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SURVEY OF TRACTOR USAGE AND PARTS BREAKDOWN IN NIGER STATE, NIGERIA

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ABSTRACT
An investigation into the level of farm tractor breakdown was carried out to determine the component wear in a tractor. The nature, frequency and magnitude of wear of these component as well as their causes were also under focus. The study was carried out by administering questionnaire and observation to find out the common component of the tractor that wears easily. The findings of this study are as follow: The tractor owners, operators, engineers, mechanics and managers is male dominated, the age group of most of the respondents is between 30-59 years, there educational background was low, majority of the operators (92.68 %) learnt how to operate the tractor from other tractor operators rather than through a formal tractor training school, the most dominant tractor make used by respondents was Mahindra (49.6 %), about 95.1 % (117) of the respondents reported that their steering pump casing wear more than three times during the farming season

Keywords: Tractor, Malfunctioning, Breakdown, Component, Failure.

1 INTRODUCTION

The use of motorized machines for farming activities started with the advent of steam engine in the early nineteenth century and since then gradual development has lead to the use of internal combustion engine as result from limitations of human muscles as sources of power in agriculture and quest for appreciable increase in agricultural production due to population explosion and globalization, hence the need for comprehensive agricultural mechanization. Farm mechanization is the utilization of machines for farm operations. These machines include all types of implements and devices for supplying of power on the farm such as plough, harrows, seeder/seed drills and planters, cultivators, harvesters, haying machines and tractors. (Aduayi and Ekong, 2011). The tractor is the most important machinery because it is the prime mover for all the implements. It is the most used and most prone to wear and tear. It is also the most expensive item of all farm machinery. Ellis and Wain─wright (1994), put the cost of machinery used in developing countries including Nigeria, at about 30% of the total investment in agriculture while Igbeka (2014) stated that the cost of operating machinery is the largest single farm expenditure due to machine failure or breakdown. A failure or breakdown is the malfunctioning of part, component or the whole machine to carry out its specified function, partially or completely. It is as a result of inherent failure in the machine or due to misuse (Apollos, 2001). In most cases, misuse is the cause of breakdown. Misuse is a deliberate act by the user, which reduces the reliability, maintainability and operability of a given machine. It involves the use of a machine in such a way not envisaged by the designer, which may cause damage in or shorten the life of machine. Tractor misuse include use of adulterated fuel, use of machine for undesigned purposes, overloading or over speeding, incorrect adjustments and improper housing. The effects of misuse include decreases in the design and useful life of machine, disruption of production schedules, and increase in downtime and overhead costs due to maintenance. Usman and Bobboi (2003) observed that the main cause of early failure in farm tractors is the failure to adopt preventive maintenance practice. This leads to frequent tractor breakdown and high operating costs. Tuft and Hitts (2015) reported that most machines of the same make and model are designed to have same performance efficiency and life span but the subsequent differences observed in practice are due to the operators, environmental and maintenance activities. High frequent breakdown, high incidence of un-serviceability, unavailability of spare parts, handling from unskilled operators and technicians, old age of

tractors and lack of agricultural workshops and tools and insufficient experts or technicians are the objectives of this investigative study.

2 METHODOLOGY

2.1 STUDY AREA

The study was conducted in Niger State in the North Central region of Nigeria. Niger State is located in the guinea savannah agro-ecological zone of Nigeria at latitude 3.20° East and longitude 11.3° North. The state experience distinct dry and wet season's with annual rainfall varying from 1,100 mm in the Northern part of the state to 1,600 mm in the southern parts. Almost all crops that can be grown in the southern forest zone and the northern savanna zone of Nigeria can thrive well in the state. The lowest minimum temperature occur usually between December and January when most part of the state come under the influence of the tropical continental air mass which blows from the north, the dry season in Niger state commences in October.

2.2 Data Collection

About 180 questionnaires was designed and 10 each administered in 18 local government areas, that is 6 from each of the senatorial zone, only the tractor owners, operators, mechanics, engineers and managers were accessed. But only 123 received were used in the analysis of various factors and conditions of this research. Data was collected between September and October, 2018. The questionnaire was designed to obtain information on the causes of agricultural tractor steering pump problems and the major constraints affecting tractor steering pump maintenance and repair. Some information were gotten from oral interviews carried out.

