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Effect of Soil Forces On Ridger Plough under Different Working Conditions During Earthing up Operation of Sugar Cane

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Abstract - *The experimental study was conducted to determine the effect of forces on ridger plough during earthing up operation in sugar cane plant at three different widths (55.88 cm, 60.96 cm, 66.04 cm), two different depths (20.32 cm, 25.4 cm) and speed of earthing up operation remains the same (2Km/hr). A two load cells were fixed on the surface of the ridger plough to measure draft forces applied on the surface. The results show that the maximum force observed at a 26" width with 10" depth and decreases with decreasing depth and width. It has also been observed that different width of cut have a considerable impact on the width of the cut. Draft forces range varies from 8 to 42 kg in different trials. Improve sugarcane production after earthing up operation by ridger plough.*

***Key Words*: Load cell1, Ridger plough2, Black cotton soil3, Braught forces4.**

1. INTRODUCTION

Tillage is the process of creating soil conditions for seed germination and crop growth. Soil cultivation is considered one of the largest farm operations, as farming operations require the largest amount of farm energy. Scraper plows are widely used by farmers as a major farming tool[1].Soil mechanical resistance is an indicator of soil mechanical properties. Soil mechanical resistance may be affected by many factors such as soil compaction, soil texture, water content and other parameters. Draft force on ridger plough is affected by the condition parameters, for example: tool type, work Width, depth of work and working speed. The second aspect of the impact factor the power of the draft is dependent on soil factors such as soil type, soil bulk density; soil moisture .Other factors that affect the final value of draft force are tooling conditions and tool adjustment[5]. Lodging constitutes a potential threat to economic cane production. Stay Sugarcane crops are more susceptible to rodent damage. Its axillary bud sprouts or may. It is damaged by decay and false tillering, thus reducing sugarcane weight and sugar recovery. In addition to yield and quality losses, sugarcane remains unsuitable for seed purposes. In addition, the registered sugar cane crop is more susceptible to pest infestation and frost damage[15]. Sugarcane is an important agricultural commodity crop and plays an important role in the national economy, contributing 0.67% of GDP because of its wider adaptability in different agro-climatic conditions, and many of the subsequent sugar cane crops that are also unique in agricultural crops are extracted from monocultures indispensable to sugar cane production systems. In India, more than 50% to 55% of the sugarcane plantation area is occupied by dead vines, which are generally worse than plant sugarcane due to the lack of improved agronomic techniques. Thus, even with small-scale improvements in aquaculture, productivity will also significantly increase overall sugar cane production in the country and increase the profitability of mature sugar cane growers by timely sowing of wheat and other crops in the field and providing mature sugarcane in the early crushing stages, Thus benefiting sugar cane growers. As a result, recycled crops generally have higher yield, quality, and sugar recovery than plant sugarcane. First and second ratoon crops raised from a single plant cane proved beneficial for farmers when crop was earthed up at 25th April with 20 cm height along with 210 kg N ha-1 for better yield and ratoonability of sugarcane[14]. enamel coaction is helps to reduction in the specific draught and friction between soil and Mouldboard surface in the range of 4 to 21%, angle, tilt angle and ridging speed also friction coefficient[10].Sensing equipment is used to measure soil strength and soil deformation under various tool operating conditions. The draft requirements for measuring farming tools are done by the sensor. This has been extensively studied by many studies. Few efforts have been made to measure the soil forces on different parts of the low share of the sensor, which is important for the designer and the manufacturer[1].

The mains purpose of this study is to measure the soil force on ridger plough with following objectives. (i) To measure the soil force on the surface of the ridger plough. (ii) To measure the soil force at different widths and depths with constant forward speed in black cotton soil.

2. MATERIALS AND METHODS

Field measurements took place at Valivade village of India .The soil type as black cotton. The Greaves power tiller was used to measure the draught force. The working width of the ridger plough was 55.88 cm, 60.96 cm and 66.04 cm with working depth is 20.32 cm, 25.4 cm. Earthing up

operation depths and width were controlled by adjusting the position on power tiller and ridger plough tool.

