COSTS OF TRACTOR OWNERSHIP UNDER DIFFERENT MANAGEMENT SYSTEMS IN NIGERIA

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ABSTRACT
Tractor is an important source of farm energy and power for mechanization of farm operations. It requires high initial capital investment. Tractor costs have great influence on profit. Knowledge of tractor costs for farm operations has a prime importance in making management plans and decisions especially in comparing different tractor types and models thereby assisting in the selection of a more appropriate farm tractor. This paper reports on the various factors that contribute to the ownership costs of farm tractors and the various techniques of estimating tractor costs in Nigeria under three different management systems. These management systems include Tractor and Equipment Hiring Services (TEHS) under the Ministry of Agriculture and Natural Resources; Farmers' Co-operative Management System (FCMS); and Private Ownership Management System (POMS). In each of the Management Systems, the costs of three tractor makes namely MF 135; Steyr 768 and Zetor 7711 were investigated and compared. Results indicate that the average units cost per hour were ₦I20.44; ₦134.96; and₦159.56 for POMS, FCMS and TEHS respectively. In terms of hours of usage per annum, POMS has the highest effective use of 678.92 hours followed by the FCMS with 603.63 hours while TEHS has only 534.4 hour.

1. INTRODUCTION

The agricultural tractor is at the center point of agricultural mechanization. In Nigeria, agricultural mechanization is being encouraged to boast agricultural production. There exist some tractors and equipment hiring services in many states of the federation. Also some private farms, institutions, government agencies, cooperative bodies etc. buy and operate tractors for agricultural and other services. At present, there are many different makes and models of tractors in the country.

Nigeria's agricultural mechanization technology has continued to be import-oriented. Agricultural machines and equipment were imported into the country to support the various governments' mechanization policies. Between 1980 - 1982 period alone, the Federal Government of Nigeria imported and distributed many tractors, implements and other agricultural machines [1].

The report of a farm machinery use survey conducted five years later showed that out of the total number of 15, 906 tractors in use in Nigeria between 1975 - 1985, only 59.80% were functional, 26.66% were not in operational condition while 13.54% or 2,154 tractors were unserviceable or in a state of disrepair and packed in the continuously expanding graveyards of unserviceable farm power and machinery sheds [2]. This alarming state of disrepair of agricultural machines and equipment prompted the Federal Government of Nigeria to embark on the PTF tractors and the equipment rehabilitation project in 1998. The positive effects of the project are yet to be felt or seen in the agricultural sector of the economy.

The reasons for the high rate of tractors breakdowns have been attributed to many factors, prominent among which were poor Management System, inadequate knowledge of tractor ownership costs, and lack of funds to enable prompt repairs and maintenance services.

There is therefore the need to study, document and appraise the various management and cost factors influencing the management and ownership costs of agricultural machinery and equipment. Such a study will enable farmers to determine whether they have profited or lost in their respective farm businesses using tractors.

It will help to expose certain problems inherent in some of the already existing tractor management systems and hence will enable the tractor owner to select a better one. In addition, the knowledge of tractor costs will also help in making management plans and decisions, more so, in comparing different tractor types and models for the selection of the most appropriate farm tractor under different management systems. Previous attempts to study the costs of owning and operating tractors revealed that tractor ownership costs were viewed from many perspectives.

Tractor costs were classified as fixed and variable costs [3]. Fixed costs were identified to include depreciation, interest on investment, taxes, housing and insurance. Variable costs include the repair and maintenance, lubrication, fuel and operator's labour costs.

Tractor costs were also classified as comprising of two groups namely: owning or fixed costs and operating of variable cost [4]. Owning or fixed cost includes annual depreciation, interest, taxes and shelter charges. The operating costs were defined as fuel, oil, lubricants, maintenance, repairs and labour costs.

Tractor power costs could be divided into fixed and operating costs [5]. Fixed costs were identified as depreciation and interests whereas operating costs include fuel, oil, lubricants, maintenance and repair costs, which were 35% and 34% of the overall operating cost per hour at life expectancy of 8,000 and 10,000 hours respectively.

