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Comparative Field Performance of Tractors with M. B. Plough Attachment

R. H. Rahate[1], N. A. Bokade[2], S. P. Wagh[3]

[1-3]*Assistant Professor, Anand Niketan College of Agriculture, Warora Dist- Chandrapur (M.S.) 442914*

Abstract -*The field performance trials of 2 bottoms M. B. plough with three different company tractors of 55 hp were evaluated for determination of depth of ploughing, fuel consumption, operating speed and effective field capacity at their rated working rpm and speed. Results indicated that New Holland, 3630,TX plus tractor was performed better than other two with respect to depth of ploughing 37 cm, fuel consumption 5.72 lit/hr and 22.45 lit/ha, and effective field capacity of 0.647 ha/hr.*

Key words : Tractor, Plough, Fuel consumption, Field capacity, Performance of tractor

1. INTRODUCTION

Mechanization in agriculture plays key role for sustainable improvement for increasing the production by timely precision farm operations, reducing losses, reducing cost of operations by ensuring better management of costly inputs and enhancing the productivity of natural resources also it helps in reducing drudgery in farm operation and reducing scarcity of labours. Mechanized agricultural practices and operations have been adopted by farmers for various field operations starting from land preparations to threshing and post harvest management. Mechanical power becomes essential for adoption of higher level of technology to perform complex operations within time constrains and with comfort and dignity to the operations. Tractor becomes a main unit in mechanization. The population of tractor is increasing due to its adoptability. Table 1 shows present scenario of tractor during 2018-19. Farmers are adopting heavier implements and machinery for timely operations, more area coverage and better field efficiency. Tractors with higher power 55-60hp requires to operate heavier machineries.

Ploughing is primary tillage operation carried out for land preparation. Farmers are adopting tractor drawn reversible multi bottom mould board plough for ploughing due to more efficiency, less cost of operations and less time consumption.

Table 1. Tractor market during 2018-2019

Month	Production	Sale
January 2018	53685	55948
February 2018	60962	54589
March 2018	75171	83114
April 2018	77052	73268
May 2018	79726	77838
June 2018	79301	96480
July 2018	73090	59032
August 2018	84666	53160
September 2018	88379	97893
October 2018	92422	120310
November 2018	70071	69172
December 2018	62313	48868f
January 2019	73295	57488
February 2019	59604	54281
March 2019	57629	70686
April 2019	68623	62497

2. MATERIAL AND METHODS

A field experiment was conducted to study the comparative performance of different tractors with Lemken make 2 bottom Mould plough. Three 55 hp tractors of different companies were selected for ploughing operations as T1- New Holland 3630 TX plus, T2- John Deere 5310 and T3- Same Deutz Fahr Agrolux 55. The technical specifications of tractors are shown in Table 2. Three replications were taken in the field for more accuracy and results. All the parameters of the tractor-implements performance were measured and recorded.

2.1 Operating speed

The operating speed was measured in the field by fixing two poles in the test plot 20m apart. Time required to cover 20m distance was measured with the help of stopwatch and actual speed of operation in km/hr was calculated.

2.2 Fuel consumption

Fuel consumption by the tractor during field operation was measured using an auxiliary fuel system. The fuel system consists of an auxiliary fuel M. S. tank that was fixed on the tractor. A supply pipe was connected in between fuel injectors and fuel tank. To find out the consumption of fuel, the auxiliary tank was filled up to full level before starting of operation and measured quantity of fuel was added after the operation into auxiliary tank upto previous level and measured quantity of additional fuel added.

2.3 Theoretical field capacity

It was measured by considering 100 percent of time at the rated speed and covering 100 percent of its speed and covering 100 percent of its rated width.

$$\text{Theoretical field capacity (ha/hr)} = \frac{\text{Width (m)} \times \text{Speed (m/hr)}}{10000}$$

2.4 Effective field capacity

It is measured as actual area covered by the tractor drawn plough, based on its total time consumed and its width. It was calculated as

$$\text{Effective field capacity (ha/hr)} = \frac{\text{Actual area covered, ha}}{\text{Total time required, hr}}$$

Table 2. Technical Specifications of tractors

Specification	T1	T2	T3
	New Holland, 3630,TX plus	John Deere 5310	Same Deutz Fahr Agrolux 55
No. Of Cylinder	3	3	3
Power (HP)	55	55	55
Capacity (CC)	2991	2400	3000
Engine Rated RPM	1500	2400	2350

Cooling	Water Cooled	Coolant cooled with overflow reservoir	Water Cooled
Air Filter	Dry type, 2 Elements with Pre Cleaner	Dry type, Dual element	Dry type
Clutch	Dual	Single Wet Clutch	Single / Double with independent clutch liver
Gear Box	8 Forward + 2 Reverse	9 Forward + 3 Reverse	8 F & 2R / 12 F & 3 R
Forward Speed	31.30 kmph	2.6 - 31.9 kmph	4.0 - 30 kmph
PTO Type	Single PTO / GSPTO	Independent, 6 Splines	Dual PTO with 540/750
PTO RPM	540	540 @2376 ERPM	Dual PTO with 540/750
Fuel Capacity	60 litre	68 litre	60 litres

