سامية محمد مصطفى



شبكة المعلومات الحامعية

# بسم الله الرحمن الرحيم



-Caro-

سامية محمد مصطفي



شبكة العلومات الحامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم





سامية محمد مصطفى

شبكة المعلومات الجامعية

# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

## قسو

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



يجب أن

تحفظ هذه الأقراص المدمجة يعيدا عن الغيار



سامية محمد مصطفي



شبكة المعلومات الجامعية



المسلمة عين شعور المسلمة عين شعور المسلمة عين شعور المسلمة عين شعور المسلمة ا

سامية محمد مصطفى

شبكة المعلومات الحامعية



بالرسالة صفحات لم ترد بالأصل



# "A STUDY ON HARVESTING MACHINS" DEVELOPMENT OF THRESHING DRUM OF CROP TIGER COMBINE TO SUIT HARVESTING RICE CROP.

#### $\mathbb{B}\mathbb{T}$

#### Adel Fathy Abdou Mohamed Abd Rabou

B.Sc. in Agric. Mech., Faculty of Agric., Kafr El-Sheikh, Tanta University, 1986.

#### **Thesis**

## SUBMITTED IN PARTIAI FULFIIIMENT OF THE REQUIREMENTS OF THE DEGREE OF

Master of Science

#### $\mathbf{IN}$

#### Agricultural Mechanizatoin

Department, of Agriculturel Mechanizatoin Faculty of Agriculture, Kafr El-Sheikh Tanta University

B 18511

(2000)

#### **APPROVAL SHEET**

"A Study on Harvesting Machines"

Development of Threshing Drum of Crop Tiger

Combine to Suit Harvesting Rice Crop

#### $\mathbb{B}\mathbb{T}$

#### Adel Fathy Abdou mohamed Abd Rabou

Thesis for M. Sc. Degree from Agricultral Mechanization Dept., Faculty of Agriculture, Kafr El-Sheikh, Tanta University

#### This thesis has been approved by:

1. Prof. Dr. Mubarak Mohamed Mostafa

Professor of Agric. Eng., and Head of Agric. Eng. Dept., Faculty of Agric., Ain shams University

2. Prof. Dr. Metwalli M. Mohamed

Professor of Agric. Eng., and Head of Agric. Mechanization dept., Faculty of Agric., Kafr El-Sheikh,

Tanta University.

3. Prof. Dr. Abd El-Kader Ali El-Nakeeb

Professor of Agricultural Eng., Agric Eng. Dept, Faculty of Agric., Al-Azhar University.

4. Dr. Ismail A. Abd El-Motaleb

Associate professor of Agric. Eng., Agric. Mech. Dept., Faculty of Agriculture, Kafr El-Sheikh, Tanta University. A.EL-Nakb

, lende

.. I Abdefnotaleb

Date: / /2000

Committee in charge

#### SUPERVISION COMMITTEE

#### Prof. Dr.

#### **Mubarak Mohamed Mostafa**

Professor of Agricultural Engineering
And Head of Agricultural Mechanization Department,
Faculty of Agriculture,
Ain Shams University

#### Dr.

#### Ismail Ahmed Abd El-Motaleb

Associate Professor of Agricultural Engineering
Agricultural Mechanization Department
Faculty of Agricuitre,
Kafr El-Sheikh, Tanta University

#### Dr.

#### Said El-aeid Abou Zaher

Assist. Prof. of Agricultural Engineering Agricultural Mechanization Department Faculty of Agricuitre, Kafr El-Sheikh, Tanta University

#### **ACKNOWLEDGMENT**

First and forever, thanks to ALLAh for giving me the power and strength to carry out this work.

The author withes to express his deepest apprecaition and sincere thanks to **Prof. Dr. Mubarak Mohamed Mostafa**, Head of Agricultural Engineering Department, Faculty of Agriculture, Ain shams University for suggesting the problem, supervision, valuable consultation, and sincere advice.

Deep appreciation and great indebtedness to **Prof. Dr. Metwalli** M. Mohamed. Head of Agric Mech. Dept., Faculty of Agric., Kafr El-Sheikh, Tanta University for his continuous encouragement.