Machinery costs were divided into two: fixed and variable costs were identified as fuel, lubrication, daily service and maintenance, power and labour. It was reported that the anticipated annual cost of repair for anyone machine is uncertain maintaining that only repair records kept can give an indication of average or expected repair costs because repair cost vary form one section of a country to another due to the natural randomness of breakdowns and variations in repair charge [6].

The annual repair cost as a decimal factor of list price was estimated to be 0.045 considering 700 hours per year for a tractor [7]. It was reported that the costs of farm machinery operations can only be estimated maintaining that time should not be wasted in using complex depreciation method [8].The straight-line depreciation method was suggested' as most reliable for cost approximations [8].

Repair costs may be governed by probability laws [9]. Tractor costs were classified into three namely: fixed, energy and time costs [10]. Fixed costs were identified as interests, insurance, housing and only a portion of depreciation associated with obsolescence and time deterioration. Energy costs were defined as comprising of fuel, lubricants, maintenance and repair. Time costs were directly proportional to the number of hours the tractor operates regardless of size.

In terms of annual use and cost of tractor operation, it was reported that there was a reduction in cost per hour as annual use increased [11].

The average annual working time of farm tractors in Nigeria was reported to be 535 hours, which was quite low, compared to 1400 hours in Ethiopia during 1967 and 1500 hours in Kenya during 1965 - 66 [12]. The low annual use resulted in high cost per unit of work.

The older tractors have higher repair and maintenance costs per hour because older tractors breakdown more frequently [11].

It was suggested that a new tractor should be replaced at the end of 9 years stating that used tractors purchased as late as 6 years of age can have lower operating cost than a new tractor and a tractor purchased at the age of 3years and sold at the age of 6years has the lowest cost, and that the time of replacement decision depends on the accumulated costs over a period of years. The optimum replacement of a machine was at the age of 9-10 year [9].

It has been showed that out of the total number of 15, 906 tractors in use in Nigeria between

1975-1975, only 59.80% functional, 26.66% were not in operational condition while 13.54% were unserviceable, indicating lack of repair and maintenance resulting to high ownership cost and high rate of unserviceable tractors [2].

Between 1980 - 1982, Nigeria imported about 863 tractors with other implements. The tractors had high rate of breakdowns, repair and maintenance; with less than 500 hours of usage per annum [1].

From the review of literature, it is discernible that the cost of owning and operating agricultural tractors could be classified into variable, fixed and time costs. These costs were identified to include depreciation, interest on investment, taxes, housing and insurance; repair and maintenance, lubrication, fuel, operator's labour costs and the number of hours the tractor operates.

The main objective of this study is therefore to carryout an investigative research survey on the various management and cost factors affecting the management and ownership costs of agricultural tractors. Specifically, the objectives of the study are:-

i.) To obtain a reliable data on the factors affecting tractor ownership costs such as interest on investment, housing and insurance; repair and maintenance; depreciation, taxes, lubrication, fuel, operator's labour costs and number of hours the tractor operates.

ii.) To ascertain the influence of tractor-make and management system on the costs of owning and operating agricultural tractors.

2. METHODOLOGY

The study adopted the investigation survey research approach using questionnaires. The study was limited to three tractor ownership and management systems namely Tractor and Equipment Hiring Services (TEHS) under the Enugu State Ministry of Agriculture and Natural Resources; Farmers' Co-operative Management System (FCMS) represented by Ndike - Ahia Farmers Co-operative Society in Rivers State; and the Private Ownership Management System (POMS) represented by Ace Farms in Anambra State of Nigeria. The concept and operations of the three management systems are as described [11].

During the survey, quantitative and qualitative data were obtained from each of the establishments. The quantitative data were based on observations, existing records and authoritative publications which provided the age, purchase price, hours of use, repair and maintenance costs, fuel, lubrication etc. of the tractor makes and models selected. The qualitative data came from observations, expert opinions and questionnaires considering the fixed and variable costs of the tractor under investigation as well as their total hours of use per annum for a period of five years. Interviews were also held with some relevant staff of the establishments.