2.1 Soil forces on the surface of Ridger Plough

The force was measured by using the bridge type load cell ranging from 0-500 kg. It was attached between the implement and shank. One end of load cell was tied with shank by using bolt and another with the implement through M.S plate, such that force exerted through load cell as shown in Fig.1. The observations of force were recorded during each pass of the implement. Such each observation was taken by using digital display during each pass of the implement. Electronic system is used to getting digital output value of load cell.

Arrow is shown on Load cell. This arrow shows the direction of force on the load cell. This type of arrangement is done by using metal strips. Metal strip is attached on the Load cell by using bolts. [12]

Fig 2.1. Back view of ridger plough with load cell

2.2 HX711 Load Cell Amplifier Interface with Arduino

In this arduino connection of HX711 Load Cell amplifier interface. HX711 Load Cell Amplifier Module to be connects a 500 kg load cell to the arduino. HX711 is a precision 24-bit analogto-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor.12 V supply are connected to analog power supply pin. On chip power supply regulator eliminates the need for an external supply regulator to provide analog power for the ADC and the sensor. All controls to the HX711 are through the pins shown in Fig 2.2

2.3 Display unit

Output load cell is sending to display unit by Arduino board. In display board two values are print one is current changing weight and second is that maximum value is printed. The maximum value printed helps to how much load is comes on mould board. There is no need to check continually value of load.

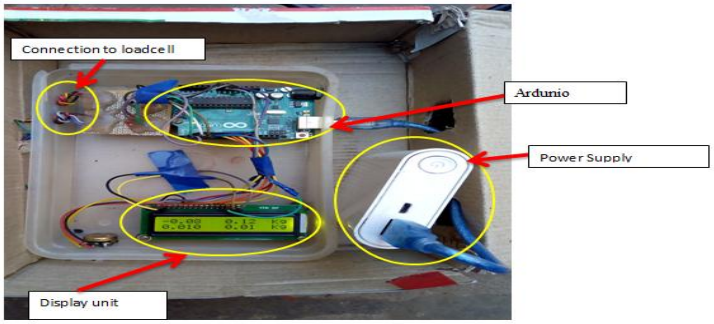

Fig 2.2 Connection of load cell with Ardunio and Display unit

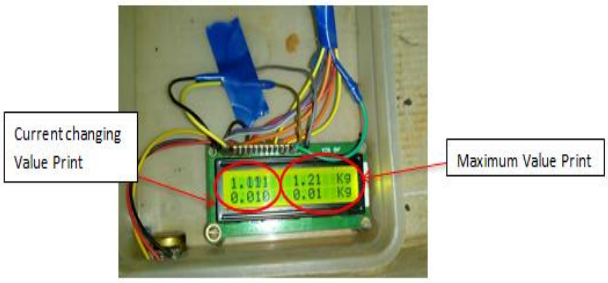

Fig 2.3. Draft force display unit

3. Results and Discussion

3.1 Soil forces on the surface Ridger Plough at 20.32 cm depth

Soil forces on the surface of ridger plough at 20.32 cm depth with different width are shown in Figure 3.1. It indicates that at the depth of 20.32 cm, soil forces 8kg, 13kg and 18kg on surface of ridger plough, at 55.88 cm, 60.96 cm and 66.04 cm width respectively. It is observed that minimum forces were applied on surface at 55.88 cm width, while maximum forces were applied on surface of ridger plough at 66.04 cm width.

3.2 Soil forces on the surface Ridger Plough at 25.4 cm depth

Soil forces on the surface of ridger plough at 25.4 cm depth with different width are shown in Figure 3.2. It indicates that at the depth of 25.4 cm, soil forces 11 kg, 12 kg and 42 kg on surface of ridger plough, at 55.88 cm, 60.96 cm and 66.04 cm width respectively. It is observed that minimum forces were applied on surface at 55.88 cm width, while maximum forces were applied on surface of ridger plough at 66.04 cm width.

4. Conclusions

On the basis of the results and discussion, the following conclusions may be arrived at.

- Earthing up with ridger plough reduced cane lodging significantly.
- Earthing up improved cane juice quality.
- The draft was increased with increasing ridger plough width and depth.
- The draft force in different trails varied from 8 kg to 42 kg.
- Low draft with good earthing up operation should be carried out with 20.32 cm depth and 55.88 cm width of ridger plough.

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