

Performance evaluation of sugarcane trash shredding machine with different HP tractors in different gear settings

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ABSTRACT

A sugarcane trash shredding machine was evaluated by using three tractors of 52 HP, 55 HP and 59 HP, which are easily available capacities of tractors on Indian farms, in I-L, II-L and III-L gears at 1900 rpm. The experiments were conducted after the harvest of sugarcane crop which left the trash spread on field. The average density of trash was 0.720 kg/m² area with 1.25 m average length of leaf. The effective field capacity was found in 52 HP tractor for I-L was 0.2802 ha/h, for II-L was 0.4067 ha/h, for III-L was 0.5205 ha/h and also in 55HP tractor for I-L was 0.3436 ha/h, for II-L was 0.4379 ha/h and for III-L was 0.5415 ha/h and also in 59HP tractor for I-L was 0.3703 ha/h, for II-L was 0.5042 ha/h and for III-L was 0.6217 ha/h. While the field efficiency was observed in 52 HP tractor for I-L was 51.34 %, for II-L 42.28 % and for III-L was 40.79 % and also in 55 HP tractor for I-L was 64.22 %, for II-L was 55.39 %, for III-L was 50.99 % and also in 59 HP tractor for I-L was 86.02 %, for II-L was 74.01 %, for III-L was 59.22 %. The length of trash before operation was nearly about 150 cm, which was then reduced to about 8 to 10 cm. The average fuel consumption was nearly about 33.23lit/ha, 26.69 lit/ha, 22.19 lit/ha in 52 HP tractor for I-L, II-L, III-L, respectively and nearly about 28.74 lit/ha, 23.11 lit/ha, 20.81 lit/ha in 55 HP tractor for I-L, II-L, III-L, respectively and nearly about 27.67 lit/ha, 23.41 lit/ha, 19.86 lit/ha in 59 HP tractor for I-L, II-L, III-L, respectively.

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In sugarcane field after harvesting of sugarcane, there was 7 to 10 tones/ha trash remained behind in field. In traditional method, for decomposition of sugarcane trash require 8 to 9 months. By the use of sugarcane trash shredding machine in field the machine cuts sugarcane leaves (120 to 150 cm long). In to small pieces of 8 to 10 cm. By this operations trash bed was made on field, which increased the water holding capacity of soil and saved 35 to 40% irrigation water. Also it reduced the problem of weeds. So by using this operation in sugarcane field the decomposition of chopped sugarcane trash takes place within 3 to 3.5 months (Deshpande *et. al.*, 2000). This machines worked with tractor with PTO power. The purpose of the machine was to pick-up the trash laid on the field after harvesting of sugarcane crop and chop it in to small pieces. Different types of machines are available for this purpose but the operational settings of these machines needs to be evaluated for better fuel economy, time efficiency and appropriate size (HP) of tractor to drive it. These machines could be operated by 35 to 50 HP tractors and field capacity of 0.27 ha/h and fuel consumption of 32.5 lit/ha was reported by Sharma, 2004. As these machines are newly launched in the market the farmers are not aware of there energy efficient settings. Keeping these points in view this research was started to enable the operators of this machine to set the operational settings for an economic work.

METHODOLOGY

The field tests were conducted after the harvest of sugarcane crop which left the trash spread on field. The average density of trash was 0.720 kg/m² area with 1.25 m average length of leaf. The performance evaluation of trash shredding machine (Fig. 1) was made on the basis of effective field capacity, fuel consumption and trash handling capacity.

The actual time required for shredding, time lost in turning, adjustments of the machine etc. was measured by using stop watches and the field capacity was calculated by dividing the total area shredded by total time required to cover it and the straw handling capacity was calculated by multiplying effective field capacity with straw density

The fuel consumption was measured by fixing an auxiliary fuel supply system on the tractors selected for the study. The system indicated number of divisions lowered and the amount of the fuel consumed corresponding to the number of divisions lowered was determined at all the gear settings for all the tractors selected for the study.

The quality of shredding was accessed by measuring length of sugarcane leaves after shredding and observing damaged to ratoon crop.