The study met several limitations some of which include difficulty of public officers to let out information concerning costs of running the tractors; poor documentation of activities on the part of most of the establishments. Making repeated visits to the staff of the establishment for them to agree to spare their tight schedule in order to attend to the questionnaires surmounted these problems. Individual interviews and personal explanations were also very useful in clarifying their doubts and reluctance in giving out information.

Due to incomplete data availability, only three tractor makes namely MF 135, Steyr 768 and Zetor 7711 had complete information required, hence were considered for this study. In each of the management systems, the costs of the three tractors were investigated and compared. After analyzing the completed questionnaires and some relevant records of the establishments, fixed and variable costs were determined.

The depreciation costs were determined using the straight-line method given by equation 2.1 as follows:

$$D = \frac{PL}{n} \qquad (2.1)$$

Where D = depreciation (₦)
P = Purchase price of tractor (₦)
n = Useful or economic life of tractor (years)
L = Salvage value of the tractor

The useful life of 10 years and a salvage value of 5% was assumed in line with existing literature [12].

The interest on investment for a tractor is usually added to the fixed costs of the machine because the money invested by buying the machine cannot be used for any other productive venture. In this study, the interest rate of 14% of the average investment was used based on the prevailing rate at the time in the banking sector of the economy.

Shelter is a vital cost factor in determining the cost of farm machinery. When shelter is provided, the average expected life of the machine would be increased. Also the average annual repair cost estimates will be reduced and smaller for sheltered machines. Costs due to shelter vary according to types and complexities of the structure. In most cases, cheap structures are used as shelter and the cost of such cheap structure hardly exceeds 0.5% of the purchase price of the machine [13]. In this study, 0.5% of the purchase price of the tractors was used to calculate the costs of housing the tractors.

The repair and maintenance costs of the tractors were determined by adapting repair and maintenance cost formula [14]. The formula suggested that the repair and maintenance costs for a tractor averaged 6% of the purchase price a year for a 10 years or 6000 hours life. A schedule of repair and maintenance costs as a percentage of purchase price were developed assuming that overhauls were done when needed and not delayed. The repair and maintenance schedule is as follows [14]:

1st year = 0%; 2nd year = 1%; 3rd year = 3.75%;
4th year = 8.5%; 5th year = 2.5%; 6th year = 10%;
7th year = 4.5%; 8th year = 5.75%; 9th year = 11.25%; 10th year = 6.5%.

Costs data pertaining to fuel, oil and lubrication consumptions including some information on repair and maintenance were collected from records available in the establishments covered by this study. Also obtained from available records at the establishments visited were the total hours used and operator's salary.

3. RESULTS AND DISCUSSIONS

Tables 1, 2, 3,4,5,6 and 7 show the detailed results of the ownership costs of the three tractors under the three Management System. In all, there were generally low annual usage of the tractors, with Tractor and Equipment Hiring Service taking the lead.

From table 8, it is observable that the mean annual unit cost per hour for the tractors was ₦134.96 for FCMS; ₦120.44 for POMS and ₦159.56 for TEHS indicating that POMS incurred the least unit cost per hour followed by FCMS and lastly by the TEHS.

In terms of hours of usage POMS registered the highest average annual usage followed by FCMS and TEHS. Also the average percentage of total operating cost on total costs were 25.96%; 26.82% and 27.93% for POMS, TEHS and FCMS respectively.

In all the management systems, there is generally a low average hours of usage ranging from 507.2 hours to 682 hours per annum, indicating that the tractors were under-utilized. This shows that if the tractor ownership [9] and usage is to be a self-sustaining and profit making venture, the low annual usage cannot guarantee the sustainability of the venture in terms of cost. The low hours of tractor use per annum shows that tractorization in Nigeria is low indicating that farmers awareness and financial capability to tractorize the farming activities in the country are very low. Another reason for the low usage is that a tractor is generally believed to be a farm machine only, and farming being a seasonal activity in Nigeria, attracts rapid use of tractors only during the farming season.

