

Agricultural Information and IT

Proceedings of IAALD AFITA WCCA 2008

August 24 - 27, 2008 at Tokyo University of Agriculture

[Table of Contents](#)

[Author Index](#)

[Keyword Index](#)

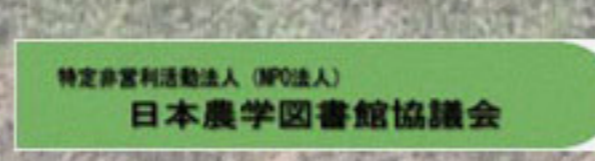
[Preface](#)

[Sponsors](#)

[Exit](#)

[Search This CD-ROM](#)

[Book \(All PDF Files Included\)](#)



ISBN 978-4-931250-02-4

Datamining / Pattern Recognition / Modeling / Simulation

Identifying key crop performance traits using data mining D. Diepeveen and L. Armstrong	1
Lognormal vs. Normal and Weibull Distributions for Modeling the Mass and Size Distributions of Sunflower Seeds and Kernels Javad Khazaei, Sahebeh Jafari and Sara Noorolahi	7
Enhancement of Plant Shape Classification Power by Combining Size-Independent Shape Analyses with Size Factors Seishi Ninomiya and Mari Oide	17
Comparing Multivariate Statistical Techniques and Supervised and Unsupervised Neural Networks in Identifying of Subspecies and Origins of Wheat accessions Javad Khazaei, Mohammad R Naghavi, Mansoureh Danesh, and Rasoule Amirian	25
Classification of Philippine Rice Grains Using Machine Vision and Artificial Neural Networks Jose D Guzman and Engelbert K. Peralta	41
An Image Change Detection Application for Field Server Kei Tanaka, Yasuyo Kita, Masayuki Hirafuji and Seishi Ninomiya	49
A Simple Model to Simulate Sago Palm Growth Evi Gusmayanti, Takemi Machida and Masao Yoshida	55
A Regional Model of Sustainable Utilization in Marginal Lands by the AHP Method: A Case Study of Kabude Olia in Kermanshah Province, Iran Ali Ariapour, Fazel Amiri and Ahmad Torknezhad	61
A macroeconomic (simultaneous equation) model of the Estonian livestock sector Reet Põldaru, Jüri Roots, Ants-Hannes Viira and Rando Värnik	67
The importance of wine components in human health Gabriela Teodorescu	75
A New Method for Modeling the Drying Kinetics of Zataria Multiflora (Avishan Shirazi) Leaves: Superposition Techniques Javad Khazaei, Akbar Arab-Hosseini, Zahra Khosro-Beygi, Nasibeh Izadikhah and Shahla Sivandi Nasab	79
Approximating milk yield and milk fat and protein concentration of cows through the use of mathematical and artificial neural networks models J. Khazaei and M. Nikosiar	91

Climate change effects on the maize growing season Márta Gaál and Levente Horváth	107
Modeling Cyclic Water Absorption and Desorption Characteristics of Three Varieties of Wood Sara Noorolahi, Javad Khazaei and Sahebeh Jafari	113
PCRANCH: Cow-Calf Herd Simulation System J. W. Oltjen, A. Ahmadi, A.J. Romera, D.J. Drake and S.J.R. Woodward	123
<hr/> Data Acquisition / Monitoring / Sensing / Control / Precision <hr/>	
A communication protocol for collaboration among the measurement and control nodes in a decentralized autonomous environment control system of greenhouses Takehiko Hoshi, Yasumasa Hayashi and Keiji Shintani	127
Development of Microcontroller Based Grape Dryer V. R. Thool, R. C. Thool, W. S. Khandlikar and A. G. More	135
Automation integration for Taiwan country-chicken farm management using field server Yenu Wan, Sunming Yu, Jinwen Huang, Jashang Yang and Chinghsin Tsai	143
A Branch Predictor with New Recovery Mechanism in ILP Processors for Agriculture Information Technology Kwang-Hyun Ko and Young-Il Cho	151
Numerical Analysis of Microclimate inside Four Single-span Greenhouses Digui Yang, Kazuhiro Nakano, Daisuke Terano and Haijun Yan	165
Geospatial data management and integration of geospatial web services Jachym Cepicky, Pavel Gnip, Stepan Kafka, Irena Koskova and Karel Charvat	175
EarthLookCZ as Czech way to GMES Karel Charvat and Petr Horak	191
An internet based tool for land productivity evaluation in plot-level scale: the D-e-Meter system Tamas Hermann, Ferenc Speiser and Gergely Toth	197
Exploitation of Groundwater for Irrigation in Nganjuk District, East Java, Indonesia Liyantono, Takemi Machida and Tasuku Kato	203