The author wishes to express his deepest appreciation and great indebtedness to **Dr. Ismail A. Abd El-Motaleb**, Associate Prof. of Agric. Eng., Agric. Mech. Dept., Faculty of Agric., Tanta Univ. for his supervision, guidance, encouragement, reviewing the manuscript and continuous scientific help and suggesting the problem.

The author also wishes to thank **Dr. Said El-Seid Abo zaher**, lecturer of Agric. Eng., Agricultural Mechanization Department Faculty of Agriculture, Kafr El-Sheikh, Tanta university for supervision, helpful guidance and continuous encouragement.

Thanks to all sraff members of Agricultural Mechanization Department, Faculty of Agriculture, Kafr El-Sheikh, Tanta University. for their continous encouragement.

Very deep thanks to my mother and my wife for their continuous encouragement and their patient during the prepartion of this work.

### Contents

Chapter	page
1. Introduction	1
2. Review of literature:	3
2.1. Type of threshing cylinder (drum)	3
2.1.1. Rasp-bar cylinder and concave	4 .
2.1.2. Spike-tooth cylinder and concave	4 . 5 5 5
2.1.3. Angle-bar cylinder and concave	5
2.1.4 Single or double rotor and concave	
2.2. Techincal notifications and parameters of threshing sparating device	10
2.2.1. Threshing cylinder	10
2.2.2. Threshing rotor	10
2.2.3. Separating cylinder rotor	10
2 2 4 Rotary separator	10
2.2.5. Cylinder or rotor threshing or separating diameter	10
2.2.6. Cylinder or rotor threshing or separating length	10
2.2.7. Diameter and length values of a drum	12
2.2.8. Peripheral speed of a drum	12
2.3. Effect of cylinder type	13
2.4. Effect of cylinder speed	15
2.5. Effect of forward speed	19
2.6. Effect of moisture content	21
2.7. Cost analysis	23
3. Materials and Methods	27
3.1. Materials	27
3.1.1. The combine class crop-tiger	27
3 1 1 1 Two threshing drum	32
3.1.2. Measuring instruments	38
3.1.2.1. Electrical oven	38
3.1.2.2. Balance	38
3.1.2.3. Stop watch	39
3.1.2.4. Photo sensing tachometer	39
3.1.2.5. Calibrated tube	39
3.1.2.6. Measuring scale	39
3.1.2.7. Several square frames made from wood	39
3.1.2.8. Long sheets of canvas	39
3.1.2.9. The screen	39.

Chapter	Page
3.2. Methods:	42
3.2.1. Experimetal procedure	42
3.2.2. Grain losses	43
3.2.2.1. Pre-harvest losses measurement	43
3.2.2.2. Header losses measurement	43
3.2.2.3. Threshing losses measurement	43
3.2.2.4. Separating losses measurement	44
3.2.2.5. Sho losses measurement	44
3.2.3. The theoretical field capacity	44
32.4. The field efficiency	45
3.2.5. Grain yield	45
3.2.6. Combine performance efficiency	46
3.2.7. Husked grain measurement	46
3.2.8. Determination of fuel consumption	46
3.2.9. Cost analysis	46
3.2.10. Criterion cost. ( C.V. )	48
3.2.11. Statistical analysis	48
4. Results And Discussions	49
4.1. Criteria of performance	50
4.1.1. Header losses	50°
4.1.2. Threshed grain losses, %	50
4.1.2.1. Effect of forward speed, cylinder speed and grain	
moisture content on threshed grain losses	52
4.1.3. Unthreshed grain losses, (%)	53
4.1.3.1. Effect of forward speed, cylinder speed and grain	
moisture content on unthreshed grain losses	53
4.1.4. Total losses, (%)	59
4.1.4.1 Effect of forward speed, cylinder speed and grain	
moisture content on total losses	59
4.2. Husked grain, (%)	69
4.2.1. Effect of forward speed cylinder speed and grain moisture	
content on husked grain	69
4.3. Field Performance	74
4.3.1. Effective field capacity, (fed/h)	74
4.3.1.1. Effect of forward speed cylinder speed and grain moisture	ļ
content on effective field capacity	74
4.3.2. field efficiency, (%)	74
4.4. Combine performance efficiency, (%)	83
4.4.1. Effect of forward speed, cylinder speed and grain moisture.	
content on combine performance efficiency	83

