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Assessing the impact of tractors and equipment hiring services on farm power and machinery use in Awka, Anambra state

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Abstract
This research was done to assess the impact of tractors and equipment hiring from the department of engineering services at the ministry of agriculture Awka, Anambra State, Nigeria. The parameters used were fleet of equipment, personnels and workshop facilities. The study used documental and interviewed schedule methods to achieve the research aim and objectives. Those interviewed included officers and farmers respondents of 300 people out of the whole population with regards to how they accessed services rendered by this unit and farm sizes. Records available at the headquarters of Anambra Development Programme (ADP) and Engineering services department, Ministry of Agriculture Awka provided additional sources of information. The unit has a total of 24 tractors which comprises two case-3; two Mahindra; 4 Eictcher; 6 John Deere; 3 Massey Fergusson; 7 New Holland; 9 bulldozers; 10 Disc plough; 10 Ridgers; 8 Disc harrows; 10 Planters; 10 Slashers; 12 Harvesters; 5 Graders; 7 Haiab; 7 Excavators; 20 Boom sprayers; 20 Root rakers. Most of this equipment were either functional or required minor repairs before use in the farms depending on farm size. Personnel's incompetency and lack of skills for good practices resulted in equipment abandonment as scraps coupled with serious lack of maintenance culture. There has been a general increase in farm size cultivation since the introduction of the Engineering Department Services Unit which has considerably increased economic fortunes. Some farmers have not benefitted from these services because of their inability to raise funds for hiring and the remoteness of these farms which made it difficult to access farm machineries. These among many are the militating factors. The unit has great potentials for increasing agricultural productivity of the state if the equipment available can be effectively utilized.

Keywords: Assessing, Impact, Tractor, Equipment, Hiring Services, Farm Power Machinery

1. Introduction

Tractors and Equipment Hiring Services are platforms established with the purpose of acquiring and hiring out tractors and equipments at a subsidized rate to farmers so as to facilitate agricultural production. Utilizing and maintaining tractors properly increases their financial advantages (Kapuwaththa et al., 2018). These tractors and equipment hiring services are under farm power and machinery. The usage and ownership of agricultural machinery has frequently been considered as being severely constrained by seasonality and small farm size (Ji et al. 2012). Farm tractors are essential in the agricultural sector, particularly when it comes to mechanizing tasks like ploughing, harrowing, ridging, sowing, inter-cultivation, planting, weeding, applying fertilizer and pesticides, harvesting, and transportation. (Darshana et al., 2018).

Farm power and machinery may be described as any source of energy that make power available to machineries for farming operations. These include animal power, wind power, hydropower, electric power, solar power, internal combustion engine power etc. The dependability of the equipment used, the working environment, and the effectiveness of maintenance determine the appropriateness of agricultural machine use and performance. (Najafi et al., 2015). The usage and ownership of agricultural machinery has frequently been considered as being severely constrained by seasonality and small farm size (Ji et al. 2012). Tractor is the most important machinery because it is the prime mover for all the other implements. Tractors were profitable for 83% of owners after taking into account the timely advantages of owning one, as opposed to 54% when only service provision income were taken into account, Houssou et al (2014). It is the most used and most prone to wear and tear. It is also the most expensive item of all farm machinery. Tractors and other huge equipments are highly visible technologies, and the results of these technologies may be seen on the farms of their owners

and experienced by hiring in services (Cossar 2015). The use of these services by smallholders is fairly prevalent (Akramov and Malek 2012).

Farm Power Machinery and equipment are major costly items in agriculture, larger machines, new technologies, high prices for parts, new machineries and higher energy prices have caused machinery and power costs to rise in recent years. The data obtained from the various tractors and implements performances are important for farm machinery management and their selections for a particular farming situation (Sharm et al., 2016; Saeed et al., 2017). However, making smart decision about how to acquire machinery, when to trade and how much capacity to invest in per hectare can reduce machinery cost. Tractors hiring schemes (THS) have approaches adopted by different levels of government in Nigeria.