Use of the spatial analogy method to analyse to possible land use change in Hungary Levente Horvath	209
Verification of a Prototype System based on RFID to Recognize Agricultural Operations Automatically Koji Sugahara, Teruaki Nanseki and Tokihiro Fukatsu	215
Construction of Support Tools to Assist an Agent System Tokihiro Fukatsu, Masayuki Hirafuji and Takuji Kiura	221
Field Server Network Design - a case study Takuji Kiura, Tokihiro Fukatsu and Masayuki Hirafuji	229
Simple, Rapid and Non-Destructive Determination of Nitrate Nitrogen Content Using Mid-Infrared Spectroscopic Method Atsushi Hashimoto, Naoko Hayashi, Ken-ichiro Suehara, Mikihiro Kanou, Takaharu Kameoka, Takao Kumon and Katsutoshi Hosoi	235
Forestry in situ monitoring and data management Karel Charvat, Ota Cerba, Josef Fryml, Martin Pospisil, Petr Horak, Jan Jezek, Petr Kubicek, Marek Musil, Zbynek Krivanek, Avi Gal, Paolo Capodieci and Maris Alberts	241
In situ sensors and Prefarm system Pavel Gnip, Karel Charvat, Maris Alberts, Marek Musil, Jan Jezek, Zbynek Krivanek and Luigi Fusco	255
Application of embedded system in field image monitoring Chiaki Yamaguchi and Ryoei Ito	263
Wireless Networking and Filed Server in the high Himalayas Mahabir Pun, Bhushan Shrestha, Gaurab Raj Upadhaya, Prashant Manandhar and Indiver Badal	267
Real-time Insect Monitoring System by Using Field Sever Masayuki Hirafuji, Hideo Yoichi, Tomonari Watanabe, Motoaki Asai, Haoming Hu, Kei Tanaka, Tokihiro Fukatsu, Takuji Kiura and Seishi Ninomiya	277
Landslide Early Warning System for Rural Community as an Application of Sensor Asia Honda Kiyoshi, Aadit Shrestha, Rassarin Chinnachodteeranun, Nguyen Duy Hung, Hiroshi Shimamura, Teuku Faisal Fathani, Dwikorita Karnawati and Kyoji Sassa	283
Development of a Near Real-Time Drought Monitoring System in Ubon Ratchathani, Northeastern Thailand Daroonwan Kamthonkiat, Honda Kiyoshi, Rushikesh P.Kulkarni, Sujittra Charoenhirunyingyos and Khun San Aung	289

Slope and Wheel Slip's Variations Based Continuous Cereal Yield Monitoring on Combine Harvesters Aided by GPS/GIS A case study of field-workshop experience 297
Akbar Sanaei

Information Technology for Smart Vineyard 313
Nattapong Tongrod, Krisanadej Jaroensutasinee, Adisorn Tuantranont and Teerakiat Kercharoen

Maximization of fruit growing activity using precision management 321
Gabriela Teodorescu

Decision Support System / Farm Management

Improved Geo-ICT model GramyaVikas for rural development planning 325
Adinarayana Jagarlapudi and Samee Azmi

CAPRICORN: A Windows Program for Formulating and Evaluating Rations for Goats 331
A. Ahmadi and P.H. Robinson

Applicability of the FAPS-DB system for farm simulation and planning: A Case study in the Dominican Republic 337
Teruaki Nanseki, Winston E. Marte and Yi Xu

Applicability of the Noyaku-Navi System for Appropriate Use of Agricultural Chemical: A Case Study in China 345
Teruaki Nanseki, Yi Xu, Hui Zhou, Bo Huang and Min Song

