UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

OPTIMIZING FERTILIZER ON OIL PALM PRODUCTION USING THE GOAL PROGRAMMING METHOD

FATIMAH AZ-ZAHRA BINTI AZHAR (2021149391)
SITI HAZLINA BINTI ABDUL KUDUS (2021196293)
NUR WAHIDAH BINTI ZAHARI (2021341031)

(P35S22)

Report Submitted in partial fulfilment of the requirement
for the degree of
Bachelor of Science (Hons.) Management Mathematics
College of Computing, Informatics and Media

FEBRUARY 2023

ACKNOWLEDGEMENT

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

First and foremost, we would like to express our sincerest gratitude to Allah S.W.T. the Almighty for showering us with all the blessings continuously, we will forever be grateful.

Nonetheless, we would like to express our deepest and sincerest gratitude to our respected supervisor Puan Norul Fadhilah Ismail, for providing invaluable guidance and encouraging suggestions throughout the completion of this research. Her dynamism, vision, sincerity and motivation have deeply inspired us. Working and studying under her guidance was a great privilege and honour. We would also like to thank our Mathematical Modelling (MAT530) and Final Year Project (MSP660) lecturers, Profesor Madya Dr Nur Azlina Abd Aziz and Sir Abdullah Yahya, for their motivation and consistent advice and guidance.

We express our deep appreciation to each of our dedicated group members and classmates for giving full cooperation, extremely great commitment, timely assistance and incredible support throughout this work, directly or indirectly. It is a pleasant occasion to show our courtesy in remembering our father, mother and fellow family members who showered us with all the love, prayers, care and whole-hearted support extended to us throughout our studies. Let us also take this opportunity to thank Universiti Teknologi Mara (UiTM) Seremban for providing us with a conducive environment and sophisticated facilities, which helped us in the progress of completing the work assigned.

TABLE OF CONTENTS

ACKNOWLEDGEMENT ..... **i**

TABLE OF CONTENTS ..... **ii**

LIST OF TABLES ..... **iv**

LIST OF FIGURES ..... **v**

ABSTRACT ..... **vi**

CHAPTER 1 ..... **1**

INTRODUCTION **1**

1.1 Introduction 1
1.2 Problem Statement 3
1.3 Objectives 4
1.4 Significant and Benefit of Study 4
1.5 Scope and Limitation of Study 5
1.6 Definition of Terms 6

CHAPTER 2 ..... **7**

BACKGROUND THEORY AND LITERATURE REVIEW **7**

2.1 Optimizing Return from Fertilizer 7
2.2 Goal Programming 13

CHAPTER 3 ..... **16**

METHODOLOGY AND IMPLEMENTATION **16**

3.1 Overview 16
3.2 Method Steps 17
3.3 Development of Production Planning Model 24
3.3.1 Notations 24
3.3.2 Constraints 25
3.3.3 Decision Variables 27
3.3.4 Determining the Priority of Each Goal 27
3.3.5 Objective Function 28
3.3.6 Summarization of Goal Programming Model 28
3.3.7 Goals 30

CHAPTER 4 ..... **32**

RESULT AND DISCUSSION **32**

4.1 Introduction 32
4.2 Result and Analysis 32
4.3 Implementation Result of the Model 34

CHAPTER 5 ..... **37**

CONCLUSION AND RECOMMENDATION **37**

5.1 Overview 37
5.2 Summary of Findings 37
5.3 Implication for Practice 37

5.4 Recommendation 38
5.5 Conclusion 38
REFERENCES 39
APPENDICES A 43
APPENDICES B 44
APPENDICES C 45

ABSTRACT

In Malaysia, well-managed oil palm plantations spend the most on fertilizer management. Fertilizer purchases alone contribute to 85% or more of overall production costs. Fertilizer is any synthetic substance that is applied to soils. When growing plants, fertilizer enhances the supply of tissues and gives the plants more nutrients. This study proposes the Goal Programming approach to determine the accuracy rate of fertilizer used to produce a sustained maximum quality of oil palm fertility, to find the optimum mix of NPK fertilizer for oil palm plantation and to minimize the cost of production. The data was provided by interviewing the person in charge of the oil palm company in Kuala Pilah. The model was then run with LINGO 20.0 software. Nutri Gro, Power Gro, MPOB F1 and MPOB F5 fertilizers with various NPK concentrations were examined. To optimize oil palm production, 6.3 kg/ha of Nutri Gro, 1.575 kg/ha of Power Gro, 178.29 kg/ha of MPOB F1, and 162.26 kg/ha of MPOB F5 is required. This approach has been extensively utilized in various sectors to solve multi-criteria issues. This study is expected to be significant for both new and experienced farmers since it will help them make the most cost-effective decisions and guide them more about the benefits and consequences of fertilizer use in plants.