Most farmers use tractor services out of concern that operations delays will negatively impact crop yield or marketing (Nakamura 2013). The statement of the problem is that tractors and equipment hiring services on farm power and machinery is a panacea for food insecurity, helping small-scale farmers have access to tractors and increase their farm size. The aim of the present study is to assess the impact of tractors and equipment hiring services in Awka Metropolis, Anambra State through these objectives of cost of tractors and machineries, maintenance culture and abolishment of tediousness in agriculture through provision of data and information.

2 Methodology

2.1 Study Area

The south east agro-ecological zone of Nigeria lies between longitudes of 05^0 34' to 09^0 24' east and latitudes 04^0 15' to 07^0 00' north. The area is bounded to the east by the five states that make up south east geopolitical zone namely; Abia, Anambra, Enugu, Imo and Ebonyi. Anambra State's Tractor and equipment hiring services on farm power and machinery use, has her headquarters at Awka Metropolis. For effective service delivery and coverage of the state, their activities are executed through the four agricultural zones of the state which are Aguata, Awka, Anambra and Onitsha. Awka metropolis will be used as our case study with Awka North and Awka south as our stations, as shown in Table1. A recent method and procedure on how to hire a tractor and equipment based on horse power is employed through registration, inspection of farmland, payments made, reservation or allocation of tractor, date of work, return of tractor etc.

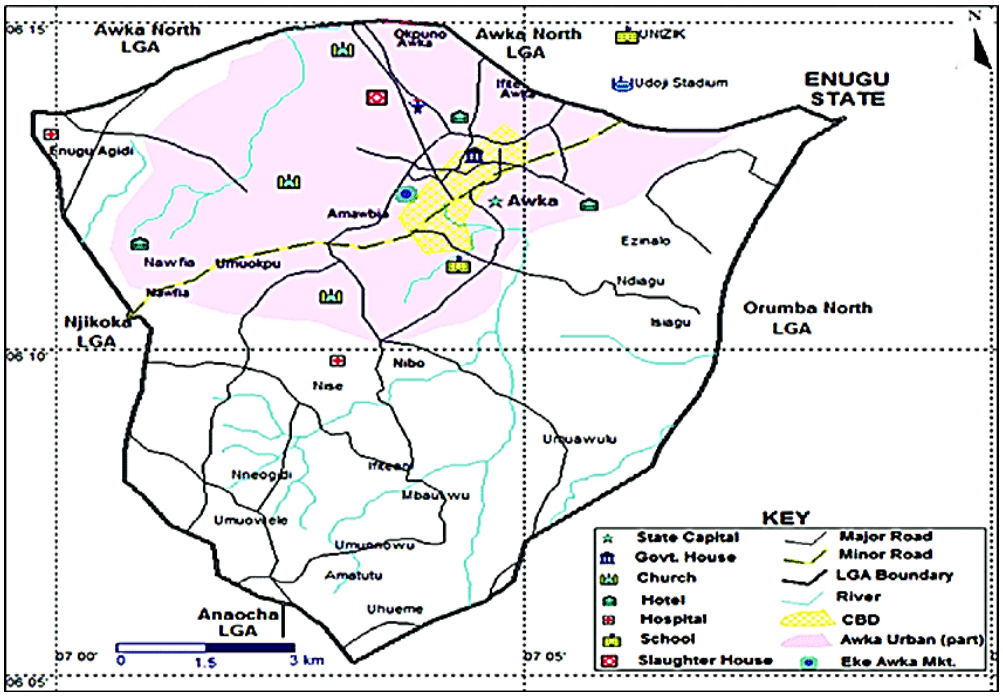


Fig. 1.1: Map of Awka Zone, Work Facilities and Personnels

The unit has no service bay for minor repairs while major repairs are contracted out. The staff strength is eighty (80) comprising of four 4 engineers, Fourteen (14) technologists, four (4) superintendents, fifty (50) tractors operators and eight (8) tractor mates. The ratio of tractors to operators is 1:2 assuring no idle time due to lack of operators and there in trainings given current practices with all these, it was observed that assessing the impact of tractor and equipment hiring services on farm power and machinery use in Awka Metropolis, Anambra state is very positive, affordable and successful.

