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Maintenance and Repair Cost of Company Wise Vehicles: A Case Study of the University of Agriculture Peshawar, Pakistan

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***Abstract*—**Maintenance and repair cost for vehicles not only determines replacement time but also decreases total costs. This study compares maintenance and repair cost of various vehicles manufactures (Buses such as Isuzu, Bedford, Hino-Pak; (Hiaces such as Toyota and Mitsubishi) and (Pickups such as Toyota, Mitsubishi and Nissan) to recommend an affective and economical manufacture for end users. Data for the study was collected from The University of Agriculture Peshawar, Pakistan through mean accumulated maintenance and repair cost for company wise basis vehicles. During the last 11 years, the university has paid the highest amount of maintenance cost of Rs. 974667 and repair cost of Rs. 1279069 for the year 2009 and 2010 respectively, while the lowest amount of maintenance cost of Rs. 292842 and repair cost of Rs. 188558 for the years 2001 and 2000 respectively for all university vehicles.

Keywords— Repair & Maintenance, Vehicles, Cost, Companies.

I. INTRODUCTION

Maintenance and repair enhance vehicles life. However a National Institute for Automotive Service Excellence (ASE) (1) study claims that at least half of the consumers ignore routine maintenance, particular young consumers. Almost two-thirds of automotive technicians believe those consumers can take care of their vehicles' maintenance and repair needs for less than $500 annually. Considering the average cost and complexity of a new vehicle, it may be penny-wise and dollar-foolish if neglect routine maintenance. However many of vehicle owners are not aware of the importance of vehicle maintenance for its durability and efficient functioning (6).

Maintenance and repair (M and R) cost is an important factor in costs of owning and operation. In general, the costs other than those for maintenance and repair usually decrease with increasing usage, but the reverse is true with respect to M and R costs (3). The cost of M and R is usually about 10% of the total cost; as the machine age increases the cost increases until it becomes the largest cost item of owning and operating vehicles and farm machines. Agricultural engineers have conducted many studies on cost benefit ratio of M and R of vehicles and also farm machines (9). Several studies conducted in both developed and undeveloped countries have attributed to develop models to determine the cost during a certain period or to get absolute numbers to represent owning and operating certain equipment (4).

Vehicle maintenance means keeping all the systems and features functioning as closely as possible to the manufacturer's original design intentions. Routine maintenance should be an ongoing process even when the vehicle is new (8). Proactively tending to your vehicle's maintenance needs is likely to help your vehicle start, run, and stop as the manufacturer intended, so you get the maximum amount of performance, reliability, and service life. Periodic inspections of the vehicle's systems are the easiest way to monitor its health (5).

II. MATHODS AND METARIALS

The study was conducted at the Department of Agricultural Mechanization, The University of Agriculture, Peshawar, for management of university vehicle maintenance and repair. In this study, a database was used for automatic generation of update report of maintenance and repair of vehicles. The data was collected from the Department of Agricultural Mechanization as well as from individual department vehicle lock book.

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1.1. Detail specifications of all vehicles are given in tables (I – V)

2.1.1. Table- I. Isuzu Buses

S. No.	Reg. No.	Department	Engine No.	Chassis No.	Model	Company	Purchase Date
1	A-3188	Transport	50066-F	300176	1991	Isuzu	1991
2	A-3189	Transport	50050-F	3000160	1991	Isuzu	1991
3	A-3191	Transport	50072	3000182	1991	Isuzu	1991
4	A-3192	Transport	50072	3000182	1991	Isuzu	1991

2.1.2. Table- II. Bedford Buses

S. No.	Reg. No.	Department	Engine No.	Chassis No.	Model	Company	Purchase Date
1	A-3197	Transport	3922	602258	1979	Bed Ford	1980
2	A-3198	Transport	55000304	701350	1990	Bed Ford	1980
3	A-3193	Transport	321351	601927	1984	Bed Ford	1984
4	A-3194	Transport	321350	601794	1984	Bed Ford	1984
5	A-3200	Transport	13949	617925	1993	Bed Ford	1993
6	A-3201	Transport	6239044	733367	1974	Bed Ford	1993

