

**THE USE OF REMOTE SENSING TECHNIQUES
AND GEOGRAPHICAL INFORMATION
SYSTEM FOR MONITORING
CULTIVATED AREA AND
PRODUCTIVITY OF
SOME FIELD
CROPS**

By

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B.Sc. Agric. Sc. (Agronomy), Kafr El-Sheick University, 2007

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A thesis submitted in partial fulfillment

of

The requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Agricultural Science

(Agriculture in Desert and Salt Affected Areas)

Arid Land Agricultural Graduated Studies and Research Institute

Faculty of Agriculture

Ain Shams University

2015

Approval Sheet

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Date of Examination: 22 / 12 / 2014

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ABSTRACT

Abdelraouf Massoud Ali: The Use of Remote Sensing Techniques and Geographical Information System for Monitoring Cultivated Area and Productivity of some Field Crops. Unpublished Ph.D. Thesis, Arid Land Agricultural Graduated Studies and Research Institute, Agriculture in Desert and Salt Affected Areas, Faculty of Agriculture, Ain Shams University, 2015.

One of the main challenges in determining crop growth vigor or biomass from remotely-sensed images is the alignment of the acquisition date of the image with the optimal crop growth period. As discussed to increasing the temporal frequency of image acquisition addresses this problem but can be costly ,especially, in the case of fine resolution (i.e. high spatial resolution) platforms .

However, with landsat being available at a relatively small cost (usually free ,composite 16-day NDVI LANDSAT data (~30 m x 30 m pixel size) throughout the entire crop growth period was used for this research. This ensured a continuous vegetation index profile, which captured land use patterns (e.g. fallow, cropping (before and during the growing period of winter crops. The measured 16-day aggregated NDVI LANDSAT was used as temporal input for quantifying and understanding the crop growth trajectory at each pixel. Standard and advanced image processing techniques were applied to the multi-date NDVI imagery .These methods included geometric corrections, image enhancement and transformation, re-projection, supervised classification, and classification accuracy assessment. Temporal classification methodology and multi-temporal algorithms were adapted, developed and tested at the shire level in order to determine crop area planted for different crop types

(e.g. wheat, sugar beets, Alfa Alfa, Potato and onion) at the end of the crop growing season as well as for early-season estimates.

the second objective of this research is to use remote sensing satellite data imagery to generate remotely-sensed empirical pre-harvest wheat and rice yield prediction models. The main input parameters of these models are spectral data either in form of spectral reflectance data that are released from the different land sat bands (, red, and near infra-red) or in forms of spectral vegetation indices that are algebraic ratios generated from the spectral reflectance values. The other type of the input factors is Leaf Area Index (LAI) that is a biophysical parameter closely related to crop canopy spectral characteristics and was measured by LAI Plant Canopy Analyzer (PCA). The five vegetation indices that are calculated through different forms that mastered the band of near infra-red with the bands of red to produce Difference Vegetation Index (DVI), Infrared Percentage Vegetation Index (IPVI), Ratio Vegetation Index (RVI), Normalized Difference Vegetation Index (NDVI) and Soil Adjusted Vegetation Index (SAVI). The above mentioned factors were individually used as input factors for either simple regression modeling or for multi-regression modeling associated with the Leaf Area Index (LAI) in each model of yield prediction for wheat crop in each of their season of cultivation. All generated models are site specific limited to the area and the surrounding environment and could be applicable under similar conditions using the extra pollination approach. The study was carried out in Salheia project using the dataset from two wheat seasons 2012/2013, 2013/2014, The total wheat area was cultivated by Misr1. Molding and validation process were carried out for crop for each season independently. The generated models were validated through main step. the correlation coefficient that is released from the generated models, while the second one is the validation through testing the yield that is calculated through the generated models (modeled yield) against the yield that is reported from field. Testing modeled yield versus reported yield was carried out through common statistical test. the correlation coefficient for a direct regression analysis between modeled and predicted yield for each generated model. The correlation coefficient (r) of the generated models indicated that spectral bands (red and near infra-red bands) showed high accuracy and sufficiency to predict the yield. This relationship

was proved through correlation coefficient of the generated models and through the generated models with the wheat for the two seasons. It is clear that using LAI with other spectral factor increased the accuracy of the generated models as shown from the validation process for all models. The models are applicable after 90 days from sowing date for similar cultivation management under the same environmental conditions.

ACKNOWLEDGMENT

All praises are due to God, who blessed me with kind professors and colleagues, and gave me the support to produce this thesis.