2.3 Data Analysis

The data obtained from the survey were summarized using descriptive statistics. The summarized data were presented in the form of tables and graphs. Tables were used to help focus on specific numbers in the results. Bar charts were used to compare respondent responses for the different categories in a question. Frequencies and percentages were used to describe the composition of sample.

3 RESULTS AND DISCUSSION

3.1 Sex and Age of Group Distribution (Tractor Owners, Mechanics, Engineers, Manager and Operators)

The questionnaire was administered to 180 tractor owner, operator, engineer, mechanic and manager. The respondents included 122 male and one female. Out of 123 respondents, 28 were tractor owners, 15 were engineers, 17 were mechanics, 41 were tractor operators while 24 were managers. The result shows that tractor owners, operator, engineers, mechanics and manager is male dominated. Table 1 shows the age group distribution of all respondent

Table 1: The Age Group Distribution of All Respondents

Age Group	Frequency	Percentage (%)
30-39	28	22.76
40-49	46	37.40
50-59	24	19.51
60-69	9	7.32
Total	123	100

3.2 Educational Background of All the Respondents

Education has an immense impact on the human society (Goel, 2007). Education is the knowledge of putting one's potentials to maximum use. Education is one of the factors affecting the capability of the tractor users. The literacy status of a tractor user may influence understanding about the use of tractor and its associated implements because he can study the operation manual and understand all the instructions (Bhutta,*et al* 1997). The educational background of tractor owner, tractor operator, mechanics, engineers and manager is presented in figure.1. Generally, the educational background of the respondents was low. About 62 % of the respondents had Arabic/ Islamic knowledge, no formal education or had between one and six years of formal education. 22 % of the respondents were makaranta graduate. 21.1 % of the respondents had no formal education while 18.7 % had between one and six years of formal education (primary school level education). About 16.3 % of the respondents had middle school level education; approximately 6.5 % had junior secondary school level education, while about 7.3 % had senior secondary school level education. Approximately 8.1 % of the respondents had technical school level education and polytechnic level education.

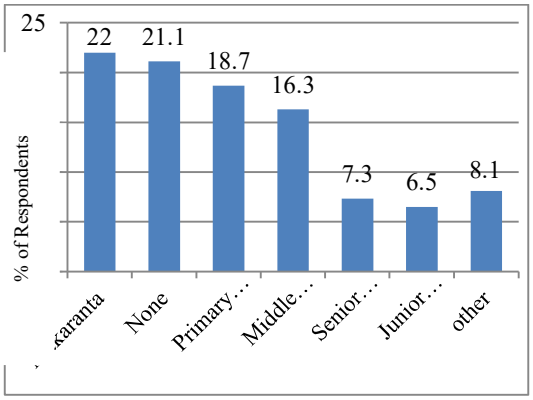

Figure 1: Educational Background of the respondent

3.3 Tractor Operators Background Training and Experience

Table 2 displays the background training of the tractor operators. It can be seen that the majority of the operators (92.68 %) learnt how to operate the tractor from other tractor operators rather than through a formal tractor operator training school. Only 7.32 % of the operators had formal tractor operator training. While formal tractor operator training is structured, informal tractor operator training is not structured. This means that different tractor operators would train their subordinates, based on their own limited experience producing 'gaps' in their (subordinate) training

Table 2: Tractor Operator Training

Mode of Tractor operator Training	Frequency	Percentage (%)
From another Tractor operator	38	92.68
Government Sponsored (Ministry of Agriculture and Rural Development)	3	7.32
Total	**41**	**100**

Table 3.2: Tractor Operator Training

Figure 3.2 illustrates the years of experience of the 41 tractor operators. Tractor operators with one to ten years of operating experience constituted 36.8 % of the respondents. This was followed by those with 11 to 20 years of experience (27.6 %); and 21 to 30 years of experience (17.2 %). Tractor operators with 31 to 40 years of operating experience represented 13.8 % of the respondents while those with 41 to 50 years experience made up 4.6 % of the respondents.

