Contents

List of Figures v
List of Table vi
Acronyms vii

1 Introduction 1
2 Literature Review 5
  2.1 Precision Agriculture 6
    2.1.1 Overview of Precision Agriculture 7
    2.1.2 Precision Agriculture in India 9
  2.2 Agriculture Expert Systems 10
    2.2.1 Overview of Expert System in Agriculture 10
    2.2.2 Irrigation Scheduling 11
    2.2.3 Soil Fertility Management 13
    2.2.4 Pest Management 14
    2.2.5 Web Based Systems 17
    2.2.6 GIS Based Systems 19
  2.3 Expert System for Irrigation Scheduling 20
    2.3.1 Overview on Irrigation Scheduling Methods 21
    2.3.2 Irrigation Scheduling Based on Water Balance 22
    2.3.3 Issues and Challenges 22
  2.4 Agriculture ES in India 25
  2.5 Problem Formation 27
3 Agricultural Expert System 30
  3.1 Overview of Expert Systems 30
    3.1.1 Classifications of ES methodologies 31
    3.1.2 Expert Systems in Agriculture 33
  3.2 Knowledge Engineering 35
    3.2.1 Transfer Process Approach v/s Modeling Approach 36
    3.2.2 CommonKADS Modeling 38
  3.3 Proposed Framework for Agriculture Expert System 39
    3.3.1 CommonKADS Model Set for Agriculture ES 39
    3.3.2 Discussion 44
4 Estimation of Evapotranspiration 45
  4.1 Evapotranspiration 45
    4.1.1 Direct Measurement of Evapotranspiration 48
    4.1.2 Estimation of Evapotranspiration 50
    4.1.3 Calibration of Hargreaves Equation 52
  4.2 Fuzzy logic based Calibration 53
    4.2.1 Fuzzy Logic Model 54
    4.2.2 Fuzzy Inference System for C_H and E_H 56
    4.2.3 Result and Discussion 58
4.3 ECALTOOL : Evapotranspiration Calibration Tool
4.3.1 LabVIEW based GUI
4.3.2 User’s Guide
4.3.3 Performance Comparison

5 Weather based Disease Forecasting
5.1 Integrated Pest Management
5.1.1 Genesis of Disease Forecasting
5.1.2 Disease Forecasting Methodologies
5.2 Issues of Weather based Disease Forecasting System
5.2.1 Leaf Wetness Duration Estimation
5.2.2 Knowledge Base for the System
5.3 Fuzzy Logic Based Disease Forecasting System
5.3.1 Fuzzy Inference System
5.3.2 Case studies and Discussion

6 KrishiSENSE : Web and Mobile based Agriculture DSS
6.1 Overview
6.1.1 Concept Model
6.1.2 Irrigation Scheduling Algorithm
6.2 KrishiSENSE : Web Application
6.2.1 Introduction and Profile
6.2.2 Navigation Detail
6.2.3 System Analysis and Design
6.2.4 Functionality Check
6.2.5 Discussion
6.3 KrishiSENSE : Mobile Application
6.3.1 Introduction and Profile
6.3.2 System Analysis and Design
6.3.3 Functionality Check
6.3.4 Discussion

7 Conclusion and Future Work
7.1 Conclusion
7.2 Future Work
Reference
List of Publication
Appendix A
Appendix B
Appendix C