are small and irregular. This makes field operation especially difficult as some of these farm holding are not well cleared and developed.

Tree remains which damage the tractor chassis and tiers are still found in the field this leads to poor field efficiency, as much time is lost in obstacle negotiation and turning at headlands which are not regular. The speed of operation is also affected.

An indication of the effectiveness of carrying out field work is obtained from the proportion of productive time during the operational time and the low application of farm machinery and the low application of limited seasonal application of farm tractors and lack of technical and managerial competence to handle, use and maintain farm machinery and equipment.

5.1.3 Lack of Planned and Preventive Maintenance Culture:

Because most of the operators are unskilled the time issue of preventive maintenance could be regarded as not necessary, or mere ignorance rather it is corrective maintenance.

A particular operator claimed, he keeps a "mental chart" instead of a lubrication and maintenance chart and also the major faults or the problems

TABLE 5.1.3: - STATISTIC OF MAJOR CAUSES OF BREAKDOWN OF MACHINES/EQUIPMENT IN THE STATE.

Cause	Private Frequency	%	Govt. Etab Frequency	%
Engine Problem	6	50	15	48
Cooling system	-	-	-	-
Transmission system	1	8	8	12
Hydraulic system	-	-	6	19
Auxiliary Equipment	3	25	4	13
Steering system problem	-	-	1	3
Speed rehabilitation (wheels,	2	16	1	3 (tiers etc).
Source: - From Data.				

TABLE 5.1.4: - ON THE ACQUISITION OF SPARE PARTS

	Private	Govt. Etab.	%
Made of acquisition	%		%
Purchase locally	36	64	
Imported	100	-	
No Response	33	67	

Source: - From Data.

associated with most of the broken down machines, seems to be engine problem. This and other causes are analyzed in table 5.1.3. The maintenance of machines is one of those problems facing most Government establishments. They are ill equipped to maintain their equipment. This resultantly poses a serious problem to the authorities and consequently the nuisance breakdown during operation. In some cases, it has led to the fast depletion of their machines. To compound this problem is the issue of having many brands and their spare parts are hard to come by and where they are available it is purchased at exorbitant prices.

Most of the maintenance work is not scheduled and they are done when deemed necessary. This non-scheduled maintenance obviates the absence of planned maintenance culture.

5.1.4 Lack of Maintenance and Repair Facilities and Unavailability of Spare Parts:

This is the case of most of our agricultural establishments. Apart from the inability to make major repair, there is the issue of non-availability of the necessary facilities to make these repairs.

Among the farms visited, only about 3 out of about 11 farms could boast of a store of spare parts and out of the (3) mentioned, only one (1) is well equipped.

In all the government establishment, if a machine/equipment breaks down and needs a spare part, it takes about 1-2 weeks for repair to be effected, depending on whether, such spare part can be acquired locally within the immediate environment or not. Table 5.1.4 shows that only 28% purchase their spare parts locally 100% of all the establishment import spare parts and 62% made no response at all.

5.1.5 Poor to Near Zero Equipped Workshop

If the standard of a fully well equipped workshop is to be followed, then most of the farm workshops visited if not all will get the zero score. But what was tried here was to in a way classify them as in table 5.1.5, only 4% generally could be classed as having a functional workshop which is well equipped, 16% is functional but not well equipped and 79% are non-functional workshops and zero equipped most of which are government establishment.

From analysis of data, it was found that the frequency of major repairs of machines in the state were more in the government establishment than in the mechanized private farms this also shows the level of maintenance in the privately owned compared to that in government established farms. Table 5.1.6 gives the main statistics.

TABLE 5.1.5: - FARM WORKSHOPS FUNCTIONALITY AND REPAIR FACILITIES

	Private farms		Gov. stab.	
	Frequency	%	Frequency	%
Repair workshops				
Functional workshops	2	11		4
Functional workshops				
Not well-Equipped	6	33	2	16
Not-functional workshops				
Zero Equipped	10	55	28	78

Source: - From Data.

TABLE 5.1.6: - FREQUENCY OF MAJOR REPAIR OF MACHINES IN THE STATE

Mechanized farms Establishment	one year		2-4 times yearly		5-10 times yearly	
	Frequency	%	Frequency	%	Frequency	%
Government	9	50	17	77	14	57
Private mechanized Farms	9	50	5	5	23	43

Source: - From Data.

Table 5.1.7 gives a general response on maintenance on the various mechanized farms in the state, it shows that the maintenance culture is more in the mechanized private farms than in the government establishment. And this goes to show that there is a better management of agriculture machinery's in the mechanized private farms than the government establishments.

Another issue of importance is that machinery and equipment storage of all the establishments visited only few could boast of equipment shades or a proper place to store or park machinery and equipment after use or when not in use. It is a common sight to see machines and its parts scattered on the ground, some in the bush, some parts already getting buried in the soil. This is very common in our government agricultural establishment and some of the mechanized private farms even though they tend to store some of these machinery's better. This machines are left in the open come rain or sunshine and without the necessary maintenance even after use. It is only when this equipment breakdown, that they ever get to repair and lubricate them. Lack of lubrication and maintenance has been found to be the major causes of breakdown of machines because of the increased wear due to continues use without lubrication and when foreign material like sand gets into or between cinematic parts.

