



UNIVERSITI PUTRA MALAYSIA

**DEVELOPMENT OF A TRACTOR MOUNTED PEANUT
HARVESTING EQUIPMENT**

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**DEVELOPMENT OF A TRACTOR MOUNTED PEANUT
HARVESTING EQUIPMENT**

By

ELNOUGOMI ABDELGADIR OMER MUSSAD

**Thesis Submitted in Fulfilment of the Requirements for the Degree of
Doctor of Philosophy in the Faculty of Engineering
Universiti Putra Malaysia**

January 2001



*Dedicated
to
My*

**Parents ABDELGADIR, SKEENA
Brother and sister ABUBAKAR, NAHID
Wife, sons and daughter, MANAL, MUHAMMAD, MUHANAD, MRWA**



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Doctor of Philosophy.

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Chairman: Associate Prof. Dr. Ir. Desa Ahmad

Faculty : Engineering

A peanut harvesting equipment suitable for operation by a 35hp tractor has been designed, developed and tested at the Department of Biological and Agricultural Engineering, UPM, Malaysia. The equipment consists of adjustable V-shaped digging blade where the angle of penetration can be easily adjusted with the help of bolts and nuts. Double discs lifter for gripping the loosened plant above the soil surface follows the digging blade. The loosened plant enters into a threshing mechanism, which consists of two cylinders with different number of fingers to achieve the stripping operation without dragging and clogging the pods then transfers them to the tank at the end of the equipment via a conveyor.



Light weight and durable materials were chosen to fabricate most of the peanut harvesting equipment parts. Therefore, in terms of weight, the equipment was lighter (about 315kg) compared with other existing machines (400kg). This facilitates easy hitching and transporting. Overall the peanut harvesting equipment was designed, fabricated, utilised and maintained using local resources and skill, with initial and fabrication cost of about US \$1455.

Soil moisture content was significant parameter for harvesting peanut crop in a single operation. This new equipment was designed for higher soil moisture content. The previous machines were operated below 30% soil moisture content. It was also found suitable and efficient for harvesting peanut in rainy season.

During the tests the clay soil cause digging, stripping and cleaning problems. Hence the new peanut harvesting equipment was designed to provide proper and efficient digging blade (V-shaped) with the following added features: Suitable clearance between cylinders and their concave (35 mm), suitable spacing between concave bars (25 mm) and conveyor wire mesh (20 mm). Equipment performance test achieved good results on clayey soil (Serdang Series Soils). Results from the field test show that the equipment is suitable for harvesting peanut in a single operation. The total power requirement of a single row equipment was about 15kW (20hp).

The losses during digging, lifting, stripping and conveying were 6.23%, 8.65%, 5.06% and 1.96% respectively. Other peanut harvesters had higher

digging and stripping losses (15% and % 9.3% respectively). The equipment pods breakage scored lower percentage at 1.91 % compared with the previous designed machines (about 8.9 %). Overall efficiency was 78.1%, considered high compared with other combines efficiencies.

The peanut harvesting equipment had an average capacity of 324.9kg/h. The maximum capacity reached by the equipment was about 377.3kg/h, while the previous designed harvester had a maximum capacity of 337 kg/h.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah.

PEMBINAAN ALAT PENUAI KACANG TANAH BANTUAN KUASA TRAKTOR

Oleh

ELNOUGOMI ABDELGADIR OMER MUSSAD

Januari 2001

Pengerusi: Prof. Madya Ir.Dr. Desa Ahmad

Fakulti : Kejuruteraan

Sebuah jentera yang menggunakan traktor 35 kuasa kuda telah direka dan dibangunkan di Jabatan Kejuruteraan Biologi dan Pertanian, Universiti Putra Malaysia.

Jentera ini mengandungi bilah penggali yang boleh dilaras berbentuk V manakala sudut penusukannya dikawal dengan melaras bolt dan nat. Bilah penggali ini diikuti oleh cakera berkembar pengangkat bertujuan menarik tanaman dipermukaan tanah. Tanaman yang telah dicabut akan memasuki mekanisme peleraian yang mengandungi dua silinder berjejari bertujuan meleraikan

kekacang sebelum dihantar ke tangki dibelakang jentera menerusi alat pengangkut.

Bahan yang digunakan untuk membina bahagian jentuai adalah ringan dan tahan lasak. Berbanding jentera lain, jentera ini lebih ringan serta memudahkan pemasangan dan pengangkutan oleh sesebuah traktor.