Chapter	Page
4.5. Fuel consumption, (L/h)	89
4.5.1. Effect of forward speed ,cylinder speed and grain moisture	
content on fuel consumption	89
4.6. Cost analysis, (L.E/fed)	94
4.6.1. Effect of forward speed cylinder speed and grain moisture	
content on cost analysis	94
4.7. Comparative value, (L.E/fed)	95
4.7.1. Effect of forward speed cylinder speed and grain moisture	 
content on comparative value	95
5. Summary and conclusions	105
J. Outiminity and contraction	
6. Referances	110
7. Appendix A	116
Appendix B.	120
Appendix C.	130
8. Arabic summary	

#### **List of Tables**

Table No.	Page
1: Peripheral speeds of drums for some crops	13
2: specifications of claas crop-tiger combine	30
3: Technical data of two different drum ( developed and original drum)	38
4: some physical properties of rice crop variety Giza 171 at moisture	
content 23.8% grain and 55.8% for straw	40
5: Some physical properties of rice crop variety Giza 177 at moisture	
content 22.2% for grain and 46.6% for straw	41
6: Average crop conditions for each harvesting date	42
7: Effect of forward speed and grain moisture content on the header	
losses,% by using combine harvester crop tiger and as a percentag of	
total yield with rice crop 171, 177	51
8: Effect of forward speed on threshed grain losses, % at different drum	
speeds of rice crop Giza 177 having various moisture contents in grain	
and straw for two different threshing drum	54
9.Effect of forward speed on threshed grain losses, % At different drum	
speeds of rice crop Giza 171 having various moisture content in grain	
and straw for two different threshing drum	56
10: Effect of forward speed on unthreshed grain losses, % At different drum	30
speeds of rice crop Giza 177 having various moisture contents in grain	
and straw for two different threshing drum	60
11: Effect of forward speed on unthreshed grain losses, % At different	00
drum speeds of rice crop Giza 171 having various moisture contents in	
grain and straw for two different threshing drum	62
12: Effect of forward speed on Total losses, %at different drum speeds of	02
rice crop Giza 177 having various moisture contents in grain and straw	
· · · · · · · · · · · · · · · · · · ·	65
for two different threshing drum	03
i	
rice crop Giza 171 having various moisture contents in grain and straw	67
for two different threshing drum	07
14: Effect of forward speed on Husked grain, %. Different drum speeds of	
rice crop Giza 177 having various moisture contents in grain and straw	70
for two different threshing drum	70
15: Effect of forward speed on Husked Grain, % .At different drum speeds	
of rice crop Giza 171 having various moisture contents in grain and	70
straw for two different threshing drum	72
16. Effect of forward speed on Effective field capacity, fed/h at different	
drum speeds of rice crop Giza 177 having various moisture contents in	
grain and straw for two different threshing drum	75