**TABLE 5.1.7: - STATISTIC ON MAINTENANCE MECHANIZED FARM/
ESTABLISHMENT**

Forms of maintenance	Private Mech. Farm	Government Estab.
	%	%
Preventive maintenance	31	17
Running in maintenance	42	38
Periodical maintenance	60	40
Corrective maintenance	20	80

Source: - From Data.

BREAKDOWN IN NIGER STATE

In an attempt to evaluate the natural and frequency of land clearing equipment breakdown in the state, a number of machines/equipment are lying in different position throughout the state. Some could still be rehabilitated some that could have been okay for rehabilitation have ever worsened due to long duration it has been packed. Rain found its way into the engine and got it rusted and even as far as transmission system for some, they are already scrap materials.

Such were the sight at some of the establishment. Unused and abandoned land clearing equipment were found in many government ministries and agro – industrial establishments. Although only a few of the establishments visited supplied the required information on this aspect of the investigation I had taken a serious look around the establishment to get some of this facts.

In general the minor breakdown consists mainly of fuel tank leakage electrical system is malfunctioning. V. Belt snapping and failure of worn out replaceable component and bearing that are easily replaced. On the other hand, the major break downs which consist of engine lubrication defect, engine cooling system defect transmission system defect etc. usually major repairs take time depending on location of the farm or establishment and also availability of funds

(especially government establishment) to purchase the needed spare parts if available locally.

Zaide, et al, (1992) as asserted that although repair constitute about 10-15% of operating cost of any equipment it is difficult to estimate. This is because accurate record of repairs over the life of the equipment may not be available (Oni, 1996). Never the less repair cost is a major determinant for replacement programme of any equipment and its accurate estimate is essential for computing ownership cost of the equipment (Oni, 1996).

Land clearing equipment, although the wear rate is largely governed by soil characteristic, or by natural deterioration good maintenance can extend the serviceable life.

Problem relating to the hydraulic linkage system is common with government machines/equipment though it takes time to develop, and even when it worsens, unskilled operators usually ignore it.

The result of the frequency of equipment breakdown in this study compare well with those earlier reported by Anazodo (1986) and Oni (1996). It can be reported that most government equipment loses the functioning of the electrical system or electrical dashboard as early as first six month of purchase or use.

From the qualitative analysis of the major factors contributing to high frequency of equipment breakdown in Nigeria as reported in the paper presented

by Anazodo, et al (1987) on agriculture machinery use in Nigeria. Furthermore it was found that the breakdown due to worn out part were most frequent (i.e. pistoning & sleeve), followed by poor field condition and then poor adjustment and operation of the equipment.

On the availability of spare parts and the repair capability of technical personnel in the government establishment, it revealed that apart from the fact that there is no spare parts readily available, repairs facilities are poor and generally non existent in some establishments. Reverse is the case for few mechanized farm in the state apart from that, some of the mechanized farms reported earlier do not make repair on their farms, instead repair and maintenance are contracted out any time there is equipment breakdown be it minor or major. This is done to show the management capabilities of such establishments.

The omission of any relevant point made in this write-up should not be judged as being over looked. But it is for the simple reason that since this is investigative survey, any incomplete or any information for which its source is questionable could not be evaluated and analyzed.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The problem militating against effective management and maintenance of machines and equipment in Niger State have been discussed. The issues involved center around lack of planned and preventive maintenance culture, lack of maintenance and repairs facilities, which is worsened by the unavailability of spare parts and poorly equipped or no workshop.

We keep trying to emphasize maintenance without actually enforcing it. We should begin to make it our culture. The state government should plan and enforce maintenance of its machinery, install effective professional management, accord requisite level or recognition and importance to land clearing machinery maintenance.

The establishment of sustainable repair and maintenance programme for machinery and equipment appear to be the antidote to the sporadic breakdown of these equipment, in addition the establishment of service center to cater for the repair and maintenance needs of machinery and equipment would go a long way in alleviating the problems.

Following the findings of this study, it clearly implies that a foundation is being set for this important requirement for a sustainable economic and maintenance of mechanized land clearing in Niger State. This has also made it necessary to recommend the strict adherence to the principle of preventive, curative fire brigade approach to repairs and maintenance.

1. In view of the minimal facilities available on ground for machinery repairs, the general degree of mismanagement, pilferage and the associate heavy finance, a clear distinction has to be drawn between routine services, minor repairs, major repairs and works that requires special expertise assistance. Because of these reasons the government should establish functional well-equipped workshops manned with well trained mechanics that have undergone training at manufacturers workshops this workshops should be located at about 4 - 5 central locations in the state so that even other private farmers and government establishments can have access to make repairs at reasonable rates.