An Environmental Risk Management System for Pesticide Use: Indicators, System Design, and Application 353
Masaei Sato and Teruaki Nanseki

Regional Variability in Crop Specific Synoptic Forecasts 359
Kathleen M. Baker

PROGIS ICT and SaRAM for know-how transfer and capacity building within rural area management (agriculture, forestry, environment) 365
Walter Mayer

Information Systems for Pest Control in Protected Agriculture: The Almeria Experience 373
Martin Acevedo, Samuel Tunez and Fernando Bienvenido

DRIS-LT. A set of tools for DRIS application with learning capabilities 381
Antonio J. González-Lázaro, Miguel Guzmán-Palomino and Fernando Bienvenido

Climate Analogies and Risk Analysis of Hungarian Viticulture Karoly Szenteleki, Levente Horvath and Márta Ladányi	389
A Smart Mobilized Fertilizing Expert System: 1-2-3 Personalized Fertilizer Watchara Sriswasdi, Sutthilak Luengsrigoon, Nonthiwat Lorsuwansiri, Suparat Wuttilerdcharoenwong, Vasuthep Khunthong, Thanapat Suksangsri, Asanee Kawtrakul, Nipaporn Seebungkerd, Urai Tananon, Werachai Narkwiboonwong and Anan Pusittigul	397
Business Intelligence in the Vineyard Miguel de Castro Neto, Carlos Lopes, Jorge Maia and Fernando Bação	405
A GIS based System For Paddy Field Precision Farming Fauzul Azhan Abdul Aziz, Abdul Rashid Mohamed Shariff, Mohd. Amin b. Mohd. Soom, Anuar Abdul Rahim, Ebrahim Jahanshiri and Nik Norasma Che' Ya	417
Prefarm Solution - Mapserver as a Services Support Tool for Farmers to Make Fast Decision in Crop Production, Precision Farming System Pavel Gnip, Stepan Kafka, Karel Charvat and Stanislav Holy	423
DDISMedia: A Digital Media Library for Pest Diagnosis Shiwei Zhang, J. Xin, T. Momol and F. Zazueta	429

Knowledge Management / Text Mining / Ontology / Semantics Part

Selection of automatically extracted agricultural terms Daisuke Horyu and Seishi Ninomiya	435
Development of Agricultural Vocabulary to Enable Simple and Effective Searching for Agricultural Information Akiko Okabe, Akane Takezaki and Mitsuyuki Saito	441
Development of a Dictionary for the Morpheme Analysis of Agricultural Information Akane Takezaki, Mitsuyuki Saito and Akiko Okabe	449
URM for agriculture, environmental education, and knowledge sharing Karel Charvat, Stepan Kafka, Marek Splichal and Maris Alberts	455
Towards a Harmonization of Metadata Application Profiles for Agricultural Learning Repositories Nikos Manouselis, Gauri Salokhe, Johannes Keizer and Stephen Rudgard	461