2.1.3. Table- III. Hino-Pak Buses

S. No.	Reg. No	Department	Engine No.	Chassis No.	Model	Company	Purchase Date
1	A-4836	Transport	12642	11173	2002	Hino Pak	2002
2	A-4835	Transport	12641	11172	2002	Hino Pak	2002

2.1.4. Table- IV. Hiaces

S. No.	Reg. No.	Department	Engine No.	Chassis No.	Model	Company	Purchase Date
1	A-3256	Entomology	784615	8000502	1984	Toyota	1984
2	A-4209	DT Office	1184192	1670	1986	Toyota	1986
3	A-2275	Agronomy	1371965	6461	1987	Toyota	1987
4	A-3095	Soil Science	1368624	6431	1987	Toyota	1988
5	A-3190	Transport	156370	6420	1988	Toyota	1988
6	A-3354	Agric. Chemistry	2579607	144-0003592	1991	Toyota	1991
7	A-1763	WAMA	3537625	114-0015393	1993	Toyota	1993
8	A-3204	Plant Protection	J08CFM 16111	AK1JMKA 11260	2007	Toyota	1993
9	A-3328	DASAR Office	314390	916373	1996	Toyota	1996
10	A-1761	PB &G	2l-202850	LHI 146-000076	1989	Toyota	1999
11	A-2909	Dean Crop Protection	F364234	979721	2005	Toyota	2005
12	A-3398	FS&T	J08CFM 16113	AK1JMKA 11262	2007	Toyota	2007

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2.1.5. Table- V. Pickups

S. No	Reg. No.	Department	Engine No.	Chassis No.	Model	Company	Purchase Data
1	A-2355	Transport	25017303	2100755	1988	Toyota	1985
2	A-2469	Livestock Mgt.	250176566	00073C	1988	Toyota	1988
3	A-2774	DOW Office	25017587	00073C	1988	Toyota	1988
4	A-3404	Transport	17656	000736	1988	Toyota	1988
5	AD-44-165	Provost	1806795	52500	1989	Toyota	1989
6	A-2775	DOW Office	4D56-DA-3573	340-LP-00516	1990	Toyota	1990
7	A-1129	IDS	4056DA	CJNK340LP00519	1990	Toyota	1990
8	A-3603	Poultry Science	4d56DA 3491	CJNK340LP 00511	1990	Toyota	1990
9	AD-44-149	WAMA	1806795	106R-FRMS	1990	Toyota	1990
10	A-1762	WAMA	4190080	1060143011	1996	Toyota	1998
11	A-1214	Animal Nutrition	4190080	1060143011	1998	Toyota	1998
12	A-3111	Horticulture	3l4565286	LN166-0011760	1999	Toyota	1999
13	A-2356	Pathology	25017623	21-000731	1988	Nissan	1988
14	A-2072	Transport	56DA3571	342900512	1991	Mitsubishi	1991

III. Results And Discussion

This section of the study presents maintenance and repair cost which were obtained from the university vehicles lock book as well as from the record of the Department of Agricultural Mechanization, The University of Agriculture, Peshawar, Pakistan. The data was analyzed statistically.

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A. Maintenance and Repair Cost of Company wise University Vehicles during the Year 2000 - 2010.

1. Maintenance and Repair Cost of Isuzu Buses:

In Figure 1, maintenance and repair cost per kilometer of Isuzu buses are shown for the year 2000 - 2010. Minimum maintenance cost per kilometer of Rs. 1.04was recorded for vehicle Isuzu bus No. A-3189, while maximum maintenance cost per kilometer of Rs. 1.90was noted for Isuzu bus No. A-3192. The maintenance cost of Isuzu bus No. A-3189 was highly significant with the other vehicles of Isuzu Buses. However, the maintenance cost of Isuzu bus No. A-3188 and A-3191 were not significant with each other but significantly different with the maintenance cost of Isuzu bus No. A-3192.