3. RESULTS AND DISCUSSION

The performance of three tractors with M. B. plough was evaluated for determination of fuel consumption, effective field capacity, theoretical field capacity and ploughing depth. The details of are shown in table 3, Fig. 1 and Fig. 2. The depth of ploughing for T1 tractor was 37 cm as compared to T2 and T3, 30 cm and 28 cm respectively. It was higher than other tractors due to low in operating speed. Fuel consumption rate for T1 was low i.e. 5.72 lit/hr (22.45 lit/ha) which was lower than T2 and T3, it was due to low in working rpm. The actual area covered by tractor T1 is 0.647 ha/hr.

Table 3. Performance of Tractors with plough

Particulars	T1	T2	T3
Ploughing Depth, cm	37	30	28
Avg. Test Time, hr	60	60	60
Fuel comp. lit/Hr	5.72	7.36	6.75
Effective Field Capacity, ha/hr	0.647	0.644	0.564
Fuel Comp. lit/ha	22.45	28.6	29.925
Working RPM	1600	1800	1800
working speed, km/hr	5.0	5.5	5.5
Width of cut, cm	53	53	53
Theoretical Field capacity, ha/hr	0.265	0.2915	0.2915

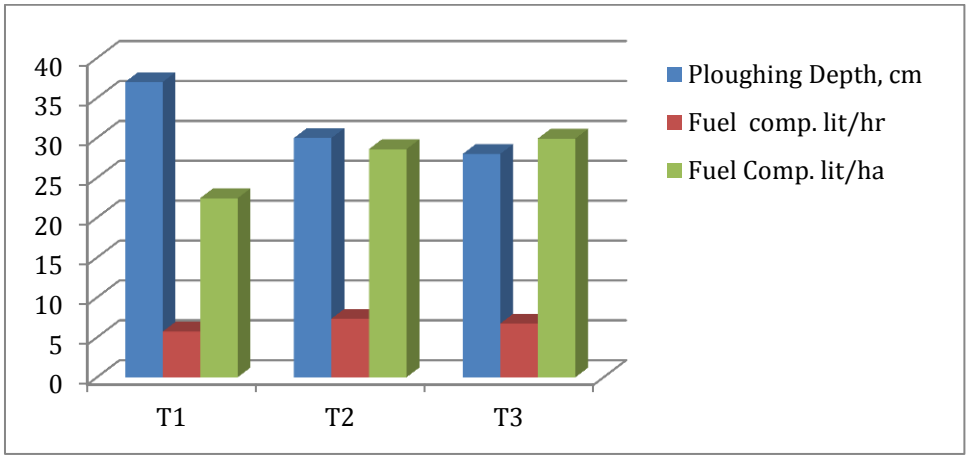

Chart 1. Performance of tractors with 2 bottom M. B. plough

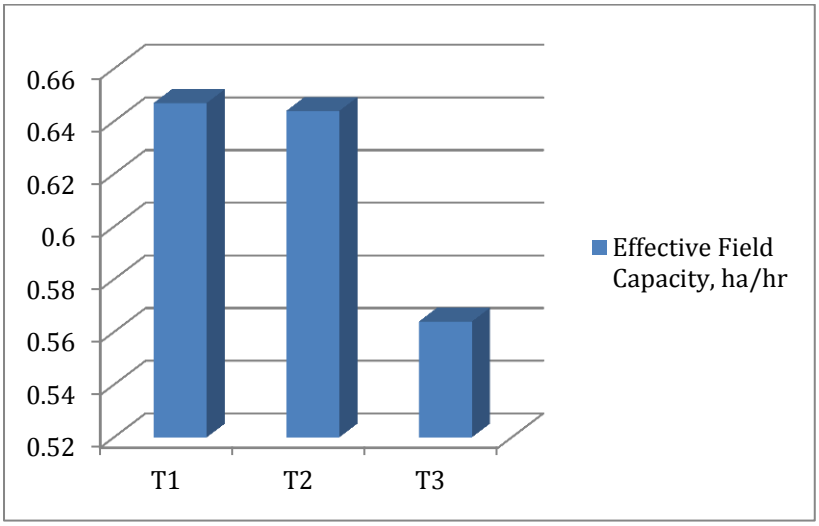

Chart 2. Effective field capacity of different tractors

4. CONCLUSION

The study was highlighted that the performance of New Holland, 3630,TX plus tractor with 2 bottom M. B. plough was better with high ploughing depth, low fuel consumption and high field capacity than John Deere 5310 and Same Deutz Fahr Agrolux 55.

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