Tractors and equipment hiring services no doubt has brought a positive change to operational development in Awka Metropolis because it involves machineries and high productivities with generated income. A fleet of machineries are on ground though they may be functional or dysfunctional, thus may need repairs and maintenances. The maintenances culture adopted are customer driven once there is need or request for use of machinery, payment for repairs is made. Another observation is lack of implement shed to protect equipment from harsh weather and inadequate personnel staff. The cost of equipment and tractor hiring is very cost effective as shown in table 5, estimating cost of one farming season. The unit has great potentials for removing tediousness and drudgery associated with farming in agricultural productivity of the state if well managed.

Table 1: The Stratified Random Sampling of the Target Study Area

S/N	Case Study	Population	L. G. A	Towns and Units	Sample Size	Total
1	Awka	301,657	Awka North	Awba Ofemili	15	
2	Awka	301,657	Awka North	Ugbene	15	
3	Awka	301,657	Awka North	Ebenebe	15	
4	Awka	301,657	Awka North	Achalla	15	
5	Awka	301,657	Awka North	Urum	15	**150**
6	Awka	301,657	Awka North	Amansea	15	
7	Awka	301,657	Awka North	Amanuke	15	
8	Awka	301,657	Awka North	Isuaniocha	15	
9	Awka	301,657	Awka North	Mgbakwu	15	
10	Awka	301,657	Awka North	Ugbene	15	
11	Awka	301,657	Awka South	Amawbia	15	
12	Awka	301,657	Awka South	Awka	15	
13	Awka	301,657	Awka South	Ezinato	15	**135**
14	Awka	301,657	Awka South	Isiagu	15	
15	Awka	301,657	Awka South	Mbaukwu	15	
16	Awka	301,657	Awka South	Nibo	15	
17	Awka	301,657	Awka South	Nise	15	
18	Awka	301,657	Awka South	Okpuno	15	
19	Awka	301,657	Awka South	Umuawulu	15	
20	Ministry of Agriculture THS				15	**15**
	TOTAL				**300**	**300**

Thirty (30) questionnaires were administered to farmers randomly selected who were involved in mechanized farming in Awka headquarters. Interview schedules were employed for the purpose of information collection. Additional information was equally gathered through personal communication with staff of the unit with records and information retrieved from headquarters offices. Stratified multi-stage random sampling technique was used in this survey having each of the local government of Akwa North and South towns and fifteen (15) mechanized farmers randomly selected. The total number of respondents for the study were three hundred (300) (15 mechanized farmers plus 285 respondents from the towns). The

data obtained were collated and analyzed using descriptive statistics of tables regarding the characteristics of the observations, findings and hypothesis.

2.2 Presentations of Results

The data generated from Tractor and Equipment Hiring Unit of Department of Engineering Services, Awka Metropolis, Anambra state were described and summarized in the tables presented as follows.

Table 2: Result of Tractor and Equipment Inventory of Tractor and Equipment Hiring Unit Awka, Anambra State.

S/N	Equipment or Tractor	No Available	In Good Condition	Serviceable Condition	Unserviceable Condition	Year of Acquisition
1	Case 3 tractor. 60% hp	2	1	-	1	2003
2	Mahindra. 55% hp	2	-	1	1	2008-2010
3	Eictcher. 55% - 120% hp	4	2	1	1	2012-2014
4	John Deere. 65% hp	6	3	1	2	2011-2013
5	Massey Fergguson. 65% - 72%	3	1	1	1	2017
6	New Holland 75% hp	7	2	2	3	2017
7	Bulldozer	9	4	2	3	2017
8	Disc plough	10	6	2	2	2016
9	Ridgers	10	10	-	-	2017
10	Disc Harrows	8	5	2	1	2015
11	Planters	10	6	3	1	2016
12	Slashers	10	4	4	2	2008
13	Harvesters	12	8	2	2	2011
14	Trailers (4 – 10 tons)	10	1	6	3	2014
15	Graders	5	2	2	1	2009
16	Haiab	7	4	1	2	2012
17	Excavators	7	3	2	2	2015
18	Boom Sprayers	20	12	5	3	2007
19	Fertilizer Applicator	25	18	2	5	2003
20	Bird Scarers	25	20	5	-	2006
21	Root Rakers	20	16	4	-	2007

