Perspective
Volume 10:2, 2021

Industrial Engineering & Management

ISSN: 2169-0316 Open Access

Vibrating Dual Bent-Share Cultivator

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Abstract

In this research, the suitability of a vibrating dual bent share cultivator was studied. Therefore, an eccentric pin slider mechanism was designed to vibrate the 2 shanks laterally, employing a tractor power takeoff. this study investigates the sector performance of the vibrating dual bent share cultivator with three different vibration frequencies (0, 0.88, and a couple of Hz) during a clay loam soil at two working depths (100 and 200 mm) and having a water content of a 0.7 or 0.9 plastic limit. rock bottom values of the draught, specific draught, and MWD were recorded at a vibration frequency of two Hz and a working depth of 100 mm. The draught force, specific draught, and MWD of the non-vibration implement were reduced by employing a vibration frequency of two Hz. The coefficient of determination and F values proved that the vibration frequency was simpler than the soil water content and therefore the working depth on the draught, specific draught, and MWD. Although a dual bent share cultivator needs low energy compared with a mould board plough, the vibration of the twin bent share cultivator could also be recommended as an efficient energy demanding implement within the soil manipulation process.

Introduction

Vibratory tillage may be a concept in which the tillage tools can oscillate during a particular mode of oscillation. The oscillating tools have several advantages in comparison to passive tillage tools. The vibration could effectively reduce the draught force of the tools. Various studies have reported that oscillating tools require 50 to 60% less draught force compared with non oscillating ones (Rao, Chaudhary 2018). However, there are conflicting reports regarding the total power requirement of the vibrating tillage implements. Soil fragmentation increases with the oscillating tool frequency, and therefore the size of the soil fragments has found to be a function of the speed ratio of the carrier and vibrating tool (Niyamapa, Salokhe 2000). Moreover, the draught force and fuel consumption are reduced as compared to the non vibration machine (Xirui et al. 2016). Most investigations focused on the application of the vibration on the tool draught reduction and didn't consider its effects on the soil pulverization and specific draught. Despite the potential of the forced vibration as a promising means for soil pulverization and reducing the draught force, it's not yet been studied for a dual bent share cultivator. The soil failure of a bent share cultivator is in tension, which needs a way lower energy requirement than it might under compression, which may be a characteristic of conventional tillage tools, during which soil failure occurs under shear.

Moreover, the soil has little or no lastingness (Harrison 1988). a rise within the cross-sectional area of the disturbed soil results in a decrease within the specific draught, thereby enhancing the efficiency of the tillage. A reduction in draught force is that the most critical performance indicator of vibrating tools. However, a tractor's body vibrates severely from the fluctuating soil cutting forces working on the vibrating tools (Sakai et al. 1993). The ratio of the tool vibration speed to the tractor forward speed may be a significant criterion on the effectiveness of a vibrating tool on the soil failure.

Conclusion

The results of this study revealed that inducing a vibration at a 2 Hz frequency to a dual bent share cultivator significantly decreases the specific draught and clod MWD. The decrease within the specific draught was thanks to a decrease within the draught force by an element of 1.9, and a rise within the soil disturbed area by 13%. The smaller clod size during the soil disturbance with the vibrating cultivator was thanks to the simpler energy transfer to the soil.

How to cite this article: William Jones. Vibrating Dual Bent-Share Cultivator. Ind Eng Manage 10 (2020): e103.

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Received 04 January 2021; **Accepted** 18 January 2021; **Published** 25 January 2021