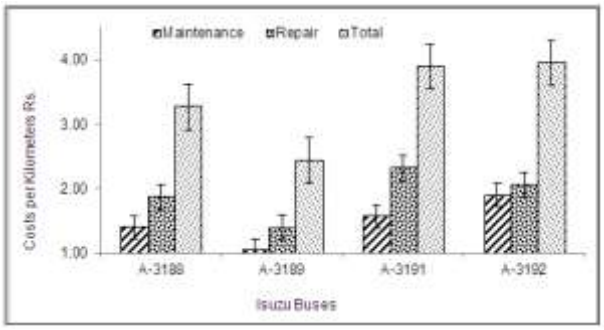

Figure 1. Maintenance and Repair cost of Isuzu Buses

Regarding to compare the repair cost, the data shown in figure 1, that there was a significant different among the vehicles of Isuzu buses. The minimum repair cost per kilometer of Rs.1.39wererecorded for Isuzu bus No A- 3189 and the maximum repair cost per kilometer of Rs. 2.32wasfound for Isuzu bus No. A-3191.The repair cost of Isuzu bus No. A- 3189 was statistically significant different with all others Isuzu buses. However, there was no significant difference among Isuzu buses No. A-3188 and Isuzu bus No. A-3192,, but both were significant different with the vehicle No. A-3191.

Whereas, to compare the total maintenance and repair cost, there was significant difference among all Isuzu buses as shown in figure 1. The total maintenance and repair cost of Isuzu buses were ranged from 2.43 – 3.95 Rs/km. The least amount of total maintenance and repair cost of Rs. 2.43 Rs/km

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were observed for Isuzu bus No. A- 9189, while the highest amount of total maintenance and repair cost was noted for Isuzu bus No. 3.95 Rs/km. The data shown in figure 1, that the total maintenance and repair cost of Isuzu bus No. A-3189 was significantly lowest from others Isuzu buses, however Isuzu buses No. A- 3191 and A- 3192were not significant different with each other, but significantly different with Isuzu bus No. A-3188 during the year 2000 - 2010.

2. Maintenance and Repair Cost of Bedford Buses

Maintenance cost of Bedford buses for the year 2000 - 2010were shown in figure 2. There was a statistically significant difference among various Bedford buses. The minimum maintenance cost per kilometer of Rs. 0.07 is recorded for Bedford bus No. A-3201, followed by 0.64 Rs/km for Bedford bus No. A- 3193 respectively; while maximum maintenance cost per kilometer of Rs. 2.94was found for Bedford bus No. A-3200.The maintenance cost of Bedford buses No. A- 3201 and A-3193 were highly significant difference from other Bedford buses, which shows not significant difference from each other's.

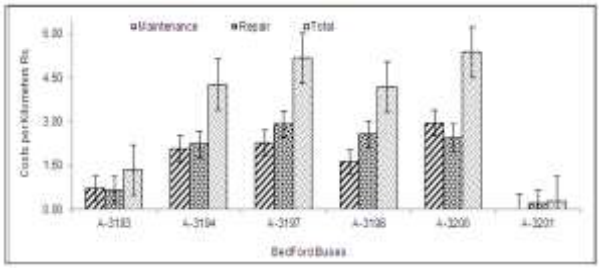

Figure 2. Maintenance and Repair Cost of Bedford Buses

Similarly, with respect to repair cost of Bedford buses, the minimum repair cost per kilometer of Rs. 0.18were noted for vehicle Bedford bus No. A- 3201, followed by Rs. 0.64 per kilometer for Bedford bus No. A-3193 respectively; while maximum repair cost per kilometer of Rs. 2.90was recorded for vehicle Bedford busNo.A-3197. The data seems to be that the repair cost of Bedford buses No. A-3201 and A-3193 were highly significant form other Bedford buses, which were non-significant different from each others.

Moreover, the total maintenance and repair cost Rs. per kilometer ranged from 0.25 – 5.37 is shown in figure 2. There was a significant difference among all Bedford buses. The least amount of total maintenance and repair cost per kilometer of 0.25 Rs. was noted for Bedford bus No. A- 3201, followed by 1.34 Rs/km for Bedford bus No. A-3193 respectively; and the highest amount of total maintenance and repair cost per kilometer of 5.37 Rs. were recorded for Bedford bus No. A- 3200. The figure 2 shown that the amount of total maintenance and repair cost per kilometer of Bedford bus No. A- 3201 and A-3193 were statistically significant different from all others Bedford buses, however the remaining four Bedford buses were non-significantly different during the year 2000–2010 as shown in figure 2.

