EVALUATION OF DRAUGHT ANIMAL POWER SYSTEMS FOR MAIZE AND COTTON PRODUCTION AT SMALLHOLDER-FARMER LEVEL IN MASVINGO PROVINCE

by

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ABSTRACT

An evaluation of smallholder draught animal power systems was conducted in six study areas in Masvingo and Chivi districts of Masvingo province over two seasons 1999-2000 and 2000-2002. The objective was to investigate the effect of renovating animal-drawn ploughs and cultivators on field performance and on maize and cotton yields at smallholder level as well as to assess farmers' attitudes and constraints in using draught animal power (DAP) and implements. Trials were conducted to test the hypothesis that implements in good condition make better use of DAP than implements in poor condition in terms of field performance, quality of tillage and crop yields.

Focus group discussions and a survey of 100 households were conducted to investigate the resource base of smallholder farmers. Farmers were characterised into four wealth categories based on physical capital, as related to draught animal and implement ownership. Fifty-three ploughs and two cultivators owned by different households were tested, before and after renovation, with the participation of the respective households. An evaluation of the trials was conducted 14 months later to assess the benefits of implement renovation trials and the impact of training on attitudes of farmers towards operation, repair and maintenance of implements. Surveys were designed and analysed using SNAP, while implement performance data were analysed by Statistical Analysis System (SAS).

Results from the assessment of resource base of households showed that about 30% of households were resource-poor and lacked basic resources such as DAP, access to implements, adequate arable and grazing land and labour. All farmers depended on cropping for food and income while livestock contributed more to better-resourced farmers. Ninety-seven percent of smallholder farmers owned a plough, with the better-resourced owning cultivators and harrows. However, 60% of ploughs and cultivators were poorly maintained. Poorer farmers generally owned older implements in worse condition than better-resourced farmers. The mean age of ploughs and cultivators was 19 years and 15 years, respectively. Up to 70% of the farmers lacked knowledge in correct setting of implements and did not have good skills in the correct use and maintenance of implements. The mean cost of renovating a poorly maintained implement was 40% and 10% of the cost of a new plough and cultivator, respectively. The old age of implements, removal of plough parts, poor access to spares and repair services, high cost of spares and lack of skills in correct use and maintenance were attributable to the poor condition of implements.

Implement performance trials were conducted on paired plots each measuring 100 m by 8 m per test site. The farmer's plough or cultivator was tested in its usual state and settings in one plot. The other plot was ploughed after renovating the implement and using depth and width adjustments which suited different animal pulling capabilities and prevailing field conditions. After plough renovation, draught increased significantly ($P<0.0001$) by 24%, while specific draught decreased by about 15% due to improved implement penetration. Renovation did not affect work rate and field efficiency of ploughs but their weeding efficiency increased significantly ($P<0.0001$) by 21%. Significant differences were observed in moisture content and shear strength ($P<0.05$) with no significant difference in bulk density ($P>0.05$) at different soil depths after plough renovation. Draught potentials of all animal teams remained within pulling capacities after plough renovation. Draught and speed of cultivators increased by 9% and 17%, respectively. Weeding efficiency was significantly higher ($P<0.0001$) after renovating cultivators. Water-logging reduced yields by 10% in the first season. In the second season, yield increased by 24 and 12% in maize and cotton respectively, but with no significant difference ($P>0.05$) after implement renovation.

Economic analysis results indicated that the average outlay on implement renovation would be recovered through yield gain. Renovation of implements resulted in better implement control and handling, improved quality of tillage, a reduction in weeds and improved yields. Shortage of DAP, lack of good knowledge and skills for operation, repair and maintenance of implements, poor access to spares, high cost of spares and limitations in training and extension were some of the constraints to increasing productivity. The study demonstrated the value of implement renovation, correct operation and setting in achieving better return from the use of DAP for cropping. Improving the use of DAP requires training of farmers as well as having reliable and appropriate input supply mechanisms for affordable implements and spares. There is need to improve linkages between farmers, researchers, extension agencies and manufactures so as to develop solutions that enhance the use of DAP by smallholder farmers.