Survey and Modeling Metadata Schema Relationship in Agriculture Domain for Better Metadata Schema Service Pitsanu Lousangfa, Naiyana Sahavechaphan, Marut Buranarach, Sornthep Vannrat and Asanee Kawtrakul	469
Development of Ontological Information for Agriculture in Thailand Masahiko Nagai, Teerayut Horanont, Thepchai Supnithi, Asanee Kawtrakul, Kulapramote Prathumchai and Ryosuke Shibasaki	479
Ontology based Knowledge Map Construction for a Smart Knowledge Service Asanee Kawtrakul, Therawat Toomnauy, Vasuthep Khunthong, Aree Thunkijjanukij, Kanok Lohapiyaphan, Yuphayao Pothipaki, Werachai Narkwiboonwong and Anan Pusittigul	485
Lesson Learned for Ontology Construction with Thai Rice Case Study Aree Thunkijjanukij, Asanee Kawtrakul, Supamard Panichsakpatana and Uamporn Veesommai	495
Engineering an ontology on organic agriculture and agroecology: the case of the Organic.Edunet project Salvador Sánchez-Alonso, Jesús Cáceres, Aage S. Holm, Geir Lieblein, Tor Arvid Breland, Roger A. Mills and Nikos Manouselis	503
A Multilingual Semantic Search Assistant to Facilitate Information Retrieval Soonho Kim, Jeetendra Singh, Ze Li, Andrew Bagdanov, Ajay Krishnan, Margherita Sini, Johannes Keizer, T.V. Prabhakar and Zhong Wang	511
The AGROVOC Concept Server Workbench: A Collaborative Tool for Managing Multilingual Knowledge Panita Yongyuth, Dussadee Thamvijit, Thanapat Suksangsri, Asanee Kawtrakul, Sachit Rajbhandari, Margherita Sini and Johannes Keizer	521
Thesaurus and Ontology Technology for the Improvement of Agricultural Information Retrieval Chun Chang, Guojian Xian and Guangda Li	531
Methodical Procedure for Optimization of a Document for Fulltext Search Engines Pavel Simek, Jan Jarolimek and Jiri Vanek	537
CyberBrain: Towards the Next Generation Social Intelligence Asanee Kawtrakul, Watchara Sriswasdi, Suparat Wuttildercharoenwong, Vasuthep Khunthong, Frederic Andres, Saovakon Laovayanon, Decha Jenkollop, Werachai Narkwiboonwong and Anan Pusittigu	545
CIACAP - A Latin-American Community of Knowledge in Agro-Plasticulture Isabel M. Flores-Parra, Jose R. Díaz-Alvarez and Fernando Bienvenido	553

Agricultural Information Service and Database

Networking for sustainable development: the Papua New Guinea National Agricultural Information System Peter Walton	563
Information Seeking and Use among Urban Farmers in Kampala District, Uganda Helen M. Byamugisha, Robert Ikoja-Odongo, George William Nasinyama and Shuaib Lwasa	571
Vietnam's Agricultural Extension and Market Information System Tran Than Thi Ngan Hoa, Do Thi Dung and Nguyen Hong Son	583
Development of an Online Reference System for Indonesian Rice Varieties Setyo Pertiwi, A. Karim Makarim, Salman Widodo and Bubun M. Hasbulloh	591
Bibliographic Analysis of Japanese Rice Research Kazuko Morooka	597
NABIC: a system for agricultural biotechnology information analysis Kim ChangKug, Park DongSuk, Kang ManJung, Seol YoungJoo and Hahn JangHo	605
Construction and Application of Bio-Information Database Sun Guofeng, Pan Wei and Wang Bin	611
Computer Data Base of Cashmere Quality B. Narantuya, Ch. Batjargal and B. Tsovoobaatar	615
The method and effectiveness of an analysis information service for supporting farm management decisions Keun-Seop Shim, Hyeon-Seok Ko and Pan-Ju Kim	619
Electronical Data Exchange Between Agricultural Companies and State Administration in the Czech Republic Jan Jarolimek, Jiri Vanek, Pavel Simek and Jan Skerle	625
Developing an information-driven ICT framework for Agriculture L. Armstrong and D. Diepeveen	631
Applying Information Grid for Agricultural Applications Naiyana Sahavechaphan, Kamron Aroonrua, Sornthep Vannrat and Asanee Kawtrakul	639
Data Sharing Practice in Agricultural Science Domain Sijing Li and Guomin Zhou	647

Current Situation and Development of Data Sharing in Agricultural Science in China 651
Li Zhang

Sharing Agricultural Events Information: When and Where Is That Workshop? 659
Gauri Salokhe, Valeria Pesce, Magnus Grylle, Eero Mikkola, Johannes Keizer and Ajit Maru

Extension Service / Rural Development / ICT Adoption / Policy

Capturing and reusing audio knowledge exchanges for agricultural extension – A review with reference to the Knowledge Help Extension Technology (KHETI) project in Sironj, Madhya Pradesh, India 669
Paul Matthews and Syed Haider Rizvi

E-Governance at Village Level Administration (In Rural India) 679
Santosh Shingare, Pratik Shinde, Depankar Sarkar, Priya Uttarwar and Rashmi Dusane

Adoption of Information and Communication Technology (ICT) for Agriculture: An Indian case study 685
V.C. Patil, Ehud Gelb, Ajit Maru, N.T.Yadaraju, M.Moni and Harekrishna Misra