Tables 1, 2, and 3, contain the ownership costs of the three farm tractors namely Zetor 7711,

Steyr 768 and MF 135 respectively under the Tractor and Equipment Hiring Services Management Systems. For Zetor 7711, (Table 1) the unit cost rose from ₦126.36 per hour in 1990 to ₦164.26 per hour in 1994 at an average of ₦55.22 per hour. It is observable from the table that in the 4th yr. of use the highest unit cost of ₦I89.77 per hour was recorded. In the same trend, Steyr 768 (Table 2) recorded a progressive increase in the unit costs of the tractor from ₦ 133.87 per hour in 1990 to ₦161.03 per hour in 1994 at an average of ₦159.08 per hour. Also it is discernible from the table that the highest unit cost of ₦ 197.18 per hour was recorded. Table 8 shows the summary of the unit costs of the tractors under the three management systems. TEHS has highest average unit cost of ₦ 159.56 followed by FEMS with ₦ 134.96. The least average unit cost accrued under the private ownership management system (POMS).

Similarly in table 3 under the same management system of tractor and equipment hiring services, (TEHS), MF 135 also recorded a rise in the unit cost of the tractor from ₦ 130.23 per hour in 1990 to ₦ 175.16 per hour in 1994 at the average of ₦ 164.39 per hour. Again, the highest unit cost occurred in 4th year of use.

For the three tractors under the TEHS management system, the mean total annual hours of usage were 507.2 hours for Zetor 7711, 558 for Steyr 768 and 538 for MF135 indicating that the tractors were marginally utilized.

Under the Private Ownership Management System (POMS), it could be observed that the unit cost increased from ₦ 106.65 per hour in 1990 to ₦ 121.33 per hour for MF 135 with the highest cost occurring in 1993. Also the total mean hours of usage of 682 hours per annum was recorded (Table 4).

Under the same POMS, table 4 & 5 also illustrate that the unit cost of Steyr 768 rose from ₦ 102.11 per hour in 1990 to ₦ 163.62 per hour in 1994. Also the mean annual total hours of675.83 hours was recorded (Table 5).

Analysis of table 1, 2, 3,4,5,6 and 7 indicate that the unit cost is highest in the 4th and 6th year of use of the tractor in the three management systems. This was because of usually high rate of repair and maintenance between the 4th and 6th years of use (Morris, 1965). This high cost occurred due to general overhauling of the tractors, replacement of tyres, batteries, hydraulic pumps and other major parts of the tractors.

In the Farmers Co-operative Management System (FCMS) a similar trend obtains as shown on tables 6, 7, and 8. The unit cost of MF 135 rose from ₦113.0 per hour to ₦177.47 per hour with average annual hours of usage of 600.38 hours. Under the same management system, Steyr 768 recorded a rise of the unit cost from ₦103.86 per hour in 1990 to ₦145.49 per hour in 1994. The total annual hours of usage was 606.43 hours.

Table 9.0 compares the annual usage and percentage of variable cost on total ownership costs for the tractors studied under the three management systems. The percentage of variable cost on total ownership cost was found to be 26.82%; 27.96% for TEHS, FCMS and POMS respectively, indicating that at least an average of 26.6% of the total ownership costs of the tractors will be incurred as variable costs annually irrespective of the management system adopted.

The results of the comparison also indicate that the variable or operating costs such as fuel, oil, lubricants, maintenance and repair costs are least under the POMS and highest under the FCMS.

Generally, analysis of the result reveals that the unit cost is least under the Private Ownership Management System followed by the Farmers Co-operative Management System. The TEHS Management System was most expensive.

Tractor utilization was highest in the Private Ownership Management System recording 682 hours per annum while under the Tractor and Equipment Hiring System (TEHS) the lowest hours of tractor utilization was recorded (Table 9) indicating that for a self-sustaining business outfit, the Private

Ownership Management System can guarantee the sustainability of the venture more than the other management systems.