Dalam operasi tunggal penuaian kacang tanah terutama dimusim hujan, kelembapan tanah merupakan faktor yang penting. Jentera ini direkabentuk untuk kegunaan ditanah basah dan melebihi 30% sebagaimana yang dilakukan pada jentera lain. Kajian telah dijalankan pada kelembapan 42% (asas kering).

Kajian ditanah liat menimbulkan masalah galian, peleraian dan pembersihan. Untuk mengatasi masalah tersebut bilah penggali telah dipinda kebentuk V mana kala kelegaan diantara silinder dan pelantar diubahsuai untuk menghasilkan kecekapan yang lebih baik. Jumlah kuasa yang dihasilkan oleh sebuah jentuai kacang tanah bagi satu barisan adalah 15 kW (20 kuasakuda).

Dari aspek kehilangan, peratus kehilangan yang disebabkan oleh proses galian, pencabutan, peleraian dan pengangkutan adalah masing masing 6.23, 8.65, 5.06 dan 1.96 berbanding 15% dan 9.3% kehilangan galian dan peleraian oleh jentuai lain. Pecahan kacang juga menunjukkan nilai 1.91% berbanding 8.9% oleh jentera sediaada.

Keupayaan purata jentera adalah 324.9 kg/jam manakala keupayaan maksimum adalah 377.3 kg/jam berbanding 337 kg/jam yang dihasilkan oleh jentuai lain. Kecekapan keseluruhan adalah 78.1%.

Jentuai ini telah direka, dibina dan disenggara menggunakan sumber serta kepa karan tempatan. Kos pembinaan adalah US \$ 1455. Memandangkan ia boleh beroperasi ditanah basah,ia dijangka sesuai digunakan dimusim hujan.

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May Allah (S.W.T.) bless all who has kindly helped the author! Amin.



This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy.

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TABLE OF CONTENTS

	Page
DEDICATION	2
ABSTRACT	3
ABSTRAK	6
ACKNOWLEDGEMENTS	9
APPROVAL SHEETS	11
DECLARATION FORM	13
LIST OF TABLES	18
LIST OF FIGURES	21
LIST OF ABBREVIATIONS	25
CHAPTER	
I INTRODUCTION	26
Background	26
Rationale	27
Objectives	32
II LITERATURE REVIEW	33
Peanut Plant and Varieties	33
Roots	34
Factors Affecting Peanut Growth	34
Soil Requirements	34
Land Preparation	35
Fertilisation	36
Sowing Spacing	36
Harvesting	37
Digging Operation	38
Factors Affecting Digging Operation	38
Peanut Digging Equipment	41
Digging Blades	49
Digger Share Operation	50
Digging Depth of Blades	50
Salvage Machines	56
Peanut Stripping Operation	58
Harvesting Systems	59
Peanut Combines	63
Factors Affecting Peanut Combines Operation Efficiency	71
Forward Speed	71



	Stripping Losses	71
	Cylinder Design	72
	Separation Force	79
	Equipment Capacity	81
III	MATERIALS AND METHODS	85
	Experiment I	85
	Comparative Study on Different Peanut Digging Blades	85
	Digging Blade Design	85
	Digging System Calculations	88
	Performance Test	92
	Soil Moisture Content	92
	Draft Force	93
	Tractor Forward Speed	96
	Harvesting Losses	96
	Soil Disturbance Rating	98
	Experiment II	99
	Development and Evaluation Test of a Tractor Mounted Peanut Harvesting Equipment	99
	Design Considerations and Features	99
	Design of Equipment Components	100
	Digging System	101
	Lifting System	103
	Stripping System	108
	Equipment Reel Design	112
	Conveyor Design	113
	Design of Pods and Disposal Tanks	116
	Power Transmission System	118
	Equipment Operation Procedure	120
	Equipment Transportation	122
	Equipment Components Design Calculations	123
	Stripping System	123
	Reel System	137
	Conveyor System	137
	Power Requirement of the Equipment	150
	Equipment Performance Test	152
	Equipment Primary Tests	153
	Field Test	154
	Experimental Design	165
	Actual Field Test Problems	166
IV	RESULTS AND DISCUSSIONS	168
	Experiment I	168
	Field Test of Digging Blades	168
	Digging Losses	168
	The Effects of Different Digging Blade Types	168
	Inclination Angle	169
	Forward Speed	169



