

## **AFFECTING FACTORS ON PERFORMANCE OF A DEVELOPED HOLE DIGGER**

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### **ABSTRACT**

The aim of this research was the studying of some factors affecting the development of a hole digger. The experiments were conducted in El Gemiza Research Station in Gharbia Governorate. Three auger diameters (150, 200 and 250 mm) of the developed hole-digger were tested at different auger-speeds (75, 100 and 150 rpm), auger pitches (10, 15 and 20 cm), hole-depths ( 20, 30 and 40 cm), hole-spacing (5 m) and soil type (clay) with moisture contents of 18, 22 and 26% and (bulk densities of 1.2, 1.1 and 1.05 g/cm<sup>3</sup>).

**The obtained results can be summarized as follows:**

The maximum hole productivity was 324 hole/h obtained with auger speed of 150 rpm, hole diameter 15 cm, hole depth 20 cm, auger pitch 20 cm at moisture content 26%. The penetration resistance of clay soil at 18 % moisture content increased by 35 and 45 % as compared with of clay soil at moisture content 22 % and 26 % respectively. The maximum fuel consumption was 0.69 L/h was obtained with auger speed of 150 rpm, hole diameter 25 cm, hole depth 40 cm, and auger pitch 10 cm. The maximum power requirements (2.72 kW) was obtained with auger speed of 150 rpm, hole diameter 25 cm, hole depth 40 cm, auger pitch 10 cm and moisture content 18 %. The minimum operation cost was 0.05 L.E./hole at auger diameter 15 cm, auger pitch 15 cm and hole depth 20 cm. Whereas, the maximum operation cost was 0.23 L.E./hole at auger diameter 25 cm, auger pitch 10 cm and hole depth 40 cm. The operational cost using a hole digger attached to a power tiller decreased by 500-950 % compared with manual digging.

### **INTRODUCTION**

The greatest two environmental problems in the world are the desertification due to cutting the forest trees for wood and sand movement from desert to cultivated lands. These problems could be solved by cultivation and tree planting.

Governments take care of tree-planting projects for windbreaks, minimizing of air pollution.

Various agricultural machines were manufactured to save time and effort, and to protect the environment. The hole digger is one of the most important machines used in these objectives. The devolved machine must be not expensive, simple in construction and work in all environmental conditions.

Kapnehko et al. (1976) recommended a hole digger of 30 - 100 cm diameter at penetration speed 1 - 25 cm / s to establish holes for apples. The consumed time was found to be 8, 9 and 12 - 20 s for diameters of 30, 60 and 80 - 100 cm respectively. The hole digger establishes 100 - 150 hole / h for a depth of 60 cm at speed of 180 rpm.