4. CONCLUSION

In terms of hours of usage per annum, tractors under the POMS were most effectively utilized than FCMS and TEHS. In terms of economy, the unit costs per hour for the tractors under the management systems revealed that tractors are most economical under the POMS ownership.

There was steady increase in the unit cost of the tractors within the first four years. The unit costs were low at the fifth year and this was attributable to the effect of major repairs and maintenance, which took place in the fourth year of usage.

In all management systems, Steyr 768 recorded the highest total cost as compared to other farm tractors under study. From the level of utilization of the tractors, it could be observed that POMS recorded more hours of use per annum indicating that tractor and equipment hiring services can best be handled as a self- sustaining business venture under the POMS

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Table 1. **Ownership costs of farm tractor (zetor 7711) under tractor and equipment hiring services (TEHS)**

		Fixed Cost per Year					Variable Cost per Year					
Year	Total Hours Used	Depreciation	Interest	Shelter	Operator Salary	Total Fixed Cost	Fuel Cost	Lubrication	Repair and Maintenance	Total Variable cost	Total Fixed and Variable Cost	Unit Cost Per Hour
		₦	₦	₦	₦	₦	₦	₦	₦	₦	₦	₦
1990	550	33,250.0	18,097.2	1,750.0	9,600.0	62,697.20	6,500.0	2,430.0	00.00	8,930.0	71,627.20	130.23
1991	510	33,250.0	18,097.2	1,750.0	10,200.0	63.297.20	6,680.0	3,210.0	3,500.0	13,390.0	76,687.20	150.37
1992	560	33,250.0	18,097.2	1,750.0	13.050.0	66.147.20	8,020.0	5,315.0	13,125.	26,460.0	92,607.20	165.37
1993	550	33,250.0	18,097.2	1,750.0	13,600.0	66,697.20	7,950.0	5,820.0	29,750.	43,520.0	110,217.2	200.39
1994	520	33,250.0	18,097.2	1,750.0	14,120.0	67,217.20	8,700.0	6,415.0	8,750.0	23,865.0	91,082.20	175.16
Total	2690	166,250.	90,486.0	8,750.0	60.570.0	326,056.0	37,870.	23,190.	55.125.	116,165.	442,221.0	
Mean	538	33,250.0	18,097.2	1,750.0	12,114.0	65,211.20	7,570.0	4,638.0	11,025.	23,233.0	88,444.20	164.39

Purchase price of Tractor: ₦350,00.00; Date of Purchase: 18th December, 1989.

Table 2: **Ownership costs of farm tractor (Steyr 768) under tractor and equipment hiring services (TEHS)**

	Fixed Cost per annum					Variable Cost per Annum					
Year	Total Hours Used	Depreciation ₦	Interest ₦	Shelter ₦	Operator Salary ₦	Total Fixed Cost ₦	Fuel Cost ₦	Lubrication ₦	Repair and Maintenance ₦	Total Variable cost ₦	Total Fixed and Variable Cost ₦	Unit Cost Per Hour ₦
1990	530	32,775.0	17,838.67	1,725.0	9,600.0	61,938.67	5,962.0	3,050.0	00.00	9,012.00	70,950.67	133.87
1991	520	32,775.0	17,838.67	1,725.0	10,200.	62,538.67	6,831.0	4,108.0	3,450.00	14,389.00	76,927.67	147.94
1992	600	32,775.0	17,838.67	1,725.0	13.050.	65,388.67	7.500.0	6,302.0	12,937.5	26,739.00	92,128.17	153.55
1993	560	32,775.0	17,838.67	1,725.0	13,600.	65,938.67	8,450.0	6,705.0	29,325.0	44,480.00	110,418.67	197.18
1994	580	32,775.0	17,838.67	1,725.0	14,120.	66,458.67	10,200.	8,115.0	8,625.00	26,940.00	93,398.67	161.03
Total	2790	163,875.	89,193.35	8,625.0	60,570.	322,263.65	38,943.	28,280.	54,337.5	121,560.5	443,823.85	
Mean	558	32,775.0	17,838.67	1,725.0	12,114.	64,452.67	7,788.0	5,656.0	10,867.5	24,312.10	88,764.77	159.08

Purchase price of Tractor: ₦345,000.00; Date of Purchase: 18th December, 1989.