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DEDICATION

To my mum and dad for their intuition

and to

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ACRONYMS AND ABBREVIATIONS

%	Percent
AEWs	Agricultural Extension Workers
AGRITEX	Agricultural Technical and Extension Services
AP	Animal Power
AREX	Agricultural Research and Extension
bd	Soil bulk density
CA	Communal Area
cm	Centimetre
Cottco	Cotton Company of Zimbabwe
CSO	Central Statistical Office
DAP	Draught Animal Power
DFID	Department for International Development
E	East
g	Gravitational acceleration
G	Heart girth in metres
GMB	Grain Marketing Board
ha	Hectare
HoH	Head of household
hr	Hour
IAE	Institute of Agricultural Engineering
L	Animal body length from front shoulder to base of tail in metres
Mash	Mashonaland
Mat	Matabeleland
m	Metre
mc	Soil moisture content
mm	Millimetre
MOLARR	Ministry of Lands Agriculture and Rural Resettlement
NR	Natural Region
ODA	Oversees Development Authority
P	Statistical significance level
Plot A	Plot ploughed before renovation
Plot B	Plot ploughed after renovation
r	Pearson's correlation coefficient
RA	Resettlement Area
RG	Resource Group
S	South
SRI	Silsoe Research Institute
ss	Soil shear strength
SSCA	Small-scale Commercial Area
t	Tonnes
TFP	Third furrow planting
UZ	University of Zimbabwe
V	Volts
Z$	Zimbabwe Dollar

CONTENTS

	Page
ABSTRACT……..	ii
ACKNOWLEDGEMENTS……..	iii
DEDICATION……...	iv
LIST OF ACRONYMS AND ABBREVIATIONS…….	v
TABLE OF CONTENTS……..	vi
LIST OF TABLES…….	ix
LIST OF FIGURES……...	x
LIST OF APPENDICES……...	xi
CHAPTER 1……..	1
INTRODUCTION…….	1
1.1 Draught animal power use by smallholder farmers in Zimbabwe……	1
1.2 Purpose of study…….	3
1.3 Objectives of the study……...	4
1.4 Hypotheses of study……	5
1.5 Structure of thesis……...	5
CHAPTER 2…….	6
LITERATURE REVIEW…….	6
2.1 Introduction……	6
2.2 Overview of the use of DAP by smallholder farmers in Zimbabwe……..	7
2.3 Main components of a DAP tillage system……...	8
2.3.1 Draught animals…….	9
2.3.1.1 Availability and distribution of draught animals……...	9
2.3.1.2 Uses of DAP……	9
2.3.1.3 Selection and estimation of live weight of draught animals …….	10
2.3.1.4 Training of draught animals …….	12
2.3.1.5 Management of draught animals ……..	12
2.3.2 Harnessing of draught animals……...	13
2.3.3 Soil condition…….	15
2.3.4 Implements……	16
2.3.4.1 Implement ownership and management……...	16
2.3.4.2 Local manufacture of animal drawn implements……	17
2.3.4.3 Alternative tillage options for land preparation……	18
2.3.5 Implement operators and training in the use of DAP…….	18
CHAPTER 3……..	20
GENERAL MATERIALS AND METHODS……	20
3.1 Introduction……	20
3.2 Description of study sites……...	20
3.2.1 Location of sites……	20
3.2.2 Climate and rainfall ……...	23
3.2.3 Soils……	24
3.2.4 Crop production …….	25
3.2.5 Available livestock and DAP……..	25

3.3 Assessing capital resource base of smallholder farmers in study areas…… 26
3.4 Evaluation of ploughs and cultivators before and after renovation…….. 26
3.5 Data collection and analysis……... 27

CHAPTER 4…….. 28
ASSESSMENT OF THE CAPITAL RESOURCE BASE OF SMALLHOLDER FARMERS IN THE STUDY AREAS……. 28
4.1 Introduction…… 28
4.2 Objectives…… 29
4.3 Materials and methods……... 29
4.4 Results…….. 32
4.4.1 Characteristics of households…… 32
4.4.2 Cluster analysis of households……... 33
4.4.3 Availability and use of livestock…… 34
4.4.4 Land holding and crop production……... 36
4.4.5 Livestock management…….. 38
4.4.6 Implement ownership and uses..…… 38
4.4.7 Problems with implements…… 39
4.4.8 Condition of ploughs…… 40
4.4.9 Condition of individual plough parts…….. 40
4.4.10 Ownership, age and condition of cultivators…… 41
4.4.11 Implement parts replacement intervals……. 43
4.4.12 Sourcing of plough and cultivator parts and repairs…… 44
4.4.13 Sources of knowledge on implement use……. 45
4.4.14 Renovation of implements…… 45
4.5 Discussion…… 49
4.6 Conclusion……... 53