3. Maintenance and Repair Cost of Hino-Pak Buses:

In Figure 3, maintenance cost of Hino-Pak buses were shown and there was significant difference between both the two buses during the year 2000 - 2010. The minimum maintenance cost per kilometer of Rs. 0.36was noted for vehicle Hino-Pak bus No. A-4836 and the maximum maintenance cost per kilometer of Rs. 0.55were observed for vehicle Hino-Pak bus No. A-4835.

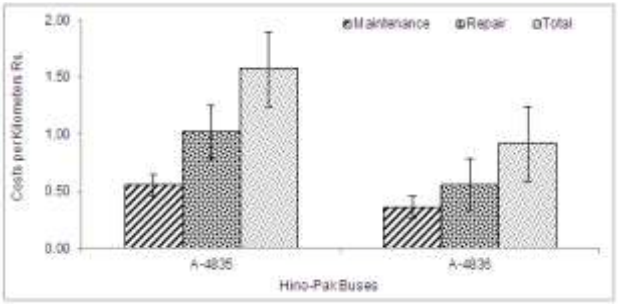

Figure 3.Maintenance and Repair Cost of Hino-Pak Buses

Whereas, to compare the repair cost of both Hino-Pak buses, the data shown in figure 3, that the minimum repair cost per kilometer of Rs. 0.56was noted for Hino-Pak bus No A- 4836 and the maximum repair cost per kilometer of Rs. 1.06 is recorded for Hino-Pak bus No A- 4835. However the total lowest maintenance and repair cost per kilometer of Rs. 0.91 was recorded for Hino-Pak bus No. A-4836, while the highest maintenance and repair cost per kilometer of Rs. 1.57 was found for vehicle No. A- 4835.

Table VI. T-Paired test between Isuzu and Bedford Buses

Source of Variance	T-value	Degree of freedom	P-Value	Decision
Maintenance Cost	-0.445	3	0.686	NS
Repair Cost	-0.368	3	0.737	NS
Total Cost	-0.422	3	0.702	NS

The T-Paired test showed comparison of Maintenance cost, Repair cost and Total cost of company wise vehicles between Isuzu and Bedford buses. The test showed that there is no significant difference between the above two companies.

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Table VII. T-Paired test between Bedford and Hino-Pak Buses

Source of Variance	T-value	Degree of freedom	P-Value	Decision
Maintenance Cost	1.194	1	0.444	NS
Repair Cost	0.626	1	0.644	NS
Total Cost	0.872	1	0.544	NS

The T-Paired test showed the comparison of Maintenance cost, Repair cost and Total cost of company wise Bedford and Hino-Pak buses. The test showed that there is no significant difference.

Table VIII. T-Paired test between Isuzu and Hino-Pak Buses

Source of Variance	T-value	Degree of freedom	P-Value	Decision
Maintenance Cost	9.00	1	0.070	NS
Repair Cost	167.00	1	0.004	**
Total Cost	17.88	1	.034	*

* indicate significant difference** indicate highly significant difference NS indicate Non-Significant difference

The T-Paired test showed the comparison of Maintenance cost, Repair cost and Total cost of company wise Isuzu and Hino-Pak buses. The test showed that there is no significant difference between maintenance cost but the test showed repair cost as well as total cost highly significant difference of Isuzu and Hino-Pak as shown in the table.

4. Maintenance and Repair Cost of Toyota Hiaces:

Maintenance cost of Toyota Hiaces for the year 2000 - 2010was shown in figure 4. There was a statistically significant difference among various Toyota Hiaces. The least maintenance cost per kilometer of Rs. 0.29were recorded for Hiaces No. A-3354 and A-2275 respectively; while highest maintenance cost per kilometer of Rs. 4.41was found for Toyota Hiace No. A-4209.The maintenance cost of Toyota Hiaces No. A- 3354 and A-2275 were significantly difference from other Toyota Hiaces, which are not significantly difference from each other's but the Toyota Hiace No. A-4209 shows highly significant different from the other Toyota Hiaces.