I would like to express my profound gratitude and sincere appreciation to **Prof. Dr. Ayman Farid Abou-Hadid**, Prof. Emeritus of Horticulture, Faculty of Agriculture, Ain Shams University and Former Minister of Agriculture and Land Reclamation for his kind supervision, valuable guidance and real encouragement during the present investigation, continuous support in the course of this investigation and help during the preparation and writing this thesis.

I wish also to express my deepest thanks for Prof. Dr. **Olfat Hassan El-Bagory**, Prof. of Agronomy, Faculty of Agriculture, Ain Shams University, for her supervision, guidance and encouragement during the work of the study.

Grateful thanks to Professor **Dr. Mohamed Amin Aboelghar** associated prof. researcher of remote sensing applications in Agriculture. agricultural Application department, National Authority for Remote Sensing and Space Science (NARSS) for his help, valuable advices and encouragement during the work of this study.

My greatest debt is to **Prof. Dr. Mohamed Zaki El-Shinawy**, Professor of Vegetable Crops, Fac. Agric., Ain Shams University for supervising this work, providing all valuable suggestions, comments, scientific material for their fruitful, help, encouragement, cooperation and friendships.

Grateful thanks for **Dr. Abdelazeiz Belal**, head of soil department. and all staff members of agricultural Application, Soil and Marine Division, National Authority for Remote Sensing and Space Science (NARSS) for their fruitful, help, encouragement, cooperation and friendships.

My sincere thanks extend to **Dr. Mohammed Ahmed El-shirbeny**, researcher of remote sensing applications in Agriculture. agricultural Application department, National Authority for Remote Sensing and Space Science (NARSS) for his help, valuable advices and

encouragement during the work of this study.

I would like to thank NASA for data availability and I would like to thank 6th of October for Agricultural Projects Company, Egypt for their kind support and encouragement i would like interoduce my greatest thankfull for ALARI for their kind support and encouragement

I am particularly grateful to my family and my wife for this continuous encouragement during the duration of this study.

CONTENTS

| | Page |
|--|------|
| LIST OF TABLES | III |
| LIST OF FIGURES | V |
| INTRODUCTION | 1 |
| REVIEW OF LITERATURE | 4 |
| 6.1- Remote Sensing in Agriculture | 4 |
| 6.2. Spatial Resolution of Satellite Imagery | 7 |
| 6.3- Temporal Resolution of Satellite Imagery | 9 |
| 6.4. Remotely Sensed Vegetation Indices | 10 |
| 6.5- Crop Discrimination from Satellite-based Images | 13 |
| 6.6. Traditional Classification Procedures in Remote Sensing | 14 |
| 6.7. Accuracy assessment | 16 |
| 6.7.1 Overall Accuracy | 18 |
| 6.8. Crop yield prediction model. | 20 |
| 6.9. Spatial modelling | 34 |
| MATERIALS AND METHODS | 39 |
| 7.1. Crop Area Estimates Using Multi NDVI-Date Land sat Imagery | 39 |
| 7.1.1. Study Area Description | 39 |
| 7.1.2. Remote Sensing Data Availability | 41 |
| 7.1.2.1.Landsat Data 7 ETM | 42 |
| 7.1.2.2.LNDSAT 8 OLI | 42 |
| 7.1.3. Image Processing | 44 |
| 7.1.3.1.Atmospheric and Topographic Correction ATCOR | 44 |
| 7.1.4Single date multispectral imagery:- | 45 |
| 7.1.5.Multitemporal Normalize difference vegetation indices (NDVI) | 45 |
| 7.1.6.Ground Truth and Survey Data | 47 |
| 7.1.7Supervised classification: | 48 |

| | |
|---|--------------|
| 7.1.8. Assessing Classification Accuracy | 50 |
| 7.1.8.1. Kappa Coefficient Analysis | 51 |
| 7.1.8.2. Overall accuracy | 52 |
| 7.1.8.3. User's accuracy | 52 |
| 7.1.9. Software | 54 |
| 7.1.9. 1. The Environment for Visualizing Images (ENVI 5. 1) | 54 |
| 7.1.9. 2 Atmospheric Correction (ATCOR10.0) | 54 |
| 7.1.9. 3. ARC MAP 10.1 | 54 |
| 7.1.9. 4. Statistical Software | 55 |
| 7.2. Early-season Crop yield Estimates for Winter Crops in newer lands in Egypt using VIS Landsat Satellite Imagery | 56 |
| 7.2.1. Field measurements. | 56 |
| 7.2.2 Plant sampling. | 56 |
| 7.2.3. Generation of estimator variables of wheat crop yield | 56 |
| 7.2.4. LAI measurement | 58 |
| 7.2.5. Satellite data specifications | 59 |
| 7.2.6. Vegetation Indices (VIs) calculation | 59 |
| 7.2.7. Statistical modeling | 61 |
| 7.2.7.1. Descriptive statistics | 61 |
| 7.2.7.2. Simple and Multiple Linear Regression (MLR) modeling | 62 |
| 7.3. Spatial Modeling | 66 |
| RESULTS AND DISCUSSION | 68 |
| 8.1. Crop area estimation | 68 |
| No. | Pages |
| 8.1.1. Crop area estimation for winter season 2013 | 68 |
| 8.1.2. Crop area estimation for winter season 2014 | 74 |
| 8.2. Crop yield prediction models | 82 |
| 8.2. 1. Simple regression analysis for wheat season in 2013 | 82 |
| 8.2. 1. 1. Simple-regression for Jan 2013 . | 83 |
| 8.2. 1.2. Simple regression Crop yield models Feb 2013 | 85 |