The government should also endeavor to have stock of spare parts of the major machinery models in the state for prompt repairs, the revenue generated can be used for up keep and maintaining the facilities there. The services of manufacturers workshops and the accredited network in the state i.e. steyr and MF should also be involved for major repairs e.g. engine overhauls transmission

system work calibration etc. there is a need to streamline and revitalized the engineering division of the ministry of agriculture in the state for effective services delivery.

2. The operators should be given adequate training on how to handle the machines and determine level of performance efficiency, log book should be designed to contain information on operator such as fuel and lubricant collected and the work done with such oils and fuel used per day.

Also minor and major repairs carried out and amount spend should be recorded to provide ready information for the researcher.

On the maintenance, each machine should be provided with file in which all issues of maintenance and repairs make adequate provision of funds for essential maintenance of this machinery.

3. The rural farmer can be sensitized to disengage from fragmented shifting of agricultural land and embrace intensive permanent agricultural land development. If the needed inputs are readily available to him at the right time and place, and alternatively groups of farmers can come together to form a cooperative society, where they can join resources to hire machinery to work on their combined plots of land. This might be a way of incurring initial cost on machinery investment.

Machines can be decentralized to job concentration centres where services can economically be provided to avoid machines travelling long distances on poorly constructed road or animal track to arrive at site operation which are not properly cleared, poorly drained and fragmented.

4. Land clearing and land development should be encouraged. This will be possible with the government assistance by establishing land and development unit. Government should also encourage mechanized farming by providing credit and extension assistance to demonstrate to the local farmers the need of agricultural mechanization.

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APPENDIX 1

DEPARTMENT OF AGRIC ENGINEERING FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

QUESTIONNAIRE

SECTION 'A'

Sir/Madam,

Please this questionnaire is designed to carry out economic and maintenance of mechanized land clearing in Niger State. I require your co-operation in filling this questionnaire. This questionnaire accurately and objectively with the view of providing useful information needed for the study. All information will be treated confidentially and strictly for academic purpose.

Background information's (please tick and fill in as appropriate where necessary).

1. **Location:** Name of establishment state. - - LGA - --
2. **Ownership:** (A) Government ownership (B) Private ownership (C) Joint ownership.

PERSONAL DATA

3. **Age of respondent:** (A) Less than 20 years (B) 21-30 years, (C) 31 – 40 year (D) over 40 years.
4. **Level of education:** (A) Secondary (B) Diploma (C) Bachelor's Degree (D) Masters Degree (E) Any other qualification
5. **Year of Working Experience:** (A) Less than one year (B) 1-5 years, (C) 6-10Years (D) over 10 years.

SECTION 'B'

MAINTENANCE STRUCTURE

6. Do you undertake major repairs in your farm workshop?
(A) Yes (B) No
7. Do you have competent hands that make repairs of your machines or equipment.
(A) Yes (B) No
8. If repairs are done outside the farm workshop what is the estimated annual cost of repair i.e. cost of spare part and labour charge.
9. Are the spare parts of the machines, equipment manufacture locally?
(A) Yes (B) No

10. Do you overhaul your engines when the oil consumption is high and blue smoke is given out?

(A) Yes

(B) No

11. Do you keep records of repairs for machines or equipment

(A) Yes

(B) No

12. Have you had any major equipment breakdown? If yes, what was it?

(A) Yes

(B) No

If Yes, what was the caused.

13. Operating cost, maintenance and repair cost escalate with the age of machinery and equipment. Do you agreed?

(A) Yes

(B) No, (C) Not completely

14. Do you observe routine servicing of your machines and equipment.

(A) Yes

(B) No, If No give reason.....

15. How often do you undertake major repairs of your machines or equipment.

(A) Once yearly (B) 2 – 4 times yearly (C) 5 – 10 time yearly.

16. Do you have a lubrication and maintenance chart for your equipment.

(A) Yes

(B) No. If No give reason why?

17. When do you change oil in the oil pan, clean oil filter, check level of brake fluid, clean and grease battery terminate and check level of electrolyte.

(A) Forth nightly or after 133 hrs of operation (B) Monthly (C) After every 4 months about (500hrs)

18. When do you drain off the transmission oil, the differential and drive axles, change the oil in the crankcase, change the oil in filter element, check the steering year oil, flush and clean radiator, clean the fuel tank

(A) After every six months (B) yearly

19. When you have low compression in engine, do you overhaul your engines?

(A) Yes

(B) No

20. Do you have a complex machine/equipment in you establishment?

(A) Yes

(B) No

21. What is the age of your equipment/machine?

22. What is the annual use of the equipment/machines?

23. Do you have any machine/equipment that cannot be utilized?

If Yes, state type and give reason

How many machines / equipment are presently in working conditions?

Do you perform your key farming operation i.e. land clearing timely?

(A) Yes 07

(B) No,

(C) Sometimes Yes.