

Development and performance evaluation of cutting mechanism of flail mower

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ABSTRACT

A self propelled flail mower is developed and its performance was tested in the field. The developed machine consists of Power unit, supporting frame and Cutting unit. The "Y" shaped cutting edge has been sharpened for easy cutting and fixed at an optimum angle of inclination of 120° to its vertical axis. The cutting blade has also been used as an inclined plane to perform cutting the weeds efficiently. The flail mower is able to cut weeds of height from 15 to 240 mm above ground level at a cutting height of 10mm to 20mm, respectively. It is able to cut a wide variety of weeds from thin-dense portion to thick-dense portion, tough stalks, cleanly and without choking. It is found that the values of field efficiency for different test plots were in the range of 80.59 per cent to 92.20 per cent and the average field efficiency was found to be 88.69 per cent. The maximum weeding efficiency of 95.12 per cent is obtained. Fuel consumption per working hour was 0.858 l/hr, 1.002 l/hr and 1.364 l/hr

Key words : Cutting mechanism of flail mower, Self propelled flail mower.

Weeds interfere with man's activities, many ways have been developed for suppressing or eliminating them. These methods vary with the nature of the weed itself, the means at hand for disposal, and the relation of the method to the environment. Mechanical weed control, in any event, has become a highly specialized activity employing thousands of trained persons. Universities and agricultural colleges teach courses in mechanical weed control, and industry provides the necessary technology. Governmental workers and private individuals are engaged daily in the practice of mechanical weed control because the growing of food and fibre crop depends on it for current levels of production. The many reasons for controlling weeds have become more complex with the increasing development of technology.

In case of cutting of weeds, a system of forces acts upon the material in such a manner as to cause to fail in shear. This shear failure is almost invariably accompanied by some deformation in bending and compression, which increases the amount of work, required for the cutting operation. An impact cutter has a single, high-speed cutting element and relies primarily upon the inertia of the material being cut to furnish the opposing force required for shear. The impact cutting principle is applied in an implement named Flail mower. The flail mower has knives rotating in vertical planes parallel with the direction of travel. The flail mower includes a cutting member which contains a cutting head named flail knives. The cutting head defines a cutting edge which acts upon material to be comminuted during operation of the rotary impact mechanism. The cutting edge is made wear-resistant by having affixed thereto a plural number of wear-resistant parts made of

mild steel metal.

METHODOLOGY

A due attention was provided on the following design aspects while designing and fabrication of flail mower. Cutting unit, Support frame, Power unit, Power transmission unit, Handle and Transporting unit.

Cutting unit :

Cutting unit consists of rotary gang, which is divided into following different parts.

Power unit :

Power to the machine is provided with the help of power generated from the Lombardini diesel engine.

Power transmission unit :

Transmission of power for the flail mower was carried out by the v-belt drive and is discussed below.

Handle :

The handle was made of 20mm outside diameter mild steel pipes. The handle was provided for the ease of driving the flail mower by walking behind the mower. Handle was very useful in turning the flail mower at headlands.

Transporting unit:

Transport unit is composed of ground wheels and axle.

Performance evaluation of flail mower:

The laboratory tests and field tests of the flail mower