Table 3: **OWNERSHIP COSTS OF FARM TRACTOR (MF 135) UNDER TRACTOR AND EQUIPMENT HIRING SERVICES (TEHS)**

		Fixed Cost per annum					Variable Cost per Annum					
Year	Total Hours Used	Depreciation	Interest	Shelter	Operator Salary	Total Fixed Cost	Fuel Cost	Lubrication	Repair and Maintenance	Total Variable cost	Total Fixed and Variable Cost	Unit Cost Per Hour
		₦	₦	₦	₦	₦	₦	₦	₦	₦	₦	₦
1990	510	28,500.0	15,511.89	1,725.0	9,600.00	61,938.67	5,962.00	3,050.0	00.00	9,012.00	70,950.67	133.87
1991	496	28,500.0	15,511.89	1,725.0	10,200.0	62,538.67	6,831.00	4,108.0	3,450.00	14,389.00	76,927.67	147.94
1992	520	28,500.0	15,511.89	1,725.0	13.050.0	65,388.67	7.500.00	6,302.0	12,937.5	26,739.00	92,128.17	153.55
1993	510	28,500.0	15,511.89	1,725.0	13,600.0	65,938.67	8,450.00	6,705.0	29,325.0	44,480.00	110,418.67	197.18
1994	500	28,500.0	15,511.89	1,725.0	14,120.0	66,458.67	10,200.0	8,115.0	8,625.00	26,940.00	93,398.67	161.03
Total	2536	142,500.	77,459.45	8,625.0	60,570.0	322,263.65	38,943.0	28,280.	54,337.5	121,560.5	443,823.85	
Mean	507.2	28,500.0	15,511.89	1,725.0	12,114.0	64,452.67	7,788.00	5,656.0	10,867.5	24,312.10	88,764.77	159.08

Purchase price of Tractor: ₦300, 000.00; Date of Purchase: 10th January , 1990.

Table 4. **Ownership costs of farm tractor (MF 135) under the private ownership management system (POMS)**

		Fixed Cost per annum					Variable Cost per Annum					
Year	Total Hours Used	Depreciation ₦	Interest ₦	Shelter ₦	Operator Salary ₦	Total Fixed Cost ₦	Fuel Cost ₦	Lubrication ₦	Repair and Maintenance ₦	Total Variable cost ₦	Total Fixed and Variable Cost ₦	Unit Cost Per Hour ₦
1990	650	30,875.0	16,804.55	1,625.0	10.800.0	60,104.55	3,045.0	2,920.0	00.00	5,965.00	66,069.55	101.65
1991	680	30,875.0	16,804.55	1,625.0	11,200.0	60,504.55	4,100.0	3,500.0	3,250.00	10,850.0	71,354.55	104.93
1992	710	30,875.0	16,804.55	1,625.0	11,800.0	61,104.55	5,650.0	4,655.0	12,187.5	2,492.50	83,597.05	117.74
1993	690	30,875.0	16,804.55	1,625.0	12,400.0	61,704.55	5,856.0	4,556.0	27,625.0	38,037.0	99,741.55	144.55
1994	680	30,875.0	16,804.55	1,625.0	13,000.0	62,304.55	6,960.0	5,115.0	8,125.00	20,200.0	82,504.55	121.33
Total	3410	154,375.	84,022.75	8,125.0	59,200.0	305,722.75	22,571.	20,746.	51,187.5	97,544.5	403,267.25	591.30
Mean	682	30,875.0	16,804.55	1,625.0	11,840.0	61,144.55	4,514.2	4,149.2	10,237.5	19,508.9	80,653.45	118.26

Purchase price of Tractor: ₦325, 000.00; Date of Purchase: 10th October, 1989.