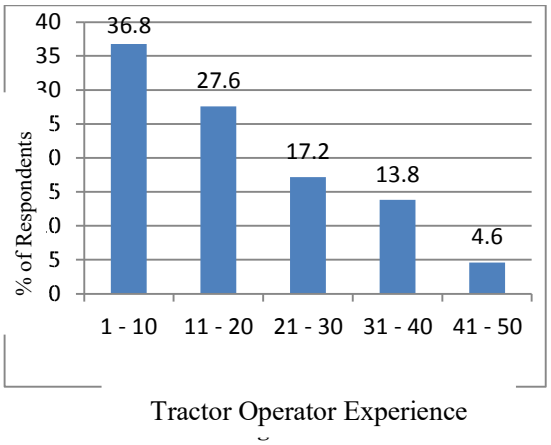

Figure 2. Experience of respondents

3.4 Tractor Makes

In figure 3, the maker of tractors used by respondents is depicted. Mahindra, Massey Ferguson, and ford consisted of 73.2 % of the make of tractor in the state. The most dominant tractor make used by respondents was Mahindra (49.6 %). Massey Ferguson constituted (13.8 %) while Ford represented (9.8 %) of the make of tractors in the study area. John Deere, styre and Fiat formed 16.3 % of the make of tractors that is john Deere had (5.7 %), Styr had (5.7 %) and Fiat constituted (4.9 %) while other make of tractors formed 10.5 % which included New Holland (3.26 %), Etcher (3.25 %), Farmtrac (1.7 %), swaraj (1.63 %), and universal (0.66 %).

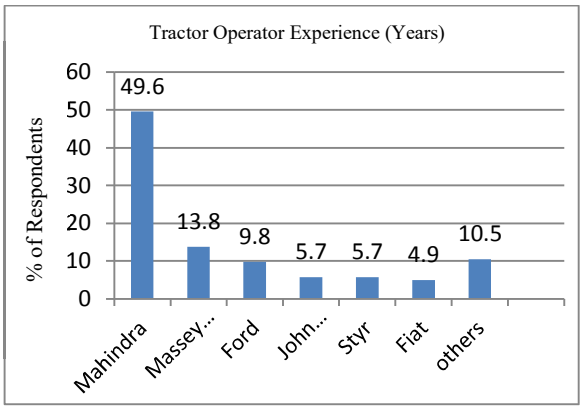

Figure 3.Distribution of Make of Tractors at the Study Area

3.5 Nature of Tractor Purchase and Tractor Size

Table 3 shows the nature of tractor purchase obtained from the survey. About 58.5 % of the respondents reported that their tractors were purchased as brand new while 41.5 % of the respondents indicated that theirs were purchased as ‘‘second hand’’.

Table 3: Nature of Tractor Purchase

Tractor Purchase	Frequency	Percentage (%)
New	72	58.5
Second Hand	51	41.5
Total	**123**	**100**

Figure 4: presents the results of the tractor Size found from the administration of the questionnaires. Out of the 123 respondents, 56.9 % did not know their tractor size in (hp). About 17.9 % indicated their tractor size to be about 65 hp while 23.5 % reported their tractor size to be 70 hp (8.9 %), 45 hp (8.1 %) and 55 hp (6.5 %). The other 1.6 % of the respondents indicated their tractor engine size 30 hp.

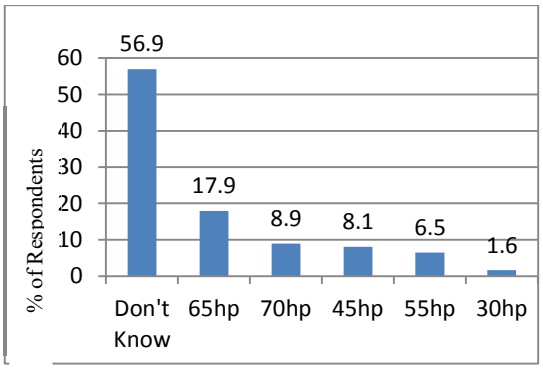

Figure 3Tractor Engine size

3.6 The Tractor Steering Pump

When respondents were asked about the working condition of their tractor steering pump, 59.3 % of them indicated that their tractor steering pump was not in working order while 40.7 % said that their tractor steering pump was in working order. This is shown in table 4.