Digging Depth	170
Soil Disturbance	176
The Effects of Different Digging Blades	176
The Effects of Inclination Angles	176
The Effect of Forward Speed	177
The Effect of Digging Depth	177
Draft Force	183
Effect of Inclination Angles, Forward Speed and Depths	183
Moisture Content	183
Experiment II	188
Field Test of the Peanut Harvesting Equipment	188
Digging Losses	188
Digging Losses at Different Forward Speed	188
Digging Losses at Different Plant Density	189
Digging Losses at Different Soil Surface Conditions	189
Digging Losses at Different Digging Depth	190
Peanut Harvesting Equipment Lifting Losses	195
Effect of Plant Density	195
Effect of Forward Speed	195
Effect of Soil Surface Condition	196
Stripping Losses	200
Stripping Losses at Different Stripping Speeds	200
Effect of Forward Speed on Stripping Losses	200
Conveyor Losses	203
Effect of Different Stripping Speeds	203
Effect of Different Forward Speeds	203
Pods Breakage Percent	206
Effect of Stripping Speed	206
Effect of Forward Speed	207
Equipment Capacity	209
Effect of Plant Density	209
Effect of Stripping Speed	210
Effect of Forward Speed	210
Effect of Soil Surface Conditions and Digging Depth	211
Equipment Overall Efficiency	215
Effect of Soil Surface Condition	215
Effect of Plant Density	215
Different Digging Depths	216
Effect of Different Stripping Speeds	216
Effect of Forward Speed	217
V CONCLUSIONS AND RECOMMENDATIONS	226
Conclusions	226
Recommendation and Further Studies	228



REFERENCES	229
APPENDICES	240
A Equipment Design Data and Materials	241
B Equipment Drawing	253
C Field Test Original Data	260
BIODATA OF THE AUTHOR	278



LIST OF TABLES

Table		Page
1	World production of peanuts	28
2	The different peanut density in some Asian countries	37
3	Service factors for chain loading, SF1	134
4	Service factors for environment, SF2	134
5	ANOVA for digging losses	171
6	LSD for the effect of digging blades on digging losses	172
7	LSD for the effect of inclination angles on digging losses	172
8	LSD for digging losses at different forward speeds	173
9	LSD for digging losses at different digging depths	173
10	ANOVA for soil disturbance	178
11	LSD for soil disturbance at different digging blades	179
12	LSD for soil disturbance at different inclination angles	179
13	LSD for soil disturbance at different forward speeds	180
14	LSD for soil disturbance at different digging depths	180
15	ANOVA for draft force	184
16	LSD for draft force at different digging blades	185
17	Soil moisture content values for (dry and wet) and moisturemeter measuring methods at different depths and days from last irrigation	187
18	ANOVA for digging losses	190
19	LSD for digging losses at different forward speeds	191



20	LSD for digging losses at different sowing spacing	191
21	LSD for digging losses at ridge and flat soil surface condition	192
22	LSD for digging losses at different digging depths	192
23	ANOVA for lifting losses	196
24	LSD for lifting losses at different sowing spacing	197
25	LSD for lifting losses at different forward speeds	197
26	LSD for lifting losses at ridge and flat soil surface condition .	198
27	ANOVA for stripping losses	201
28	LSD for stripping losses at different stripping speeds	201
29	ANOVA for conveyor losses	204
30	LSD for conveyor losses at different stripping speeds	204
31	LSD for conveyor losses at different forward speeds	205
32	ANOVA for pods breakage percentage	207
33	LSD for pods breakage percent at different stripping speeds .	208
34	ANOVA for equipment capacity	211
35	LSD for equipment capacity at different plant sowing spacing	212
36	LSD for equipment capacity at different stripping speeds	212
37	LSD for equipment capacity at different forward speeds	213
38	ANOVA for equipment overall efficiency	218
39	LSD for equipment overall efficiency at ridge and flat soil surface condition	219
40	LSD for equipment overall efficiency at plant sowing spacing	219
41	LSD for equipment overall efficiency at different digging depths	220
42	LSD for equipment total losses at different digging depths ...	220