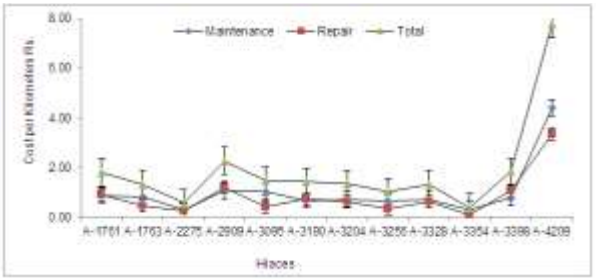

Figure 4. Maintenance and Repair Cost of Toyota Hiaces

Similarly, with respect to repair cost of Bedford buses, the minimum repair cost per kilometer of Rs. 0.10was noted for vehicle Toyota Hiaces No. A- 3354, while the maximum repair cost per kilometer of Rs. 3.36was recorded for vehicle Toyota Hiaces No. A-4209. The data seems to be that the repair cost of Toyota Hiaces No. A-4209 and A-3354 were highly significant form other Toyota Hiaces, which were non-significant different from each others.

Moreover, the total maintenance and repair cost Rs. per kilometer ranged from 0.39 – 7.76 is shown in figure 4. The least amount of total maintenance and repair cost per kilometer of 0.39 Rs. was noted for Toyota Hiace No. A-3354, followed by 0.57 Rs/km for Toyota Hiace No. A-2275 respectively; and the highest amount of total maintenance and repair cost per kilometer of 7.76 Rs. was recorded for Toyota Hiace No. A- 4209. The figure 4 shown that the amount of total maintenance and repair cost per kilometer of Toyota Hiaces No. A- 4209 and A-2275 were statistically significant different, followed by Toyota Hiaces No. A-1761 and A-3398 from all others Toyota Hiaces, while the vehicle No. A-4209 of Toyota Hiace are shown in figure highly significant different from all other Toyota Hiaces, however the remaining six Toyota Hiaces were non significantly different during the year 2000–2010 as shown in figure 4

5. Maintenance and Repair Cost of Pickups:

In Figure 5, maintenance costs per kilometer of Pickups are shown for the year 2000 - 2010. Minimum maintenance cost per kilometer of Rs. 0.17was recorded for vehicle Pickups No. A-2355, while the maximum maintenance cost per kilometer of Rs. 6.64was noted for Pickups No. AD-44-149. The maintenance cost of Pickups No. AD-44-149 was highly significant with the other vehicles of Pickups. However, the maintenance cost of Pickups No. A-2355 was showed in figure significant different with each other Pickups but not significantly different with the Pickups No. A-2356, A-2775, AD-44-149 and AD-44-165 respectively. While in the figure showed that the Pickup No. AD-44-149 was highly significant different from all the other Pickups maintenance cost.

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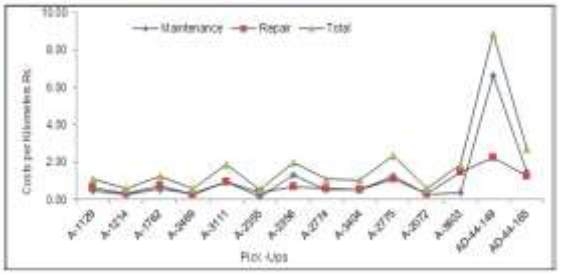

Figure 5. Maintenance and Repair Cost of Toyota, Nissan and Mitsubishi Pickup

Regarding to compare the repair cost, the data shown in figure 5. The maximum repair costs per kilometer of Rs. 2.23 were recorded for Pickups No AD-44-149 and the minimum repair cost per kilometer of Rs. 0.27wasfound for Pickups No. A-2469, followed by the Pickups No. A-1214, A-2355 and A-2072 maintenance cost of Rs/Km 0.30, 0.36 and 0.32 respectively. The repair cost of Pickups No. AD-44-149 was statistically highly significant different with all others Pickups. However, there was no significant difference among Pickups No. A-3111 and A-2775.

Whereas, to compare the total maintenance and repair cost, there was significant difference among all Isuzu buses as shown in figure 1. The total maintenance and repair cost of Isuzu buses were ranged from 2.43 – 3.95 Rs/km. The least amount of total maintenance and repair cost of Rs. 2.43 Rs/km was observed for Isuzu bus No. A- 9189, while the highest amount of total maintenance and repair cost was noted for Isuzu bus No. 3.95 Rs/km. The data shown in figure 1, that the total maintenance and repair cost of Isuzu bus No. A-3189 was significantly lowest from others Isuzu buses, however Isuzu buses No. A- 3191 and A- 3192 were not significant different with each other, but significantly different with Isuzu bus No. A-3188 during the year 2000 - 2010.