Table 4: Tractor Steering Pump

Tractor Steering Pump Tractor Purchase	Frequency	Percentage (%)
In order	50	40.7
Not in order	73	59.3
Total	**123**	**100**

3.7 The Tractor Steering Pump Casing

Table5 presents the respondent responses about steering pump casing analyzed in figure 5. As can be seen, 95.1 % (117) of the respondents reported that their steering pump casing wear more than three times during the farming season, 3.2 % (4) reported that their casing wears at least twice in a season while 1.7 % (2) indicated that theirs did not wear during the farming season.

Table 5: Wear In Tractor Steering Pump Casing during the Farming Season

Wear	Frequency	Percentage(%)
Wear More than three Times	117	95.1
wear at least twice	4	3.2
Did Not Wear	2	1.7
Total	123	100

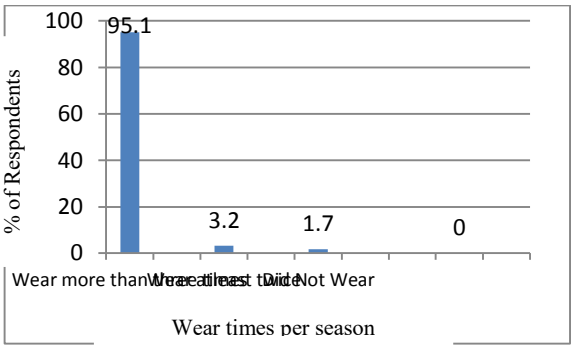

Figure 4

3.8 Use of Tractor Steering Pump Manual and Maintenance and Repairs

Reading the manual is important because it tells the owner or operator how to set the steering pump and what

part to check before one takes it to the field (Wehrspann, 2003). The respondents were asked if they have access to their operators' manual. About 57.7 % of the respondents said that they do have access to it while the remaining 42.3 % indicated that they do not have access to their manual (Table 6). Furthermore, 78 % of the respondents indicated that they do not follow the pump manufacturer's instruction in the maintenance of their pump while 22 % reported that they follow the pump manufacturer's instruction in the maintenance of their pumps

Table 6:Tractor Steering Pumps Manual and Manufacturers Instruction

Access to pump Operator manual	Frequency Instructions	Percentage (%) Manufacturer's
Yes	71	57.7
No	52	42.3
Total	123	100

3.9 Tractor Mechanics and Well Equipped Repair Workshops

Table 7 shows the responses provided by the participating respondents on availability and proficiency of tractor mechanics at the study area. Of the 123 respondents, 3.3 % said that tractor mechanics are readily available and 96.7 % said that tractor mechanics are not readily available. Similarly, 3.3 % indicated that the tractor mechanics are proficient and 96.7 % of the respondents reported that the tractor mechanics are not proficient.

Table 7: Availability of tractor mechanics

Availability mechanics Of tractor Mechanics	Frequency	Percentage (%)	Proficiency of Frequency in tractor repair	Percentage (%)
Yes	4	3.3	Proficient	4	3.3
No	119	96.7	Not Proficient	119	96.7
Total	123	100	Total	123	100

Almost 27.6 % of the respondents perceived having well equipped tractor repair workshops while 72.4 % believed that they did not have well equipped tractor repair workshops. Table 8 also shows that only 81.3 % of the respondent sought help outside their town for the repairs of their tractors. About 18.7 % does not seek help for repairs outside their home town.

Table 8: Well equipped tractor repair workshop

Well equipped repairs	Frequency	Percentage	Seek helps for Frequency outside (%)	Percentage Tractor repair (%) Workshop
Yes	34	27.6	Seek help	100	81.3
No	89	72.4	Does not Seek help	23	18.7
Total	123	100	Total	123	100

4.0 CONCLUSION

Based on the results obtained, the following conclusions are drawn. The result shows that tractor owners, operator, engineers, mechanics and manager is male dominated. The age group of most of the respondents is between 30-59 years. Generally, the educational background of the respondents was low. The majority of the operators (92.68 %) learnt how to operate the tractor from other tractor operators rather than through a formal tractor operator training school. The most dominant tractor make used by respondents was Mahindra (49.6 %). About 95.1 % (117) of the respondents reported that their steering pump casing wear more than three times during the farming season. The respondents perceived the causes of steering pump failure to be wear, leakages, cracks in the pump casing, use of fake spare parts for maintenance and repair, use of adulterated fluid and old age of the pump, exposure to extreme dust and over usage that is mis use of the pump during farming operation.

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