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Fuel consumption of different tractor operated agricultural operations

SHAILESH H. THAKARE AND MRUDULATA M. DESHMUKH

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ABSTRACT

The main mechanical expensive operation is the land preparation with tillage implements and large amount of fuel consumed by it. Therefore, the economical machinery and power selections is a way to maximize the profit and minimize the total energy requirements and consequently the cost of production. The field trials of tractor operated implement were carried out using specially fabricated auxiliary fuel tank on the farm of the Department of Farm Power and Machinery, College of Agricultural Engineering and Technology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The implements like mould board plough, offset disc harrow and nine-tyne cultivator were used in vertisol soils to find the fuel consumption. The fuel consumption of mould board plough, offset disc harrow and nine-tyne cultivator was found to be 18.32 lit/ha, 4.99 lit/ha and 4.91 lit/ha, respectively, where as actual field capacities were 0.122 ha/hr at L–II gear, 0.44 ha/hr at L-III gear and 0.59 ha/hr at L-III gear at 1400 rpm, respectively. The field efficiencies of all above three implements were found to be 75.13 per cent, 69.21 per cent and 65.06 per cent, respectively.

See end of the article for authors' affiliations

Correspondence to:
SHAILESH H. THAKARE
Department of Farm Power and Machinery, College of Agricultural Engineering and Technology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth AKOLA (M.S.) INDIA

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The importance of tractor lies mainly in the improvement of soil cultivation and transport in the field of agriculture. The availability and cost of tractor fuels is constantly changing and has shaken the foundation of the farm economy through out the world. The factors that affect fuel consumption are speed of operation, width of cut, depth of cut, type of soil and skill of operator. In order to save the cost of fuel, field operators have changed their route from ploughing to no till method. Also, tractor designers have turned their mind from diesel operated tractors to alternate energy operated tractors. Hence, fuel consumption has gained a unique importance in the field of mechanization. The study was undertaken to find fuel consumption for different agricultural operations in black cotton soil of Vidarbha region and to determine the field capacity of various agricultural operations.

METHODOLOGY

A 0.24 hectare field was selected for study and was divided into three parts. A 45 HP tractor was used for determining the fuel consumption in black cotton / vertisol soil in *kharif* crop harvested soil condition. The experiments consisted of three tractor implement systems *viz*., tractor – disc plough, tractor-harrow and tractor-cultivator. The depth of operation was kept in between 14-18 cm. The tractor implement systems were evaluated at 1400 rpm. The gear combination of L-II for ploughing and L-III for harrowing and cultivation was used since these operations are generally performed in these combination for optimum power and speed as per the test carried out in various testing institute in India.

The fuel consumed by the tractor was measured by specially fabricated auxiliary fuel tank. (Fig.1) The on-off valve was welded at the bottom of the auxiliary fuel tank and fuel supply pipe was connected between this on-off valve to the banjo bolt of primary filter. The overflow pipe was connected between injection pump overflow outlet to the overflow inlet at the top of the fuel tank. A transparent rubber tube was fixed between two copper elbow welded on the side of the fuel tank. A reference marking scale was pasted just behind the transparent tube.

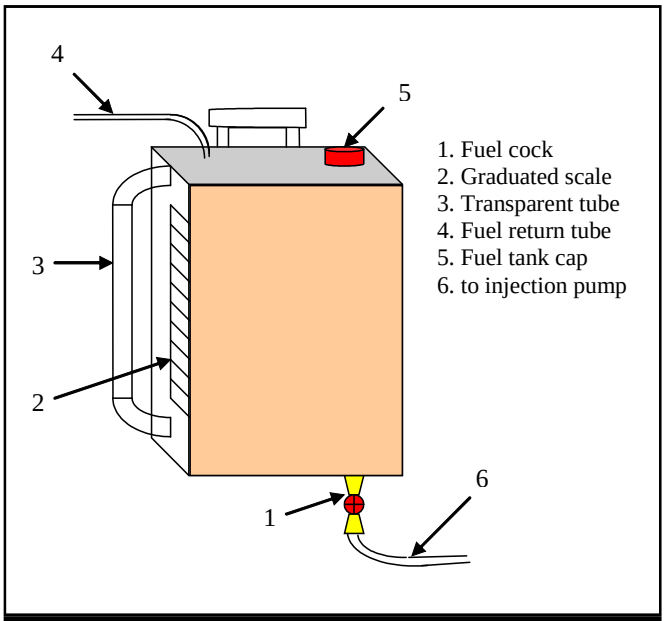

Fig. 1 : Auxiliary fuel tank