The Good Seed Initiative: Improving food security for the poorest households in Bangladesh through the use of 'Women-to-Women' videos 693
Sam L J Page, Harun-Ar-Rashid, A K M Zakaria and Elizabeth Dodsworth

Planning of Integrated ICT Centre in a Rural Area for Development of Rural Communities 697
Mohammad Akhtaruz Zaman

Emerging ICTs and their potential in revitalizing small scale agriculture in Africa 707
Hilda Munyua, Edith Adera and Mike Jensen

Mapping and Auditing of Agricultural Indigenous Knowledge in Uasin Gishu and Keiyo Districts in Rift Valley Province, Kenya. 719
Joseph N. Kiplang'at and Daniel Chebutuk Rotich

A Present Day Solution to Bridging Farmers Access to the Internet – The Question and Answer Service (QAS) Voucher System (VS) 731
Vivienne Oguya

From needs assessment to strategic priorities: strengthening agricultural information and communication management in the Caribbean and Pacific 739
Peter Walton, Barbara Gumbs and Christine Webster

Innovation and Development of Technical Task Force Information Services in Rural China Pan Shuchun, Zhang Yu and Yu Hao	747
Use of Information and Communication Technology (ICT) Among Agri – based Entrepreneurs in Malaysia Md Salleh Hassan, Musa Abu Hassan, Bahaman Abu Samah, Narimah Ismail and Hayrol Azril Mohamed Shaffril	753
A Simplified e-Agriculture Model Implementation for Developing Countries Jai Vardhan Singh	763
ICT Adoption in Rural Community of the Czech Republic Jiri Vanek, Jan Jarolimek and Pavel Simek	771
Overview of AgroWeb Networking in the Countries of Central and Eastern Europe Tomaz Bartol and Karmen Stopar	777
Supporting Discovery-driven Exploration from a Land Use, Cover and Change Model Neil Dunstan and Xiaoyun Qiang	785
Identifying Electronic Information Needs of Agricultural Faculty Members Abdol hamid Papzan and Jafar Yaghoubi	791
Analysis of External Drivers for Agriculture Pavel Gnip, Karel Charvat and Matej Krocan	797
e-Arik: ICTs for Agricultural Extension Services to the Tribal Farmers Saravanan Raj	803

Library / e-Journal / eLearning

ICT / E-Learning Readiness Analysis of Farmers in China Min Wan, Fook Wing Chan, Qiaoqiao Zhang, Elizabeth Dodsworth, Philip Edge and Ying Chiang Low	811
Computer Assisted Educational Processes based on Nature Learning Tools and their Incorporation into Uniform Resource Management System Karel Charvat, Maris Alberts, Stepan Kafka, Jachym Cepicky, Irena Koskova and Marek Splichal	819
Comparing E-learning Outcome with Face-to-face Lecture in Korean Agricultural High School Sung Youl Park, Hyun-ah Lee and Seung Bong Cha	827

Model for E-Learning in Higher Education of Agricultural Extension and Education in Iran	835
Jafar Yaghoubi and Iraj Malekmohammadi	
ICT in agricultural education, research, and outreach in Uganda	
Moses M. Tenywa, Bernard Fungo, Frank Tumusiime, Mateete Bekunda, Michael Niyitengeka, Beatrice Nakanyike-Musisi, Samuel Katunguka, Charles Muyanja, Sam Oketch, Agnes Mwang'ombe, George Chemining' wa, Florence Olubayo, Samuel Mwonga, Mary Ambula, Speranza Ndege, Gitonga Nkanata, Christine Onyango, Peter Masinde, Sabine Grunwald, George Karanja, Jessica Ndubi, Emily Twinamasiko, Imelda Kashaija, Robert Mutaka-Nsubuga, Joseph Oryokot, Robert Booth, Richard Hawkins, Edith Hesse, Bernard Vanlauwe, Adipala Ekwamu, Swale Basse, James Wire and Krishna Alluri	841
Forestry: an inter-disciplinary subject and its challenges for libraries. Is there a role for web 2.0 in information management?	849
Margaret Sraku-Lartey	
Forging and Enhancing Partnerships Using Appropriate ICTs in Agricultural Information Management: a Case Study of an Academic Library in Lesotho	853
Matšelisio Moshoeshe-Chadzingwa	
Building a Bridge between Agricultural University Library and Township Library for Information Service to Rural Communities	861
Pan Wei, Jiao Yanping and Zhao Jinhui	
A study of citations made to journals offered through the Access to Global Online Resources in Agriculture (AGORA) program by authors from eligible Asian countries	867
Sheri V. T. Ross	
Document Delivery Services of the Japanese Agriculture, Forestry and Fisheries Research Institutes from 2001 to 2008. – The changing needs and practices of researchers.	875
Takanori Hayashi	

