CONTENTS

	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	3
2.1. Weeds in rice fields	3
2.1.1. Definition of weed	3
2.1.2. Classification of weeds	3
2.1.3. Relation between rice varieties and weeds	4
2.2. Methods of weed control	5
2.3. Mechanical Weed Control	10
2.3.1. Machine used in mechanical weed control	12
2.3.2. Types of rotary blade share	14
2.3.3. Factors affecting on the performance of mechanical weeding machines	16
2.4. Influence of weed control on production and environment	17
2.5. Cost estimation	20
3. MATERIALS AND METHODS	**21**
3.1. Materials	**22**
3.1.1. Nursing of seedlings	22
3.1.2. Fertilizing	22
3.1.3. Irrigation	23
3.1.4. Permanent field	23
3.1.5. Inter-row rotary cultivator prototype	23
3.1.5.1. Power Unit	23
3.1.5.2. Cultivating Unit	24
3.2. Methods	**29**
3.2.1. Theoretical field capacity	29
3.2.2. Actual field capaeity	29
3.2.3. Field efficiency	29
3.2.4. Wheel cultivator slip	29
3.2.5. Fuel and power consumption	29
3.2.6. Specific energy	30
3.2.7. Weeding efficiency	31
3.2.8. Crop yield	31
3.2.9. Cost estimation	31
3.2.10. Net profit estimation	32
4. RESULTS AND DISCUSSION	**34**
4.1. Effective field capacity	34
4.2. Field efficiency	39
4.3. The slip ratio	41
4.4. Fuel consumption	45

4.5. Power requirements ---------- 50
4.6. Weeding efficiency ---------- 55
4.7. Yield ---------- 59
4.8. Total eost ---------- 64
4.9. Net profit ---------- 68
5. SUMMARY AND CONCLUSIONS ---------- 72
6. REFERENCES ---------- **77**
7. APPENDIX ---------- **81**
ARABIC SUMMARY ----------

5. SUMMARY AND CONCLUSION

This study was carried out at the research farm of Rice Mechanization Center (R.M.C), Meet El-Deeba, and Kafr El-Sheikh Governorate during two agricultural successive seasons 2001 and 2002. The main objective of the present work was devoted to investigate the performance of the constructed prototype cultivator during weeding operation of rice crop. Soil samples were collected from the experimental field at different soil depths and mechanical analysis was carried out at soil, water and environmental laboratory, Kafr El-Sheikh to obtain the soil texture. **The performance of the machine was evaluated by studying the effect of the following variables:**

1. Two types of shares (L- Share and cylindrical- Share),
2. Four different cultivator forward speeds (1.2, 2.6., 3.4, and 4.7 km/h),
3. Four seedling density were used (60, 70, 80, 90, hill / 3.3 m^2) and
4. Three weeding times (15, 25, 35 days after transplanting) on the following parameters:

Evaluation of the machine performance was carried out in scope of effective field capacity, filed efficiency, slip ratio, fuel consumption, power requirements, weeding efficiency, yield and total cost.

Machine performance evaluation:

Effective filed capacity:

Increasing the seedling density tended to increase the effective field capacity for all the weeder forward speeds, weeder shares and weeding times interval. The effective field capacity increased by 8.30 % when the seedling density increased from 60 to 90 at weeding time interval of 15 days transplanting and weeder forward speed of 2.6 k m/h for the L-share weeder. While, increasing the weeder forward speed tended to increase the effective field capacity for the weeder at all the planting densities, weeder shares and weeding times interval. The L-share weeder gave higher effective field capacity than that for, the cylindrical-share weeder for all the weeder forward speeds, seedling density and weeding times interval. Using the L-share weeder with forward speeds of 4.7 km/h in control the weeds of the rice crop which its seedling densities of 90 achieved the maximum values of effective field capacity during the third weeding time compared with the other variables under study.

Field efficiency:

Increasing the seedling density tended to increase the field efficiency for all the weeder forward speeds, shares and weeding times interval. While, increasing the weeder forward speed tended to decrease the field efficiency for the weeder at all the planting densities, weeder shares and weeding times interval. The field efficiency increased by 12.38 % when the weeder forward speed decreased from 4.7 to 1.2 km/h at 60 seedling density, cylindrical-shares and the third weeding time interval. The L-share weeder gave higher field efficieney than that for, the cylindrical-share weeder for all the forward speeds, seedling density and weeding times interval. Using the L-share weeder with forward speeds of 1.2 km/h in control the weeds of the rice crop which its seedling density of 90 achieved the maximum values of field efficiency during the third weeding time compared with the other variables under study.

The slip ratio:

Decreasing the seedling density tended to increase the slip ratio for all the forward speeds, rotary shapes and weeding times interval. While, decreasing the forward speed tended to increase the slip ratio for the weeder at all the planting densities, shares weeder and weeding times interval. The L-share weeder gave lower slip ratio than that for, the cylindrical share for all the forward speeds, seedling density and weeding times interval. Using the L-share weeder decreased the slip ratio of the weeder by 21.12 % at forward speed of 2.6 km/h, seedling density of 70 and the third weeding time interval. Compared with cylindrical-share weeder the slip ratio decreased by 14.16 %, as a result to control the weeds early (the first weeding time) compared to the third weeding time at 4.7 km/h forward speed and seedling density of 90 using the L-share weeder.

