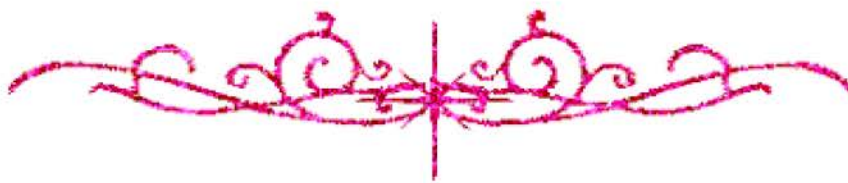


بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار





بعض الوثائق الأصلية تالفة





بالرسالة صفحات
لم ترد بالأصل



B1-759

Evaluation of Performance of a Double Knife Mower

By

Amal Ahmed Foad Salah

B.Sc. (Agr.Mech), Monofia University 1988

THESIS

Submitted in Partial Fulfilment of the
Requirements for the Degree of
MASTER OF SCIENCE

IN

AGRICULTURAL ENGINEERING

Department of Agricultural Engineering

Faculty of Agriculture

Monofia University

1995

Approved by

Salah E. A. Maksood

M. N. El Awdy

K. F. Hanna

(Committee in Charge)

Deposited in the Faculty Library

(Date)

(Librarian)

Evaluation of Performance of a Double Knife Mower

By

Amal Ahmed Foad Salah

B.Sc. (Agr. Mech.), Monofia University 1988

THESIS

Submitted in Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

IN

AGRICULTURAL ENGINEERING

Department of Agricultural Engineering

Faculty of Agriculture

Monofia University

1995

Supervision by

Prof. Dr Mohamed Nabil El-Awady *M. N. El-Awady*

Prof. Dr Saied M. Abdel Aal *Saied M. Abdel Aal*

Dr Mohamed . A. Abdel Maksoud *M. Abdel Maksoud*

Deposited in the faculty library

Date

(Committee in charge)

(librarian)

Evaluation of Performance of a Double Knife Mower

By

Amal Ahmed Foad Salah

B.Sc. (Agr.Mech), Monofia University 1988

THESIS

Submitted in Partial Fulfilment of the

Requirements for the Degree of

MASTER OF SCIENCE

IN

AGRICULTURAL ENGINEERING

Department of Agricultural Engineering

Faculty of Agriculture

Monofia University

1995

Approved by

Salah E. A. Maksoud

M. N. El Awady

K. F. Hanna

(Committee in Charge)

Deposited in the Faculty Library

(Date)

(Librarian)

ACKNOWLEDGMENTS

The author wishes to express her great appreciation and deep gratitude to Prof. Dr. M.N. El Awady, Prof of Agric Eng ., Ain Shams Univ., Prof. Dr. S. M. Abdel Aal, Prof of Agronomy., Faculty of Agric. Monofia Univ .

The author also wishes to thanks with gratitude Dr.M.A. Abdel Maksoud Lecturer of Agric Eng. Faculty of Agric Monofia Univ. for his stimulating supervision, continuous encouragement and deep interest while work was done . The outhor acknowledges with gratitude their invaluable help, advice, guidance and constructive criticism throughout this work .

The greatest respect and thanks are also extended to Prof. K. F. Hanna, Prof. and head of the Ag. Eng. Dept. and all staff members of the Agricultural Engineering Departement Faculty of Agric., Monofia Univ, and to the technical staff of the workshop of Aricultural Engineering for their valuable assistance and providing facilities throughout this study.

CONTENTS

Page

ABSTRACT

CHAPTER 1

<i>INTRODUCTION</i>	1
---------------------------	---

CHAPTER 2

<i>REVIEW OF LITERATURE</i>	3
-----------------------------------	---

2.1. History	3
--------------------	---

2.2. Type of mowers	5
---------------------------	---

2.3. Mower adjustments and maintenance	11
--	----

2.3.a. Mounting and adjusting of the mower	11
--	----

2.3.b. Mower drives	16
---------------------------	----

2.3.c. Cutting and safety devices	18
---	----

2.3.d. Cutting operation	20
--------------------------------	----

2.3.e. Cutting forces, operation parameters and plant properties effects	22
---	----