Traceability / Food Safety / Marketing

The impact of product heterogeneity on online consumer behavior	883
Misuk Kim, Chul Woo Yoo and Young Chan Choe	
Analyzing the Use of E-Commerce by Agribusiness Firms in the United Arab Emirates	903
Mohamed Said Gheblawi, Safdar Muhammad and Fatima Mohammed Jenaibi	

Information System for Efficient Management and Distribution of Production Information of Agricultural Products in Korea Cheol-Hi Lee and Woo-Jin Lee	907
Improving the Quality of Certification Standards: The Application of Information Management Systems in the Food Sector Holger Schulze, Amos Gyau, Friederike Albersmeier and Achim Spiller	911
APPA-GIS: A GIS that models the industrial cluster linked to the horticultural production in Almeria Ignacio Javier Sánchez-Rojo and Fernando Bienvenido	921
A Decision-Oriented Market Information System for Wheat and Rice in India Vasant P. Gandhi	929
Inter-Organizational Information Systems in Meat Supply Chains Jan Bahlmann and Achim Spiller	941
Consumers' New Demands on Sustainable Traceability Michel Debord	953
Sustainability – the emerging challenge for information technologies and systems Gerhard Schiefer and Melanie Fritz	959
Tracking and tracing in food networks Melanie Fritz and Gerhard Schiefer	967
A research concept for an anonymous and automatic farming labour traceability system using IC Tags Naomi Sakuramoto, Tokihiro Fukatsu and Kazunari Yokoyama	973
A research concept for the development of a new farming diary system using automatic tracing of farmers' labour data Naomi Sakuramoto, Tokihiro Fukatsu and Kazunari Yokoyama	977
About the development of the registration system of the address in the "midori-chouchin" store with Google Maps Kiyotaka Miyaki, Naomi Sakuramoto, Kaneshiro Tomi and Kazunari Yokoyama	981
The study and application of a characteristic Chinese agriculture production supplies and sales (APSS) information service pattern Zheng Yelu, Han Weiwei, Lize and Niuxiaoguo	987
Providing Regional IT Advisor Service in Biosafety Information and Education: Experiences In Asia-Pacific Ruel V. Maningas	995

IAALD Organized Session

New Development in Information Systems to Access Agricultural Research Outputs

Sharing of scattering information : a challenge for scientific information at Agropolis
International 1003
Odile Bedu and Chantal Salson

Developing the Global ARD Web Ring 1009
Ajit Maru, Valeria Pesce and Mark Holderness

JAALD Organized Panel Session

Library and Agricultural Information in Japan

Changes in university libraries in Japan 1017
Kimio Hosono

Poster Presentations

A Study on the Causal Relationship between Skin Color and Skin Temperature of
Palm 1027
Norio Hayashi, Yasufumi Fuse, Tomoya Kamiyama, Haruhisa Inden and Seigo Koura

Improvement of Quantitative Evaluation Method for Plant Type of Rice 1035
Katsuaki Suzuki, Zeyu Zheng, Yutaka Hirata

A Comparison between a new P-type Fourier Descriptors Analysis and a Conventional
Method to Evaluate Rice Plant Type 1041
Katsuaki Suzuki, Sarhadi Wakil Ahmad, Zeyu Zheng and Yutaka Hirata

Evaluation of soybean seed shape by elliptic Fourier descriptors 1047
Maki Eguchi and Seishi Ninomiya

TETYN: An Easy to Use Tool for Extracting Climatic Parameters from Tyndall Data
Sets 1053
Levente Horvath, Norbert Solymosi, Aniko Kern, Ákos Maróti-Ágozs and Károly Erdélyi

