

The Technical Evaluation of Three Different Types of Tillage Combined Machines and compared them with Individual Tillage Machines

Aqeel J. Nassir^{1*}, Sadiq J. Muhsin¹ & Dakhil R. Ndawi²

¹ Department of Agricultural Machines and Equipment, College of Agriculture, University of Basrah, Iraq

² Department of Soil Science and Water Resources, College of Agriculture, University of Basrah, Iraq

*Corresponding author email: aqeel.nassir@uobasrah.edu.iq, (S.J.M.) sadiq.muhsin@uobasrah.edu.iq, (D.R.N.) dakhil.nedewi@uobasrah.edu.iq

Received 24th January 2022; Accepted 11th October 2022; Available online 23rd December 2022

Abstract: The objective of this study was to investigate the effects of a locally manufactured combined tillage machine on the draft force, fuel consumption, field efficiency, power loss, and soil pulverization index. The combined tillage machine accomplished the primary, secondary, and deep tillage in a single pass. The combined tillage machine types were compared to individual tillage machines. The combined tillage machine accomplished the primary, secondary, and deep tillage in a single pass. A randomized complete block (RCBD) experiment was the statistical method used for the investigation with three replicates. The field experiments were conducted in silty loam soil. The combined tillage machines were used in three types. The first configuration (T1) consists of a subsoiler+ chisel plow + disk harrow + roller, the second configuration (T2) consists of a subsoiler + chisel plow, and the third configuration (T3) consists of chisel plow + disc harrow at two operating speeds (1.5 and 3 km.h⁻¹). Individual tillage machines were used in three conventional tillage systems M1, M2, and M3. M1. Conventional tillage systems M1, M2, and M3 perform similar tasks to combined tillage machine types T1, T2, and T3 respectively. The results showed that T3 reduced draft force by 40 and 34.35%, saved fuel by 19.88 and 25.89%, and reduced power loss by 54.25 and 37.22%, while increasing field efficiency by 13.64 and 5.63 and the soil pulverization index by 26.67 and 66.24% compared with T1 and T2 respectively. The combined tillage machines T1, T2, and T3 reduced the draft force and power loss while increasing the field efficiency by 19.05, 22.41, and 53.49%, respectively, compared with conventional tillage systems M1, M2, and M3. The combined tillage machines T1, T2, and T3 achieved the lowest values of the soil pulverization index, with values of 19.91, 41.93, and 33.10 mm, and saved fuel by 58.68, 41.61, and 26.86% respectively, compared with conventional tillage systems M1, M2, and M3. The results also revealed that operating speed and its interaction with the combined tillage machine types had a significant effect on all of the studied characteristics (p<0.05).

Keywords: Combined tillage machine, Draft force, Fuel consumption, Field efficiency, Soil pulverization Index.

Introduction

Developing and improving tillage machines plays a significant role in farming now that agriculture has become a trade rather than a

way of life. The main key to success in the agriculture business is efficient management (Zhao *et al.*, 2021). Utilizing a combined