B. Comparison of Mean Maintenance Cost of Company wise University Vehicles during the Year 2000 - 2010.

1. Mean Maintenance Cost of Company wise Buses:

Mean maintenance cost per kilometer of company wise buses are shown in Figure No.6. In this figure the Year wise maintenance cost per kilometer of Bedford buses are highly greater than the other two companies' means (Isuzu and Hino-pak Buses). Isuzu and Bedford company vehicles are four in number and the data are present 10 Years and means are comes to divide the total Years, while the lowest maintenance cost of Hino-pak company vehicles are shown in the same figure, due to the Newest model. Hino-pak company vehicle are present in five numbers which data are present 2 to 3 years of each vehicles so that's why the maintenance cost are low than the other two companies.

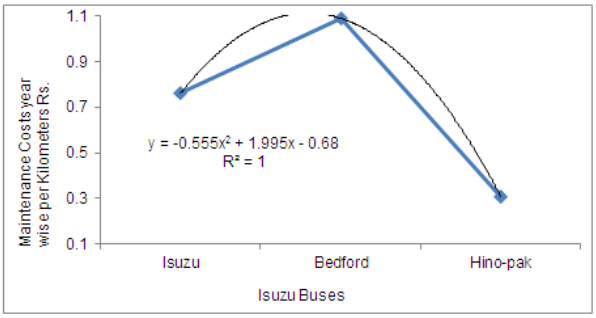

Figure 6. Maintenance Cost of Buses

2. Mean Maintenance Cost of Company wise Hiaces:

Maintenance cost per kilometer of Hiaces Year Wise is shown in figure No.8. In this figure the Year wise maintenance cost per kilometer of Toyota Hiaces are highly greater than the Mitsubishi Company. Because the Toyota company vehicle are greater in number due to this reason the maintenance cost of Toyota company vehicles are greater. In Toyota Company the data are present 2 to 3 years of only two vehicles means (A-3398 and A-2909).

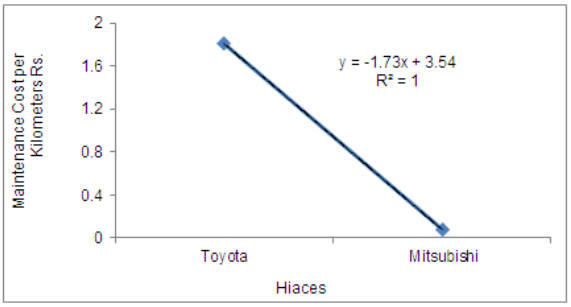

Figure 8. Year Wise Maintenance Cost of Hiaces

In Mitsubishi Company only one vehicle and the data are present for 5 years in Hiaces but the maintenance cost is nearer to the Toyota company vehicles. Toyota company vehicles are twelve in number and the 10 years data are present, while means are comes to divide the total Years, while the lowest maintenance cost per kilometer of Mitsubishi company vehicle are shown in the same figure, due to the Newest model.

3. Mean Maintenance Cost of Company wise Pickups:

Maintenance cost per kilometer year wise of Pickups are shown in figure No.10. In this figure the Year wise maintenance cost per kilometer of Nissan Pickups are highly greater than the other two companies' means (Toyota and Mitsubishi). Because the Nissan company vehicle is old due to this reason the cost of Nissan company vehicles are greater. In Toyota Company vehicles maintenance cost are greater than Mitsubishi company vehicle. In Mitsubishi Company only two vehicles are present in Pickups and the maintenance cost is low as compare to the Toyota and Nissan companies' vehicles. Toyota company vehicles are twelve in number and the 10 years data are present, while means are comes to divide the total Years.