Fuel consumption:

Increasing the seedling density tended to decrease the fuel consumption for all the forward speeds, rotary shares and weeding times interval. While, increasing the forward speed tended to increase the fuel consumption for the weeder at all the planting densities, share weeder and weeding times interval. The fuel consumption increased by 8.45 % when the forward speed increased from 1.2 to 4.7 km/h at 60 seedling density, cylindrical share weeder and the third weeding time interval. The L-share weeder gave lower fuel consumption

than that for, the cylindrical weeder shares for all the forward speeds, seedling density and weeding times interval. Using the L-share with weeder forward speeds of 1.2 km/h in control the weeds of the rice crop which its seedling density of 90 achieved the minimum valves of fuel consumption during the third weeding time compared with the other variables under study.

Power requirements:

Decreasing the seedling density tended to increase the power requirements for all the forward speeds, weeder share and weeding times interval. While, inereasing the forward speed tended to increase the power requirements for the weeder at all the planting densities, weeder shares and weeding times. The L-share weeder achieved lower power requirements than that for the cylindrical weeder share for all the forward speeds, seedling density and weeding times interval. Using the L-shape weeder with forward speeds of 1.2 km/h in control the weeds of the rice crop which its seedling density of 90 achieved the maximum valves of power requirements during the third weeding time interval compared with the other variables under study. Using the L-share weeder decreased the power requirements of the weeder by 28.72 % at forward speed of 1.2 km/h, seedling density of 70 and the third weeding time interval compared with cylindrical share weeder.

Weeding efficiency:

Increasing the seedling density tended to increase the weeding efficiency for all the forward speeds, weeder shares and weeding times interval. While, decreasing the forward speed tended to increase the weeding efficiency for the weeder at all the planting densities, weeder shares and weeding times interval. The L-share weeder gave higher weeding efficiency than that for the cylindrical weeder share for all the forward speeds, seedling density and weeding times interval. Using the L-share weeder with forward speeds of 1.2 km/h in control the weeds of the rice crop which its seedling density of 90 achieved the maximum valves of weeding efficiency during the first weeding time compared with the other variables under study. The weed control after planting with 35 days (the third weeding time) decreased the weeding efficiency for weeds control compared with the first and second weeding times for all the other variables under study. The weeding efficiency increased by 6.24 %, as a result to control the weeds early (the first weeding time) compared to the third weeding

time at 4.7 km/h forward speed and seedling density of 90 using the L-share weeder.

Yield:

Increasing the seedling density tended to increase the yield for all the forward speeds, weeder shares and weeding times interval. The maximum values of yield were achieved with the seedling density of 90 compared with the other seedling densities of 60, 70 and 80 for all the other variables. The yield inereased by 10.04 % when the seedling density inereased from 60 to 90 at weeding time of 15 days and forward speed of 2.6 k m/h for the L-shape rotary. While, increasing the forward speed tended to decrease the yield for the weeder at all the planting densities, weeder shares and weeding times interval. The L-share weeder gave higher yield than that for the eylindrical weeder share for all the forward speeds, seedling density and weeding times interval. Using the L-share weeder with forward speeds of 4.7 km/h in control the weeds of the rice crop which its seedling density of 90 achieved the minimum values of yield during the third weeding time compared with the other variables under study.

Total cost L.E/fed:

Increasing the seedling density tended to decrease the cost for all the forward speeds, weeder shares and weeding times interval. While, increasing the forward speed tended to increase the cost for the weeder at all the planting densities, weeder shares and weeding times interval. The L-share weeder gave lower cost than that for, the cylindrical weeder share for all the forward speeds, seedling density and weeding times interval. For all the forward speeds, seedling densities and weeding times interval, the L-share weeder accomplished the minimum values cost compared to the cylindrical weeder share. However using the L-share weeder decreased the cost of the weeder by 40.36 % compared with cylindrical share weeder.

Net profit:

Increasing the seedling density tended to increase the net profit for all the forward speeds, weeder share type and weeding times interval. The net profit increased by 12.2 % when the seedling density increased from 60 to 90 at weeding time of 15 days and forward speed of 2.6 k m/h for the L-share weeder. While, decreasing the forward speed tended to increase the net profit for the

weeder at all the planting densities, weeder shares and weeding times interval. The L-share weeder gave higher net profit than that for, the cylindrical weeder share for all the forward speeds, seedling density and weeding times. Using the L-share weeder with forward speeds of 1.2 km/h in control the weeds of the rice crop which its seedling density of 90 achieved the maximum values of net profit during the third weeding time compared with the other variables under study.

Applied recommendations:

1. The replacement of reaping unit by cultivation one tends to maximize its economic use.
2. The use of L-share weeder gave the highest productivity comparing with cylindrieal-share.
3. L-share weeder was strongly recommended where it gave the highest values of net profit at weeder forward speed of 2.6 km/h.
4. Experimental results showed that the highest values of machine productivity obtained at seedling density of 90 hills/3.3 m^2.
5. The most suitable weeding time interval was at 15 days after transplanting.