Table 5. **Ownership costs of farm tractor (Steyr 768) under the private ownership management system (POMS)**

	Fixed Cost per annum					Variable Cost per Annum					
Year	Total Hours Used	Depreciation	Interest	Shelter	Operator Salary	Total Fixed Cost	Fuel Cost	Lubrication	Repair and Maintenance	Total Variable cost	Total Fixed and Variable Cost	Unit Cost Per Hour
		₦	₦	₦	₦	₦	₦	₦	₦	₦	₦	₦
1989	640	29,925.0	16,287.48	1,575.0	10.800.0	58,587.48	3,900.0	2,860.00	00.00	6,760.00	66,347.48	102.11
1990	715	29,925.0	16,287.48	1,575.0	11,200.0	58,987.48	3,800.0	3,140.00	3,150.00	10,090.00	69,077.48	96.61
1991	650	29,925.0	16,287.48	1,575.0	11,800.0	59,587.48	4,805.0	3,965.00	11,812.50	20,582.50	80,169.98	123.34
1992	700	29,925.0	16,287.48	1,575.0	12,400.0	60,187.48	5,260.0	4,650.00	26,775.00	36,685.00	96,872.48	138.39
1993	700	29,925.0	16,287.48	1,575.0	13,000.0	60,787.48	5,920.0	5,000.00	7,875.00	18,875.00	79,66.48	113.80
1994	650	29,925.0	16,287.48	1,575.0	13,600.0	61,387.48	7,350.0	6,115.00	31,500.00	44,965.00	106,352.48	163.62
Total	4055	149,625.	81,437.40	7,875.0	72,800.0	359,524.88	31,035.	25,810.0	81,112.50	137,957.5	427,480.38	736.08
Mean	675.83	29,925.0	16,287.48	1,575.0	12,133.0	59,920.81	5,172.5	4,301.67	13,518.75	22,992.92	82,913.40	122.68

Purchase price of Tractor: ₦315,000.00; Date of Purchase: 15th October. 1989

Table 6. **Ownership costs of farm tractor (MF 135) under the farmers' co-operative management system (FCMS)**

	Fixed Cost per annum						Variable Cost per Annum					
Year	Total Hours Used	Depreciation ₦	Interest ₦	Shelter ₦	Operator Salary ₦	Total Fixed Cost ₦	Fuel Cost ₦	Lubrication ₦	Repair and Maintenance ₦	Total Variable cost ₦	Total Fixed and Variable Cost ₦	Unit Cost Per Hour ₦
1989	560	30,210.0	16,442.6	1,590.0	9,000.00	57,242.60	3,530.00	2,520.00	00.00	6,050.00	63,292.00	113.0
1990	580	30,210.0	16,442.6	1,590.0	9,600.00	57,842.60	4,800.00	2,650.00	3,180.00	10,630.0	68,472.60	118.05
1991	600	30,210.0	16,442.6	1,590.0	10,200.00	58,442.60	5,300.00	3,050.00	11,925.0	20,275.0	78,717.60	131.20
1992	630	30,210.0	16,442.6	1,590.0	10,800.00	59,042.60	6,500.00	4,105.00	27,030.0	37,635.0	96,667.60	153.46
1993	640	30,210.0	16,442.6	1,590.0	12,500.00	60,742.60	6,980.00	4,815.00	7,950.00	19,745.0	80,487.60	125.76
1994	595	30,210.0	16,442.6	1,590.0	13,100.00	61,342.60	7,050.00	5,400.00	31,800.0	44,250.0	105,592.6	177.47
Total	3605	181,260.	98,655.6	9,540.0	65,200.00	354,655.6	34,160.0	22,540.0	81,885.0	138,585.	493,240.0	820.92
Mean	600.83	30,210.0	16,442.6	1,590.0	10,866.66	59,109.27	5,693.33	3,756.67	13,647.5	23,097.5	82,206.77	136.82

Purchase price of Tractor: ₦318, 000.00; Date of Purchase: 18th September, 1988.