43	LSD for equipment overall efficiency at different stripping speeds	221
44	LSD for equipment total losses at different stripping speeds ..	221
45	LSD for equipment overall efficiency at different forward speeds	222
46	LSD for equipment total losses at different forward speeds ..	222
47	Blade specific resistance	241
48	Tractive and transmission coefficients for two wheel drive tractors	242
49	Analytical data of Serdang Series Soils	243
50	Datataker programme	245
51	Estimation of peanut plant volume, stems number and number of pods per plant	246
52	Estimation of breaking load of peanut stems	247
53	Metric mechanical, property classes for steel bolts, screws and studs	249
54	Friction coefficients (sliding)	250
55	Physical properties of common metals	251
56	Peanut tractor mounted equipment field test data for (AR) plot	260
57	Peanut tractor mounted equipment field test data for (BF) plot	263
58	Peanut tractor mounted equipment field test data for (CR) plot	266
59	Peanut tractor mounted equipment field test data for (DF) plot	269
60	Peanut tractor mounted equipment field test data for (ER) plot	272
61	Peanut tractor mounted equipment field test data for (FF) plot	275



LIST OF FIGURES

Figure		Page
1	Flow chart of peanut harvesting	29
2	Digger blade types	87
3	The cutting angle of the blade	88
4	Moisturemeter device	94
5	Data acquisition system	95
6	Calibration curve of the dynamometer	96
7	Peanut harvesting equipment (General View)	101
8	Tractor mounted equipment for harvesting peanuts	102
9	V-Shaped digging blade	103
10	Lifting system (General View)	104
11	Lifting system components	105
12	Two lifting discs	106
13	Two discs motion source	106
14	Overlap between cylinder and upper guide fingers	107
15	Lower guide of the lifting system	107
16	Stripping system components	109
17	Stripping system (General View)	110
18	First stripping cylinder	110
19	Second stripping cylinder	111
20	Stripping system concave	112

21	General view of the reel	113
22	Conveyor (General View)	114
23	Conveyor components	115
24	View of the conveyor bars and wire mesh	116
25	Location of the equipment tanks	117
26	Top view of the pods tank showing the sloping surface	117
27	Power transmission system (Top View)	118
28	Power transmission system components	119
29	Power transmission system from tractor (PTO)	120
30	Tractor three points linkages	122
31	Service factor diagram	125
32	Load acting on the shaft	126
33	Roller chain pitch selection chart	135
34	Cross-belt drive arc of contact	139
35	Diagram of the conveyor dimensions	148
36	General view of experimental layout	155
37	Plot (AR) layout	156
38	Plot (BF) layout	156
39	Plot (CR) layout	157
40	Plot (DF) layout	157
41	Plot (ER) layout	158
42	Plot (FF) layout	158
43	Digging losses for different digging blades	174
44	Digging losses at different inclination angles	174
45	Digging losses at different forward speeds	175



46	Digging losses at different digging depths	175
47	Soil disturbance at different digging blades	181
48	Effect of inclination angles on soil disturbance	181
49	Effect of different forward speeds on soil disturbance	182
50	Soil disturbance at different digging depths	182
51	Effect of forward speeds on draft force at different digging blades	185
52	Draft force requirements for different digging blades and depths of operation at 0° inclination angle	186
53	Draft force requirements for different digging blades and depths of operation at 40° inclination angle	186
54	Effect of forward speeds on digging losses	193
55	Effect of sowing spacing on digging losses	193
56	Effect of ridge and flat soil surface on digging losses	194
57	Effect of digging depths on digging losses	194
58	Effect of sowing spacing on lifting losses	198
59	Effect of forward speeds on lifting losses	199
60	Effect of soil surface condition on lifting losses	199
61	Effect of stripping speeds on stripping losses	202
62	Effect of forward speeds on stripping losses	202
63	Conveyor losses at different stripping speeds	205
64	Conveyor losses at different forward speeds	206
65	Effect of stripping speeds on pods breakage percentage ...	208
66	Effect of forward speeds on pods breakage percentage	209
67	Effect of sowing spacing on equipment capacity	213
68	Effect of stripping speeds on equipment capacity	214



69	Effect of forward speeds on equipment capacity	214
70	Effect of soil surface condition on equipment overall efficiency	223
71	Effect of plant sowing spacing on equipment overall efficiency	223
72	Effect of different digging depths on equipment overall efficiency	224
73	Effect of different stripping speeds on equipment overall efficiency	224
74	Effect of different forward speeds on equipment overall efficiency	225
75	Properties of sections	248
76	Coefficient of rolling resistance	252
77	Elevation view of the lifting system	254
78	Top view of the lifting system	255
79	Top view of the stripping and reel system	256
80	Side view of the conveyor system and tanks	257
81	Top view of the conveyor system and tanks	258
82	Top view of the power transmission system and three point linkages system	259