Toble No.	Page
Table No.  17: Effect of forward speed on Effective field capacity, fed/h. At different	* "5°
drum speeds of rice crop Giza 171 having various moisture contents in	
grain and straw for two different threshing drum	77
18: Effect of forward speed on Field efficiency, %. At different drum	
speeds of rice crop Giza 177 having various moisture contents in grain	
and straw for two different threshing drum	79
19: Effect of forward speed on Field efficiency, %. At different drum	
speeds of rice crop Giza 171 having various moisture contents in grain	
and straw for two different threshing drum	81
20: Effect of forward speed on Performance efficiency, %. At different drum	·
speeds of rice crop Giza 177 having various moisture contents in grain	
and straw for two different threshing drum	85
21: Effect of forward speed on Performance efficiency, % At different	
drum speeds of rice crop Giza 171 having various moisture contents in	
grain and straw for two different threshing drum	87
22: Effect of forward speed on Fuel consumption, L/h. At different drum	
speeds of rice crop Giza 177 having various moisture contents in grain	
and straw for two different threshing drum	90
23: Effect of forward speed on Fuel consumption, L/h. At different drum	
speeds of rice crop Giza 171 having various moisture contents in grain	
and straw for two different threshing drum	92
24: Effect of forward speed on Cost Analysis, L.E/fed. At different drum	
speeds of rice crop Giza 177 having various moisture contents in grain	
and straw for two different threshing drum	96
25: Effect of forward speed on Cost Analysis, L.E/fed. At different drum	
speeds of rice crop Giza 171 having various moisture contents in grain	
and straw for two different threshing drum	98
26: Effect of forward speed on Comparative value, L.E/fed. At different	
drum speeds of rice crop Giza 177 having various moisture contents in	
orain and straw for two different threshing drum	101
27: Effect of forward speed on comparative value At different drum speeds	
of rice crop Giza 171 having various moisture contents in grain and	
straw for two different threshing drum	103
A-1: Cost analysis for two drums with rice crop Giza 177 and 171	119
B-1 Analysis of variance of Threshed grain losses for the two druins	1
(developed and original) of rice Giza 177 and 171	120
B-2: Analysis of variance of Grain unthreshed losses for the two drums	
(developed and original) of rice at rice Giza 177 and 171	[ 12]
B-3: Analysis of variance of total losses for the two drums (developed and	122
original) of Rice crop Giza 177 and 171	122

Table No.	Page
B-4: Analysis of variance of Husked Grain for the two Drums (developed	]
and original lof Rice crop Giza 177 and 171	123
B-5: Analysis of variance of Grain Yield for the two Drums (developed)	
and original lof Rice crop Giza 177 and 171	124
R.6. Analysis of variance of <b>Performance efficiency</b> for the two drums	
(developed and original ) of Rice crop Giza 1// and 1/1	125
B-7: Analysis of variance of Field Capacity for the two Drums (developed)	100
and original lof Rice crop Giza 177 and 171	126
B-8. Analysis of variance of Fuel Consumption for the two drums	107
(developed and original )of Rice crop Giza 177 and 171	127
B-9: Analysis of variance of Cost Analysis for the two Drums (developed	100
and original lof Rice crop Giza 177 and 171	128
B-10. Analysis of variance of Comparative Value for two Drums	120
(developed and original )of Rice crop Giza 177 and 171	129
C-1. The interaction between grain moisture content, (%) and forward	
speed km/h on Threshed grain losses, with developed and original	120
drum for rice crop Giza 177	130
C-2: The interaction between grain moisture contents, (%) and drum speed,	
m/s (r.p.m) on threshed grain losses, with developed and original drum	130
for rice crop Giza 177	
C-3: The interaction between forward speed, (km/h) and drum speed, m/s	
(r.p.m) on threshed grain losses, with developed and original drum for	130
rice crop Giza 177 (%) and forward	1
C-4: The interaction between grain moisture content, (%) and forward	
speed km/h on Threshed grain losses, with developed and original	131
drum for rice crop Giza 171	1
C-5: The interaction between grain moisture contents, (%) and drum speed,	1
m/s (r.p.m) on Threshed grain losses, with developed and original	131
drum for rice crop Giza 171	1
C-6: The interaction between forward speed, (km/h) and drum speed, m/s (r.p.m) on Threshed grain losses, with developed and original drum	
(r.p.m) on Threshed gram losses, with developed and original dram	131
for rice crop Giza 171	
speed km/h on Unthreshed grain losses, with developed and original	
speed km/n on Until eshed grain losses, with developed and stage	132
drum for rice crop Giza 177	
m/s (r.p.m) on Unthreshed grain losses, with developed and original	Í
m/s (r.p.m) on Unimestical grain 10550s, with developed and original	132
drum for rice crop Giza 177	
(r.p.m) on Unthreshed grain losses, with developed and original drun	1
(r.p.m) on Onlineshed grain losses, with developed and original drain	132
for rice crop Giza 177	