CHAPTER 5…….. 55
EFFECT OF RENOVATION ON IMPLEMENT PERFORMANCE, SOIL PHYSICAL CHARACTERISTICS AND AGRONOMIC PARAMETERS……... 55
5.1 Effect of renovation on implement performance…… 55
5.1.1 Introduction……..... 55
5.1.2 Objective……... 56
5.1.3 Hypotheses of study……... 56
5.1.4 Materials and methods…… 56
5.1.5 Results……... 66
5.1.5.1 Draught animal teams…….. 66
5.1.5.2 Draught potential of spans……. 67
5.1.5.3 Harnessing and hitching systems used in the trials …….. 68
5.1.5.4 Plough performance……... 68
5.1.5.5 Heart rate measurements of plough operators…….. 71
5.1.5.6 Cultivator performance……. 72
5.1.6 Discussion…….. 74
5.1.7 Conclusion ……. 78

5.2 Effect of implement renovation on soil physical characteristics and crop performance…….. 80
5.2.1 Introduction…….... 80
5.2.2 Objectives…….….. 80
5.2.3 Hypotheses of study…….…….. 80
5.2.4 Materials and methods…… 81
5.2.5 Results…… 82
5.2.5.1 Soil physical characteristics……...……. 82
5.2.5.2 Agronomic measurements…….……... 86
5.2.6 Discussion.…….…….……... 86
5.2.7 Conclusion…….. 89

CHAPTER 6…….. 90
EVALUATION OF BENEFITS OF IMPLEMENT RENOVATION AND EFFECT OF FARMER-TRAINING……... 90
6.1 Introduction.…….…….. 90
6.2 Objectives…….……... 90
6.3 Materials and methods…….. 91
6.4 Results…….. 92
6.4.1 Cost of renovating implements…….…….. 92
6.4.2 Cost of implement spares and their supply system ……... 94
6.4.3 Repairs carried out by farmers…..…….…… 96
6.4.4 Implement parts missing from ploughs since initial repairs …….…. 97
6.4.5 Condition of implements…… 97
6.4.6 Parts needed by households to repair ploughs…… 98
6.4.7 Problems encountered by households while using implements…….… 99
6.4.8 Knowledge of households on implement setting and operation…….… 100
6.4.9 Lessons learnt by households on implement operation…… 100
6.4.10 Topics on implements for which farmer-training was needed……. 101
6.4.11 Member of the household responsible for repairing implements…….… 101
6.5 Discussion……... 102
6.6 Conclusion …….. 106

CHAPTER 7…….. 108
GENERAL DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS……... 108
7.1 General discussion…….. 108
7.2 Conclusions……. 111
7.3 Recommendations…….. 112

REFERENCES…….. 118

APPENDICES…….….. 129

TABLES

	Page
2.1 Ownership of animal-drawn implements by smallholder farmers in Zimbabwe...	16
3.1 Area of Masvingo province by natural region……...	20
3.2 Areas of Chivi and Masvingo districts by natural region……...	21
3.3 Selected study areas in Chivi and Masvingo districts……	23
3.4 Description of soils in the study areas……	24
3.5 Main crops grown by smallholder farmers in Masvingo province in 2000……..	25
3.6 Available cattle and donkeys by farming sector in Masvingo province……	25
4.1 Details of variable of a question analysed by SNAP…….	32
4.2 Characteristics and resource availability of households (n=100)……...	33
4.3 Calendar for use of draught animals……..	36
4.4 Crops grown in the six project areas……..	36
4.5 Common implements owned and their uses……...	39
4.6 Problems with implements…….	39
4.7 Average age of ploughs……..	40
4.8 % of households reporting condition of individual plough parts and main parts removed……..	41
4.9 Average age of cultivators……..	42
4.10 % of households reporting condition of individual plough parts and main parts..	43
4.11 % of households reporting frequency of plough parts replacement……...	43
4.12 Frequency of replacement of cultivator parts…….	44
4.13 Places from where households source implements and spares……	45
4.14 Plough parts repaired for the different household resource groups……...	47
5.1 Instruments and equipment used during implement performance tests…….	57
5.2 ANOVA for draught during ploughing……	69
5.3 ANOVA for depth of ploughing……	70
5.4 ANOVA for weeding efficiency during ploughing……	71
5.5 ANOVA for draught during weeding…….	73
5.6 ANOVA for weeding efficiency of cultivator……	74
5.7 Predominant soil textural classes in test plots in the different areas at 0-150 mm and 150-300 mm depth and reduction of % sand at 150-300 mm depth……...	83
5.8 Agronomic results from trials……	86
5.9 Crop row spacing in trial plots……...	86
6.1 Cost of renovating ploughs during implement performance trials…….	92
6.2 Cost of renovating ploughs by farmer resource group……...	93
6.3 Cost of renovating ploughs by age of ploughs……...	93
6.4 Cost of renovating ploughs by site and farmer resource group……..	93
6.5 Cost of implements and spares between November 1999 and November 2001…	95
6.6 Farmers' opinions on plough renovation……...	96
6.7 The maximum and average number of times plough parts were replaced by farmers……...	96
6.8 Number of missing plough parts……	97
6.9 Problems experienced by households in using the plough…….	99
6.10 Knowledge of households on the purpose of the wheel on the plough……..	100
6.11 Lessons learnt on plough operation……	101
6.12 Topics on which households needed training……	101