Electronic Identification of Pigs in Thailand 1059
Annop Suriyasomboon and Vivat Chavananikul

Estimating Damage Ratio of Rice Crop Using Multi-temporal Satellite Data Akihiko Ito, Chiharu Hongo, Kunio Takezawa, Seishi Ninomiya, Kazuhisa Tokui, Toshiaki Takeshima and Kenji Tanaka	1063
Monitoring the olive cultivation in Shodoshima using Field Server Systems Yoshitaka Motonaga, Ryoei Ito, Tokihiro Fukatsu, Atsushi Hashimoto, Seishi Ninomiya, Takaharu Kameoka and Tsuyoshi Nakamoto	1067
The Relationship between Wheat Yield and the Vegetation Indices Using Image Data from Aerial Photographs in the Kanto Region of Japan Taimei Okada, Koji Sugahara, Masayuki Hirafuji, Masahiro Seki, Shigenori Miura, Kou Nakazono, Ritsuko Fuchiyama and Yoshiaki Watanabe	1075
Prediction of Color Appearance Change of Digital Images under Different Lighting Conditions Based on Visible Spectral Data Ken-ichiro Suehara, Makoto Hashimoto, Takaharu Kameoka and Atsushi Hashimoto	1081
GIS-based Model for Crop Water Requirement Assessment Using Agro-statistical and Geo-physical Data Pasquale Nino, Silvia Vanino, Francesco De Santis and Flavio Lupia	1087
Development of a Fieldwork Reminder System to Help Field Management P.K.S.C. Jayasinghe, D.A.L. Leelamanie, Masao Yoshida and Takemi Machida	1095
Supporting System for Management of Agricultural Corporation of Sugarcane Farming in Okinawa Islands Takeshi Shikanai, Morikazu Nakamura, Senlin Guan and Maro Tamaki	1101
Development and User Evaluations of a Farm Planning Support System, FAPS-DB, using an Agro-technology Systems Database Kaoru Maeyama, Teruaki Nanseki, Masaei Sato and Shigehiro Honda	1107
Study on Market Information Release of Farm Products in China Chunhong Qu	1115
Accessing and Sharing Knowledge Resources for Soil Health Research in Africa Lucy Fisher, Gracian Chimwaza, James Kinyangi, Blessing Chataira, Olivia Vent and Terry Tucker	1121
Investigating the farmers' degree of access and their attitudes toward information and communication technology in the efficient use of modern ways of irrigation in Kohgiluyeh and Boyer-Ahmad Province Mohammad Reza Nazari and Abu Hassan Hasbullah	1127
The Rice Database of the International Rice Research Institute (IRRI): Enabling Electronic Access to the World's Rice Literature Mila M. Ramos and Carmelita S. Austria	1135

Demonstrating Effectiveness of Propagating ICTs Towards Millennium Development Goal of Eradicating Extreme Poverty and Hunger among Kenyan Smallholders in Kenya	1143
George G. Shibanda, Silvery B. B. Oteng'I and John O. Shiundu	
The Intervening Roles of Bogor Agricultural University's Library for Food Crops Production in Indonesia on the Events of Natural Disasters	1151
Widharto, MLs.	
Comparing Consumers' Valuations of Good Agricultural Practice in the Tokyo Metropolitan Area and Miyagi Prefecture: Applications of the Contingent Valuation Method	1159
Hideo Aizaki and Noriko Sato	
The Green Lantern movement, its strategy, and road-map as a bottoms-up movement for improving the food self-sufficiency ratio of Japan	1165
Shizuka Shibata, Hiroyuki Fujimori, Kiyooki Maruyama, Kiyotaka Miyaki, Akira Mizushima, Naomi Sakuramoto and Kazunari Yokoyama	
An Analysis on Consumer Evaluation of Food Labeling -An Approach Using Scanner Panel Data-	1171
Kiyokazu Ujiie	
Modernisation and Innovation of Palm Oil Extraction Process: The Palm Nut, Its By-products and Its Properties	1177
Rosaline Njike Nyanjou	
Application of the Modern Distance Education Technology in Farmers Training in China	1185
Qiwei Dai, Caimin Xu, Huan Chen, Zifeng Wang, Zhao Dong, Kefeng Zhu, Yan Fan, Jianfeng Ma and Lihong Zhou	
<i>Author Index</i>	1189
<i>Keyword Index</i>	1195

