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DEVELOPMENT OF CULTIVATION MACHINE TO IMPROVE SURFACE IRRIGATION EFFICIENCY FOR SUGARBEET CROP

By

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THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of philosophy

IN

AGRICULTURAL SCIENCES

(AGRICULTURAL ENGINEERING)

DEPARTMENT OF AGRICULTURAL ENGINEERING

FACULTY OF AGRICULTURE

KAFRELSHEIKH UNIVERSITY

(2021)

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ABSTRACT

The developed multiuse tractor-mounted cultivation machine has been constructed and locally manufactured. The prototype has been developed to perform three main operations (ridging, bed shaping and weed control). The experiments were conducted in a completely randomized design with four replicates. Developed machine was attached to 25 hp Kubota L1-215 tractor and it was evaluated against the accuracy of bed shaping, field operations, weed control efficiency, sugar beet yield and its characteristics, and the irrigation water behavior. Developed cultivation machine and its attached bed former led to more convergent bed top widths and bed heights, thus, furrow to furrow distances and bed side angle were steadier along the planting rows. Using the developed machine and its spaying settings reduced the flow where, half the ground area did not receive herbicide, but the intra-row plants received the same herbicide dosage as for control. This result implied that the herbicide usage and cost, could be reduced by 50% compared to conventional treatment. Higher fuel consumption and engine brake power for traditional method in both years was obtained compared to lower values for the developed multiuse tractor-mounted cultivation machine. Using the developed machine twice in weeding and thus reducing soil clods with developing some compaction, reduced the irrigation advance time by 35% compared to the traditional treatment in 2017/2018. Better moisture content, advance irrigation water times, recession times, sugar yield with higher root and sugar yield were recorded with using the developed machine. Using the developed cultivation machine reduced the total costs due to saving the costs required to operate the main irrigation pump and lowering the fuel consumption with remarkable water productivity. Under conditions of the present work, practicing weeding control process mechanically using the newly designed cultivation machine, having inter-row winged furrow openers, combined with intra-raw herbicide spray after 15 days from sowing and repeating the mechanical weeding 10 days later, can be recommended to obtain the highest root and sugar yields per feddan, as well as to decrease costs of cultivation.