Table 7. **Ownership costs of farm tractor (Steyr 768) under the farmers' co-operative management system (FCMS)**

		Fixed Cost per annum					Variable Cost per Annum					
Year	Total Hours Used	Depreciation	Interest	Shelter	Operator Salary	Total Fixed Cost	Fuel Cost	Lubrication	Repair and Maintenance	Total Variable cost	Total Fixed and Variable Cost	Unit Cost Per Hour
		₦	₦	₦	₦	₦	₦	₦	₦	₦	₦	₦
1988	590	29,450.0	16,028.95	1,550.0	9,000.00	56,028.00	3,100.00	2,150.00	00.00	5,250.00	61,270.00	103.86
1989	585	29,450.0	16,028.95	1,550.0	9,600.00	56,628.95	3,900.00	2,440.00	3,100.00	9,440.00	66,068.95	112.86
1990	550	29,450.0	16,028.95	1,550.0	10,200.00	57,228.95	4,300.00	2,552.00	11,625.00	18,477.00	75,705.95	137.65
1991	620	29,450.0	16,028.95	1,550.0	10,800.00	57,828.95	5,520.00	3,500.00	26,350.00	35,370.00	93,198.95	150.32
1992	650	29,450.0	16,028.95	1,550.0	12,500.00	59,528.95	6,800.00	4,295.00	7,750.00	18,477.00	78,373.95	120.58
1993	650	29,450.0	16,028.95	1,550.0	13,100.00	60,128.95	6,980.00	4,995.00	31,000.00	42,975.00	103,103.95	158.62
1994	600	29,450.0	16,028.95	1,550.0	13,700.00	60,728.95	7,115.00	5,500.00	13,950.00	26,565.00	87,293.95	145.49
Total	4245	206,150.	112,202.65	10,850.	78,900.00	408,102.65	37,715.0	25.432.0	93,775.00	156,922.0	565,024.65	931.70
Mean	606.43	29,450.0	16,028.95	1,550.0	11,271.43	58,300.38	5,387.85	3,633.14	13,396.43	22,417.00	80,717.80	133.10

Purchase price of Tractor: ₦310, 000.00; Date of Purchase: 10th November, 1987.

Table 8: Unit Costs of Farm Tractors under the ownership and Management System.

Management System	Tractor Make	Year 1988	1989	1990	1991	1992	1993	1994	Mean
FCMS	MF 135		113.02	118.05	131.20	153.46	125.76	177.47	136.82
	Steyr 768	103.86	112.94	137.65	150.32	120.58	158.62	145.49	133.10
	Average								134.96
POMS	MF 135			101.93	104.93	117.74	144.45	121.33	118.26
	Steyr		102.11	96.61	123.34	138.39	113.80	163.32	122.62
	Average								120.44
TEHS	MF 135			130.33	150.37	165.37	200.39	175.16	164.39
	Steyr 768			133.87	147.94	153.55	197.18	161.03	159.08
	Zetor 7711			126.37	138.13	157.24	189.77	164.26	155.22
	Average								159.56

Table 9. The Comparison of the Annual Usage: Variable and Total Costs of the Tractor under the Management Systems.

Management System	Tractor Make	Annual Usage (Hours)	% of Variable Cost on Total Costs %	Total Variable Costs ₦	Total Costs ₦
TEHS	MF 135	538	26.27	116,165.00	442,221.00
	Steyr 768	558	27.39	121,560.50	443,823.85
	Zetor 7711	507.20	26.80	105,504.00	393,633.45
Average		534.40	26.82	114,409.83	426,559.43
FCMS	MF 135	600.83	26.09	138,585.00	493,240.00
	Steyr 768	606.43	27.77	156,922.00	565,024.65
Average		603.63	27.93	147,753.00	529,132.62
POMS	MF135	682.0	24.19	97,544.50	403,267.25
	Steyr 768	675.83	27.73	137,957.50	427,482.38
Average		678.92	25.96	117,751.00	415,374.81