

## Yield and Economic Analysis of Maize Production Using Different Combinations of Combined Tillage Machines and Comparison to Conventional Tillage Systems

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Received: 03/07/2022

Final Revision: 24/11/2022

**Abstract:** The study was carried out at the agriculture college research station, University of Basrah, in the 2021 season. This research aimed to investigate the effect of five combinations of combined tillage machines on maize yield, fuel consumption, total cost, total return, and return and benefit-cost return. The economic indicators of combined tillage machines were compared with five conventional tillage systems. The combined tillage machines are The T1 combined tillage machine consists of a subsoiler operating at a depth of 60 cm, a chisel plow, a disk harrow, and a roller. T2 is similar to T1, except the subsoiler operates at a depth of 40 cm. A T3 combined tillage machine consists of a subsoiler operating at a depth of 60 cm and a chisel plow. T4 is similar to T3, except the subsoiler operates at a depth of 40 cm. A T5 combined tillage machine consists of a chisel plow and a disk harrow. The conventional tillage systems include M1, which consists of four passes (subsoiler at a depth of 60 cm + chisel plow + disk harrow + roller), M2 consists of four passes (subsoiler at a depth of 40 cm + chisel plow + disk harrow + roller), M3 consists of two passes (subsoiler at a depth of 60 cm + chisel plow), M4 consists of two passes (subsoiler at a depth of 40 cm + chisel plow), M5 consists of two passes (chisel plow + disk harrow). Each treatment was replicated three times, and the data were analyzed using a randomized complete block design in this experiment. The mean of the treatments for the combined tillage machines and conventional tillage systems were compared using the t-test at the probability level (0.01). The results of the combined tillage machines T1, T2, T3, T4, and T5 comparison with conventional tillage systems M1, M2, M3, M4, and M5 revealed that the maize yield increased by 56.10 and 59.42, 56.48, 35.29, and 35.31% and saved fuel by 54.86 and 60.42, 36.77, 39.77, and 42.20% and decreased the total cost by 24.62, 24.70, 28.70, 27.61, and 16.50%. However, BCR was raised by 96.62, 101.28, 92.44, 68.35.20, and 57.2% respectively. Soil tillage with combined tillage machines improved maize crop yield and fuel consumption.

**Keywords:** Combined tillage machines, Conventional tillage systems, Maize Yield, Economic analysis

### I. INTRODUCTION

One of the most important crops grown worldwide for feed, food, and industrial use is maize (*Zea mays* L.). Columbus' expeditions at the end of the 15th century brought it from Central America to Europe and other countries. Although maize is mainly used for feed, over these five centuries of maize history, several food specialties were created and have since become conventional food specialties (Revilla *et al.*, 2021). Choosing the best soil tillage method for seed sowing is essential for success in fields where field crops such as maize are cultivated. This will help create a good seed bed according to soil structure, the residual plant before cultivation, the plant that will be cultivated, and the presence of existing mechanization (Noor *et al.*, 2020 a). However, with growing environmental awareness and economic production needs, as well as the importance of energy conservation, many countries have begun to make radical changes in tillage operations (Kan *et al.*, 2018). In order to keep agricultural output sustainable, the tillage system is crucial. Inappropriate tillage results in soil degradation and water and environmental contamination. Reasonable tillage is a key indicator of increasing agricultural productivity and minimizing soil issues. The influence of tillage depends on