2.3.f. Power requirements	25
---------------------------------	----

2.4. The effect of technical characteristics and operating conditions of mower on their performance	27
--	----

2.5. Field capacity and field efficiency	37
--	----

2.6. Cost analysis and economical evaluation	41
--	----

CHAPTER 3

<i>MATERIALS AND METHODS</i>	44
------------------------------------	----

3.1. Experiment land	44
----------------------------	----

3.2. The moisture content of soil and stems of crop	46
---	----

	Page
3.3. Equipment and instruments used in the study	48
3.3.a. Tractor rear-mounted mower	48
3.3.b. The tractor used with mowers	51
3.3.c. Additional instruments	51
3.4. Experimentation	52
3.4.1. The rotating and forward speeds for the me- chanical harvesting	52
3.4.2. Crop conditions	53
3.4.3. Soil surface conditions	54
3.4.4. Economical evaluation	55
3.4.5. Cost analysis	58
 CHAPTER 4	
RESULTS AND DISCUSSION	60
4.1. Effect of forward speed on performance of mowers at levels of crop moisture content	60
4.1.a. Cutting efficiency	60
4.1.b. Harvesting efficiency	70
4.1.c. Field efficiency	76
4.1.d. Time efficiency	84
4.1.e. Actual field capacity	90
4.1.f. Fuel consumption	97
4.1.g. Height of cut	107
4.1.h. Grain losses	113
4.2. The statistical analysis	116

	Page
4.2.1. Effect of type of mower	116
4.2.2. Effect of crop moisture content	120
4.2.3. Effect of rotating speed	124
4.3. Performance of hand tools	128
4.4. Cost analysis	130
4.4.1. Wheat	130
4.4.1.a. Cost of wheat mowing at two levels of crop moisture -content	130
4.4.1.b. Criterion cost	136
4.4.2. Barley	137
4.4.2.a. Cost of barley mowing at two levels of crop moisture contents	137
4.4.2.b. Criterion cost	139
4.4.3. Cotton - stalks	144
4.4.3.a. Cost of cotton- stalks cutting at two levels of stalks moisture	144
4.4.4. Corn- stems	149
4.4.4.a. Cost of corn - stems cutting at two levels of stem moisture contents	149
CHAPTER 5	
SUMMARY AND CONCLUSION	154
CHAPTER 6	
REFERENCES	
APPENDIX	161
ARABIC SUMMARY.	

ABSTRACT

This investigation was carried out to evaluate the performance of the reciprocating double-action mower compared with the single-action mower as a mechanical method used in harvesting both wheat and barley crops, besides cutting cotton and corn stalks . The performance of the manually-method for harvestine is used also in the comparison . The investigation aimed to determine the more suitable equipment capable of harveste and cutting more than one crop under the Egyptian conditions.

Experiments were carried out in experimental plots at the Faculty of Agriculture Experimental Farm in El-Rahib for mowing both wheat , barley crops , cotton-stalks and corn-stalks by using a double action mower , a single action mower and manual harvesting . The performance of the mowers was tested under different variations of the following factors : type of mower , crop moisture content , rotating speed and forward speed .

The performance of the mowers was evaluated by calculating the following criteria : cutting efficiency , harvesting efficiency , field efficiency , the losses of crop and the total cost of harvesting . The obtained results showed that the combinations of type of mower , moisture content , rotary speed and forward speed affected significantly on the following parameters :

height of cut , mass of mowed crop , mass of standing stubble , grain losses , fuel consumption and harvesting time .

Also, it has been found that the machine productivity increased with increasing the forward speed and the actual field capacity parameters , fuel consumption , height of cut and grain losses which increased with increasing both the forward speed and the rotating speed .

Furthermore, it could be concluded that decreasing the crop moisture content increased the productivities of mowers and decreased the height of cut and grain losses . The total cost per unit area was the lowest by using the reciprocating mowers compared with using the hand tools at the low levels of moisture content for the mowed crops .

1- INTRODUCTION

The shortage of hand labour in Egyptian agriculture has become a pressing problem in recent years . This shortage , in turn, has lead to continuous cost increase of production in the field of agriculutre . Although harvesting is one of the most labor - consuming agricultural operations , yet harvesting machines are still not widely used in Egypt .

The poor economic conditions of Egyptian farms , are due to the small sizes of land holding .

Yet there is a shortage of farm labour in key seasons of agricultural operations , especially during harvesting periods. For this reason , Egyptain planners have turned toward concepts of increasing mechanization in farming operations to cope with seasonal shortage of laboure .

So, to overcome such problems , appropriate mowing systems have a good potential . Therefore , this study enables using mowers most suitable for Egyptian farm conditions to harvest various crops in order to decrease harvesting time and cost . This would enable farmers to sow the next crop without delay and make them independent of the labor, using Reciprocating action mowers (single knife mower , double knife mower) are included. Therefore , studies and investigations should be carried out on these machines in order to adapt and