FIGURES

	Page
2.1 Linear body dimensions for estimating live mass for cattle and donkeys……..	11
2.2 An ox applying a pull force (P) at the yoke…….……	13
2.3 Tandem pairs of donkeys for pulling an implement……	15
3.1 Map of Zimbabwe and location of Masvingo province……...	21
3.2 Location of study areas in Masvingo province……	22
3.3 Rainfall received in Masvingo City during the study period……...	24
4.1 Households attending focus group meetings at two sites…….……	30
4.2 Categorisation of households by resource group…….……	34
4.3 A draught animal tillage system found in Nyimai-Chivi communal area……	35
4.4 Plough condition according to household category…….……	40
4.5 Cultivator condition according to resource category……...	42
4.6 Categorisation of renovated ploughs by age……	46
4.7 Number of households and respective parts replaced on ploughs…….……..	46
4.8 Condition of a plough before and after renovation……..	48
4.9 Condition of a cultivator before renovation…….……	48
5.1 Dimensions measured on double neck yokes……...	60
5.2 Ploughing and planting maize behind a plough: Mshagashe West-16.12.99……..	62
5.3 Mechanical weeding with a BS41 cultivator in cotton: Chedenje-09.01.01……...	63
5.4 A plough operator wearing heart rate sensing equipment: Nyimai-22.06.01……..	65
5.5 Types of draught animals used by households…….…….……...	67
5.6 Single-type of draught animal teams used by households……...	67
5.7 Elevation of working HR above resting HR……	72
5.8 Heart rate of plough operator recorded in plot A and B at one test site-Mutangi-05.07.01……	72
5.9 Variation in soil bulk density in sandy soil in Mshagashe at 150 mm and 300 mm depths……...	83
5.10 Variation in soil shear stress in sandy soil in Mshagashe at 150 mm and 300 mm depths……...	84
5.11 Variation in soil moisture content in sandy soil in Mshagashe at 150 mm and 300 mm depths…….……...	84
5.12 Variation in soil bulk density in sandy soil in Chedenje at 150 mm and 300 mm depths……...	84
5.13 Variation in soil shear stress in sandy soil in Chedenje at 150 mm and 300 mm depths……...	85
5.14 Variation in soil moisture content in sandy soil in Chedenje at 150 mm and 300 mm depths……...	85
6.1 Mean cost of repairing ploughs at the start of the 1999-2000 season……..	94
6.2 Mean cost of repairing ploughs at the start of the 2000-2001 season……..	94
6.3 Relationship between cost of new plough and a tonne of maize…….……	95
6.4 Condition of ploughs at two different stages……...	98
6.5 Number of households and respective plough spares required……	99
6.6 Member of household responsible for repairing implements……...	102

APPENDICES

		Page
1	Natural regions and farming areas map of Zimbabwe…….	129
2	Flow diagram of on-farm activities of the study……..	130
3	Participatory Rural Appraisal (PRA) data sheet……..	131
4	Resource categories of households in Masvingo province……..	133
5	Draught animal power implement survey questionnaire…….	134
6	Summary of cluster analyses of participating households…….……..	139
7	An illustration of a cluster analysis of one household…….	143
8	Details of implement parts……...	144
9	Implement defects and comparisons of new and worn parts ……..	146
10	Frequency of replacement of plough parts……..	147
11	Plough/cultivator performance data sheet……	148
12	Examples of how donkeys were harnessed with yokes…….……..	149
13	GLM procedures-(ANOVA) results……	150
14	GLM procedures-oneway anova……..	154
15	Implement assessment survey questionnaire…….……..	159
16	Condition of selected ploughs during implement assessment survey……..	162