| | |
|---|-----|
| 8.2. 2..Multi-regression for wheat season in 2013 | 91 |
| 8.2. 2.1 Multi-regression for wheat season in January 2013 | 91 |
| 8.2. 2.2.Multi-regression for wheat season in February 2013 | 95 |
| 8.2.3.. Simple regression analysis for wheat season in 2014 | 98 |
| 8.2.3.1Simple regression Crop yield models Jan 2014 | 98 |
| 8.2.3.2.Simple regression Crop yield models Feb 2014 | 101 |
| 8.2.3.3.Simple regression Crop yield models March 2014 | 104 |
| 8.2.4.Multi-regression for wheat season in January 2014 | 107 |
| 8.2.4.1.Multi regression Crop yield models Feb 2014 | 110 |
| Spatial Modelling for wheat Crop in test Area | 113 |
| SUMMARY | 119 |
| REFERENCES | 123 |
| ARABIC SUMMARY | |

LIST OF TABLES

| No. | | Pages |
|-----|---|-------|
| 1. | characterization for landsat (ETM+) | 42 |
| 2. | characterization for landsat8 (OLI) | 43 |
| 3. | Available Landsat imagery for two seasons | 45 |
| 4. | The total ground check point for winter season 2013 | 40 |
| 5. | The total ground check point for winter season 2014 | 50 |
| 6. | Available Landsat imagery for two seasons | 57 |

| | | |
|------------|--|--------------|
| 7. | Kappa Coefficient and overall accuracy for crop area estimation from land sat satellite images for winter season 2014 | 69 |
| 8. | Confusion Matrix for the Maximum Likelihood (ML) algorithm for sigle date winter season 2013 | 69 |
| 9. | Confusion Matrix for the Maximum Likelihood (ML) algorithm for Multi temporal NDVI winter season 2013 | 70 |
| 10. | Total area of the different winter crops in El-Salhia site season 2013 | 73 |
| 11. | Kappa Coefficient and overall accuracy for crop area estimation from land sat satellite images for winter season 2014. | 74 |
| 12. | Confusion Matrix for the Maximum Likelihood (ML) algorithm for sigle date winter season 2014 | 74 |
| 13. | Confusion Matrix for the Maximum Likelihood (ML) algorithm for Multi temporal NDVI winter season 2014. | 75 |
| 14. | Total area of the different winter crops in El-Salhia site season | 77 |
| 15. | Producer and user accuracy for single spectral land sat imagery 2013 for the study area | 79 |
| 16. | Producer and user accuracy for Multi NDVI land sat imagery 2013 | 79 |
| No. | | Pages |
| 17. | Producer and user accuracy for single spectral land sat imagery 2014 for the study area | 79 |
| 18. | Producer and user accuracy for Multi NDVI land sat imagery 2014 for the study area | 79 |
| 19. | The generated simple regression models and the correlation coefficient for Jan 2013 | 83 |
| 20. | The generated simple regression models and the correlation coefficient for February 2013 | 86 |
| 21. | The generated simple regression models and the correlation coefficient for March 2013 | 89 |
| 22. | The generated multi-regression models for wheat yield prediction in January 2013 | 92 |
| 23. | The generated multi-regression models for wheat yield prediction in February 2013 | 95 |

| | | |
|------------|--|------------|
| 24. | The generated simple regression models and the correlation coefficient for Jan 2014 | 98 |
| 25. | The generated simple regression models and the correlation coefficient for February 2014 | 101 |
| 26. | The generated simple regression models and the correlation coefficient for March 2014 | 104 |
| 27. | The generated multi-regression models for wheat yield prediction in January 2014 | 107 |
| 28. | The generated multi-regression models for wheat yield prediction in February 2014 | 110 |