PERCENTAGES % OF THE MACHINERY OVERALL

1) Functional Percentage % =

$$\frac{\text{Total number of Functional}}{\text{Total number of Machinery}} \times 100\%$$

2) Serviceable Percentage % =

$$\frac{\text{Total number of Serviceable}}{\text{Total number of Machinery}} \times 100\%$$

3) Scrab Percentage % or Unserviceable Percentage % =

$$\frac{\text{Total number of Scrap}}{\text{Total number of Machineries}} \times 100\%$$

Table 3: Cost of Equipment and Tractor Hirings

S/N	Equipment or Tractor	Number Available	Cost of Equipment or Tractor Per One	Hirings Total Cost
1	Case 3 tractor. 60% hp	2	N2,000	N4,000
2	Maihidra. 55% hp	2	N2,750	N5,500
3	Eictcher. 55% - 120% hp	4	N2,980	N11,920
4	John Deere. 65% hp	6	N3,050	N18,300
5	Massey Fergguson. 65% - 72%	3	N3,400	N10,200
6	New Holland 75% hp	7	N3,500	N24,500
7	Bulldozer	9	N5,000	N45,000
8	Disc plough	10	N1,550	N15,500
9	Ridgers	10	N950	N9,500
10	Disc Harrows	8	N1,500	N12,000
11	Planters	10	N1,000	N10,000
12	Slashers	10	N3,000	N30,000
13	Harvesters	12	N5,000	N60,000
14	Trailers (4 – 10 tons)	10	N7,000	N70,000

15	Graders	5	N5,000	N25,000
16	Haiab	7	N10,000	N70,000
17	Excavators	7	N10,000	N70,000
18	Boom Sprayers	20	N5,000	N100,000
19	Fertilizer Applicator	25	N5,000	N125,000
20	Bird Scarers	25	N1,000	N25,000
21	Root Rakers	20	N1,200	N24,000

Table 4: Cost Position of Some Tractors per Year in Awka, Department of Engineering Services Hiring Unit

S/N	Tractors	Year	Cost of Hiring per Year (₦)
1	Case 3 Tractor	2003	2,000
2	Mahindra	2008	2,750
3	Mahindra	2009	4,800
4	Mahindra	2010	5,000
5	John Deere	2011	3,050
6	John Deere	2012	5,200
7	John Deere	2013	7,850
8	Massey Fergusson	2014	3,400
9	Massey Fergusson	2015	5,500
10	Massey Fergusson	2016	7,000
11	Massey Fergusson	2017	10,000
12	Massey Fergusson	2018	13,000
13	Massey Fergusson	2019	18,000
14	Massey Fergusson	2020	20,000
15	Massey Fergusson	2021	22,000
16	Massey Fergusson	2022	25,000

Percentage of each equipment/machine

This can be done individually like for tractors:

1 For serviceable Tractors% =

Number of serviceable tractors ×
100% Total number of tractors

2 For Functional Tractor = Number of functional tractors × 100%
Total number of tractors

3 For Unserviceable Tractors =
Number of Unserviceable tractors × 100% Total
Number of Tractors

Table 5: Estimated Cost of One Farming Season

S/N	Operations	Machinery/Equipment	Cost (₦)
1	Land clearing	Bulldozer	5,000
2	Root raking	Rakers	1,200
3	Tillage	Plough /Harrow	1,550
4	Ridging	Ridger	950
5	Planting	Planter	1,000
6	Spray Herbicides	Sprayer	5,000
7	Fertilizer application	Applicator	5,000
8	Harvesting	Harvesters	5,000
9	Packing of stumps	Packers	1,000
10	Repair and maintenances		3,000
11	Payment to two operators		4,000
12	Transportation		2,000
13	Fuel/Diesel		4,000
14	Miscellaneous		2,500
	Total		**40,000**

The summation cost of all the operations in the farm for one season, taken as Forty Thousand Naira (₦40,000) cannot be used to buy all the machinery and equipment used for different operations in the farm. This shows us that it is very cost effective.

3.0 Discussions of Results

On assessing the impact of tractors and equipment hiring, most farmers in Anambra State are aware of the existence and activities of the unit but it is not all of them that have access to these services. The farmers can be grouped into two. Group one are those farmers who have benefitted from the services of the unit and have been able to increase their farm sizes and income given their initial capital and lands. The second groups are those who have not benefitted because they cannot afford the cost of hiring equipment, their farmlands are in remote inaccessible area or too small farm holdings without means of acquiring more lands used only for mixed farming which is uneconomical with hiring services.

Table 2 showed the result of the inventory of tractors and equipment in the fleet of the unit. To ascertain the capacity of the unit for service delivery, the tractors and implements were classified as functional, serviceable and scraps. A striking revelation of the survey is that most of the brands are not same models and that farmers would want to engage hired tractor and equipment at same time (Farming season) so their demands are never met, given also serviceable and unserviceable machineries. Lacks of funds are inhibitors to acquiring needed farm equipment. Waste of time while waiting for the service of the few machineries, operations are done only during the five months of rainy season's and remain idle under shed for the remaining seven months which does not encourage huge investment in the service unit, acquisition of machineries are done mainly by groups or cooperatives. Government and agencies should help out for its sustainability. Table 3 indicated services rendered and charges which are cost of equipment and tractors for hiring excluding fuel and lubricant charges. Table 4 gave the position of tractors hiring year by year. We had an increase in hiring cost as the year goes by. The price of tractor hiring keeps increasing on yearly basis. Thus the introduction of the unit has directly or indirectly resulted in increased farm size.

3.1 Work Facilities and Personnel

The unit has no service bay for minor repairs while major repairs are contracted out. The staff strength is eighty (80) comprising of four 4 engineers, Fourteen (14) technologists, four (4) superintendents, fifty (50) tractors operators and eight (8) tractor mates. The ratio of tractors to operators is 1:2 assuring no idle time due to lack of operators and in trainings given current practices with all these, it was observed that assessing the impact of tractor and equipment hiring services on farm power and machinery use in Awka Metropolis, Anambra state is very positive, affordable and successful.

4.0. Conclusion

Tractors and equipment hiring services no doubt has brought a positive change to operational development in Awka Metropolis because it involves machineries and high productivities with generated income. A fleet of machineries are on ground though they may be functional or dysfunctional and so need repairs and maintenances. The maintenances culture adopted is customer driven ie if there is need or request for use of machinery, payment for repairs are made, another observation is lack of implement shed, to protect equipment from harsh weather and inadequate personnel staff. The cost of equipment and tractor hiring is very cost effective as shown from table 5 estimating cost of one farming season. The unit has great potentials for removing tediousness and drudgery associated with farming in agricultural productivity of the state if well managed.

5.0 Recommendation

This paper recommends that

i) Government should establish equipped implement shed and standard workshop for repairs and maintenances with qualified personnels to handle machineries and increase its longevity and functionality.

ii) Provision of adequate funding for purchase of spare parts and new stocks of tractors and equipment.

iii) Gross under utilizations of tractors should be avoided.

iv) Proper record keepings for effective and efficient management decisions needed.

v) Standards should be upheld through monitoring mechanisms and in trainings of personnels.

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