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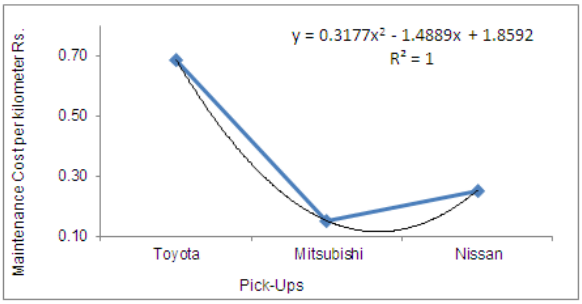

Figure 10. Year Wise Maintenance Cost of Pickups

C. Comparison of Mean Repair Cost of Company wise University Vehicles during the Year 2000 - 2010.

1. Mean Repair Cost of Company wise Buses:

Years Wise Repair cost per kilometer of Buses is shown in figure No.7. In this figure the Year wise repair cost of Isuzu buses are highly greater than the other two companies' means (Bedford and Hino-pak Buses).

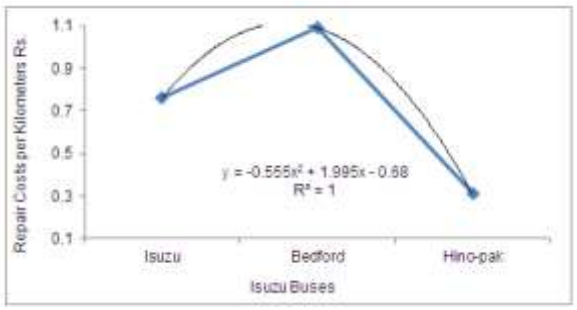

Figure 11.Year Wise Repair Cost of Buses

Isuzu and Bedford company vehicles are four (4) in number and the data are present 10 Years while means are comes to divide the total Years, while the lowest repair cost per kilometer of Hino-pak company vehicle are shown in the same figure, due to the Newest model. Hino-pak company vehicle are present in five numbers which data are present 2 to 3 years of each vehicles so that's why the repair cost are low than the other two companies.

2. Mean Repair Cost of Company wise Hiaces:

Year Wise Repair costs per kilometer of Hiaces are shown in figure No.9. In this figure the Year wise repair cost per kilometer of Toyota Hiaces are highly greater than the Mitsubishi Company. Because the Toyota company vehicle are greater in number due to this reason the maintenance cost of Toyota company vehicles are greater.

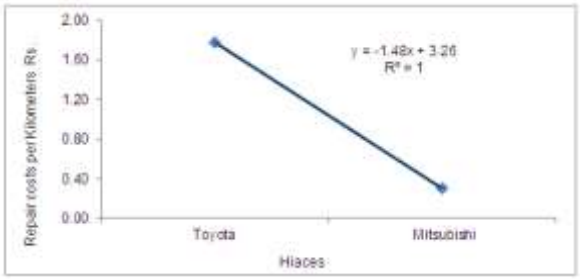

Figure 12.Year Wise Repair Cost of Hiaces

In Toyota Company the data are present 2 to 3 years of only two vehicles means (A-3398 and A-2909). In Mitsubishi Company only one vehicle is present in Hiaces and the repair cost per kilometer is low as compare to the Toyota company vehicles. Toyota company vehicles are twelve in number and the 10 years data are present, while means are comes to divide the total Years, while the lowest repair cost of Mitsubishi company vehicle are shown in the same figure, due to the Newest model.

3. Mean Repair Cost of Company wise Pickups:

Repair cost per kilometer year wise of Pickups are shown in figure No.11. In this figure the Year wise repair cost per kilometer of Toyota Pickups are highly greater than the other two companies' means (Nissan and Mitsubishi). Because the Toyota companies vehicles are old due to this reason the repair cost per kilometer of Toyota company vehicles are greater.

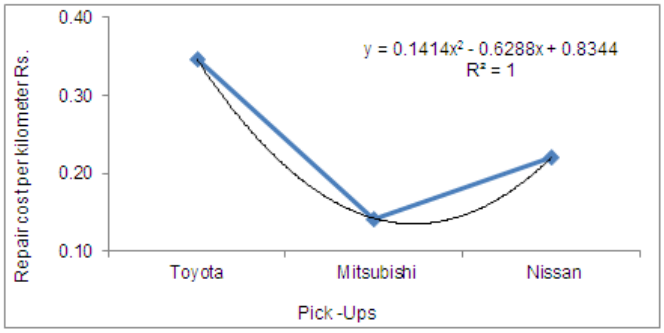

Figure 13.Year Wise Repair Cost of Pickups

In Nissan Company vehicles repair cost per kilometer are greater than Mitsubishi company vehicle. In Mitsubishi Company only one vehicle is present in Pickups and the repair cost per kilometer is low as compare to the Toyota and Nissan companies' vehicles. Toyota company vehicles are thirteen in number and the 10 years data are present, while means are comes to divide the total Years.