LIST OF FIGURES

| No. | | Pages |
|------------|--|--------------|
| 1. | Location map of the study area | 40 |
| 2. | Rainfall, temperature and sunshine diagram of Salhia area | 41 |
| 3. | Illustrates the Structure of a Digital Image and Multispectral Image | 43 |
| 4. | Single date NDVI for study area | 46 |
| 5. | Multi temporal NDVI for the study area | 47 |
| 6. | Descriptions for sample of ground truth point | 49 |
| 7. | methodology for crop area estimation | 53 |
| 8. | cell grid system to collect wheat sample season 2013 on the left and saeson2014 on the right | 57 |
| 9. | The apparatus of Global Position System (GPS) | 58 |
| 10. | LAI-2000 plant canopy analyzer | 59 |
| 11. | Derived vegetation indices from Landsat data | 61 |
| 12. | Methodology for wheat crop yield prediction | 66 |
| 13. | Model Builder diagram for wheat in the test area | 67 |

| | | |
|------------|---|--------------|
| 14. | shows the results of Maximum Likelihood (ML) supervised classification maps of the Multi temporal NDVI landsat imagery | 71 |
| 15. | shows the results of Maximum Likelihood (ML) supervised classification maps of the Multi temporal NDVI landsat imagery 2013 | 72 |
| 16. | Total area of the different winter crops in El-Salhia site season 2013 | 73 |
| No. | | Pages |
| 17. | shows the results of Maximum Likelihood (ML) supervised classification maps of the Multi temporal NDVI landsat imagery winter season 2014 | 76 |
| 18. | Total area of the different winter crops in El-Salhia site season 2014 | 77 |
| 19. | NDVI profile for winter crops of the study area | 80 |
| 20. | Crop area change increase and decrease from 213 and 2014 | 81 |
| | Simple-regression for Jan 2013 | 84:85 |
| 21. | Validation Model (DVI) | 84 |
| 22. | Validation Model (IPVI) | 84 |
| 23. | Validation Model (RVI) | 84 |
| 24. | Validation Model (NDVI) | 84 |
| 25. | Validation Model (SAVI) | 85 |
| 26. | Validation Model (LAI) | 85 |
| | Simple regression Crop yield models Feb 2013 | 87:88 |
| 27. | Validation Model (DVI) | 87 |
| 28. | Validation Model (IPVI) | 87 |
| 29. | Validation Model (RVI) | 88 |
| 30. | Validation Model (NDVI) | 88 |
| 31. | Validation Model (SAVI) | 88 |
| 32. | Validation Model (LAI) | 88 |
| | Simple regression Crop yield models March 2013 | 90:91 |
| 33. | Validation Model (DVI) | 90 |
| 34. | Validation Model (IPVI) | 90 |
| 35. | Validation Model (RVI) | 90 |
| 36. | Validation Model (NDVI) | 90 |
| 37. | Validation Model (SAVI) | 91 |
| No. | | Pages |

| | |
|---|----------------|
| Multi-regression for wheat season in January 2013 | 93:94 |
| 38. Validation Model (DVI&LAI) | 93 |
| 39. Validation Model (IPVI&LAI) | 93 |
| 40. Validation Model (RVI&LAI) | 94 |
| 41. Validation Model (NDVI&LAI) | 94 |
| 42. Validation Model (SAVI&LAI) | 94 |
| Multi-regression for wheat season in February 2013 | 96:97 |
| 43. Validation Model (DVI&LAI) | 96 |
| 44. Validation Model (IPVI&LAI) | 96 |
| 45. Validation Model (RVI&LAI) | 97 |
| 46. Validation Model (NDVI&LAI) | 97 |
| 47. Validation Model (SAVI&LAI) | 97 |
| 1Simple regression Crop yield models Jan 2014 | 99:100 |
| 48. Validation Model (DVI) | 99 |
| 49. Validation Model (IPVI) | 99 |
| 50. Validation Model (RVI) | 100 |
| 51. Validation Model (NDVI) | 100 |
| 52. Validation Model (SAVI) | 100 |
| 53. Validation Model (LAI) | 100 |
| Simple regression Crop yield models Feb 2014 | 102:103 |
| 54. Validation Model (DVI) | 102 |
| 55. Validation Model (IPVI) | 102 |
| 56. Validation Model (RVI) | 102 |
| 57. Validation Model (NDVI) | 102 |
| 58. Validation Model (SAVI) | 103 |
| 59. Validation Model (LAI) | 103 |
| Simple regression Crop yield models March 2014 | 105:106 |
| No. | Pages |
| 60. Validation Model (DVI) | 105 |
| 61. Validation Model (IPVI) | 105 |
| 62. Validation Model (RVI) | 106 |
| 63. Validation Model (NDVI) | 106 |
| 64. Validation Model (SAVI) | 106 |
| Multi-regression for wheat season in January 2014 | 108:109 |