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IV. CONCLUSIONS

During the last 11 years, the university has paid the highest amount of maintenance cost of Rs. 974667, 966585, 933049, and 927030 for the years 2009 followed by 2002, 2010 and 2007 respectively, while the lowest amount of maintenance cost of Rs. 292842, 302039, 333484 and 353174 for the year 2001 followed by 2000, 2004 and 2003 respectively. Although the department of Agricultural Mechanization has trying to control the expenditure, maintain the condition of vehicles as well as to facilitate the various Institute, departments, transport and sections of the university with their limited resources.

The highest repair cost of Rs. 1279069, 833543, 830692 and 823218 for all university vehicles are recorded for the year 2010 followed by 2003, 2007 and 2006 respectively, while the lowest repair cost of Rs. 188558 and 197216 for the year 2000 and 2001 respectively. During 2010, the department has suggested to convert the international truck into bus body, which was approved by the authority at the cost of Rs. 529000. Due to this amount, the repair cost was increased in 2010, otherwise compared to other years i.e. 2003, 2006, 2007; the repair cost is Rs.750069 during the year 2010.

V. RECOMMENDATION

- Proper maintenance may decrease the repair cost as well as longer the vehicle life.
- Not fallow proper maintenance instructions issued by the Department of Agricultural Mechanization.
- Full flagged maintenance facilities may be provided in the Department of Agricultural Mechanization.
- Proper committee may be appointed for outside repair of vehicles.
- Skilled additional mechanic may be appointed in the Department of Agricultural Mechanization.
- Incentive may be given in cash as well as in promotion to the concerned drivers, who carefully maintain and drive the vehicles.
- Educated & Authorized heavy driving license driver may be appointed for official vehicle.

REFERENCES

[1] Available at I:\Maintenance of Vehicle\The Importance of Vehicle Maintenance « Auto-Mechanic Auto Mechanic Maintenance and Repair Tips.mht/html. (Verified Sep. 20, 2010).

[2] Available at I:\Maintenance of Vehicle\The Importance of Car Repair.mht/html. (Verified Sep. 21, 2010).

[3] Available at http://Maintenance of Vehicle\Preventative Maintenance Auto Repair Benefits. mht/html. (Verified Nov. 30. 2010).

[4] Bowers. W and Hunt. D. R. Application of mathematical formulas to repair cost data. Transactions of the ASAE, (1970), 13(6): 806-809.

[5] Busch. K. Drive the best for the Price [online]. Available at http://www. Drive the best book.com/.html. (Accessed Dec. 21, 2010).

[6] Hathaway. L. R. and Riney. L. A. Fundamental of Services 5th Edition. Dear & Company, Maline.III, (1980).

[7] James. P. The importance of car servicing and vehicle maintenance [Online]. Available at I:\Maintenance of Vehicle\The importance of car servicing and vehicle maintenance mht/html. (Verified at Nov. 2010). UK motoring industry. UK.

[8] Deere. J. Fundamental of Machine Operation 3rd Edition, Deere and company, Moline, Illinois, ISBN-86691- 027-1.

[9] Khan. K. I. Auto-mechanics guide Malik Book Depo-Urdu bazaar Lahore, (1984).

[10] Rotz. A. and Bowers. W. Repair and maintenance cost data for agricultural equipment. ASAE Paper No. 91-1531, (1991).

[11] Forker. R. Maintenance and Repair Volume 10 of American Soaring Handbook. Soaring Society of America Incorporated.lnc.86691-027-1, (1965).

12. Sullivan. C. R. The Importance of Keeping Your Vehicle in Good Repair [Online].Available at http://ezinearticles.com/expert=Connor_R_Sullivan.html. (Verified Aug. 7, 2010).