Exploitation of Groundwater for Irrigation in Nganjuk District, East Java, Indonesia

Liyantono¹, Takemi Machida², Tasuku Kato²

1 Graduate School of Agriculture, Ibaraki University, email: liyantono@ipb.ac.id

2 College of Agriculture, Ibaraki University

Abstract

Nganjuk District experienced fast growth in agricultural sector during 1991-1998. Cropping intensity was increasing from 2.31 crops/year in 1991 become to 2.93 crops/year in 1998. The increasing caused increasing water consumption, especially from groundwater with irrigation wells. Objective of this research is to analysis groundwater exploitation for irrigation by using GIS.

Data was collected from a government office and other studies (i.e. irrigation wells, earth shape map and hydrogeology). All hardcopy of map was transformed to digital spatial data with digitizing process. Field data were input as spatial data. Land-use/land-cover map was developed from LANDSAT data using ERDAS 8.4. Overlay analysis was used to get actual utilization of irrigation well in dry season.

The number of irrigation wells until year 2006 was more than 15,741 wells with discharge varied at 4-60 l/s. Radius influent of well in the research areas are varied at 118-348 m (Prastowo 2007 and Liyantono 2001) and these values are using as assumption for developed irrigation well density (IWD) criteria. IWD varied from 0-2.995 well/ha. Very high exploitation (IWD >1 well/ha) has conducted in 29 villages and high exploitation (IWD >0.5-1 well/ha) has conducted in 50 villages. Both areas should be integrated management of wells and pumps to reduce exploitation. Potential areas in 47 villages can be developed irrigation wells around 82-292 wells.

Based on land-use/land-cover 2004 classification (Landsat ETM⁺, August 19, 2004), irrigated areas are distributed in central of Nganjuk with area around 43, 094.61 ha. Irrigated area with crop and IWD >0.05 well/ha has 82.68% of area. Irrigated with crop and IWD ≤0.05 well/ha has 17.32% of area. This state showed that irrigation wells were used in dry season. The further research will continue to estimate irrigation water requirement and groundwater withdraw to supplement the surface water irrigation in this area.

Keywords: groundwater, irrigation well, well density, GIS

Introduction

Generally, Nganjuk has 3 planting season, i.e., wet season (WS), first dry season (DS-I) and second dry season (DS-II). Paddy fields are cultivated in WS and DS-I. Secondary crops (corn, soybean, onions, chilies, melons and vegetables) are cultivated in DS-I and DS-II. Groundwater is used for irrigation in the dry season, which occurs during DS-I and DS-II. The average annual rainfall (1990-2006) was 1,722 mm/year with 82 rainfall event days/year. Based on

Oldeman classification, Nganjuk District is classified as type C3 with 6 dry months (May-October) and 5 wet months (December-April). This area can be planted rice only one time and one secondary crop (palawija) depends on the irrigation water supply.

Nganjuk District experienced fast growth in agricultural sector during 1991-1998. Agricultural area at this district was 43,000 ha in the year 1991 with average cropping intensity 2.31 crops/year. It has increased to 2.93 crops/year in 1998. The fast growth, it was caused by irrigation channel repair and development, was also caused by increasing the sources of water irrigation. It was taken from groundwater with irrigation wells. Groundwater discharge with irrigation wells can affect negatively at environmental if discharge is over exploitation.

The development of irrigation well has been conducted since 1975, through deep wells and shallow wells. The number of irrigation well in Nganjuk until year 2006 was more than 15,741 wells with discharge varied at 4-60 l/s. Radius of influent in this research area varied at 118-348 m (Prastowo 2007 and Liyantono 2001). Most of deep wells are located in northern of Nganjuk (Rejoso, Gondang, Sukomoro, Bagor, Nganjuk, Lengkong and Wilangan sub-districts). While most of shallow wells are located in southern of Nganjuk (Pace, Loceret, Bagor, Berbek, Sukomoro, Tanjunganom, Baron, Kertosono, Ngronggot and Nganjuk sub-districts). Shallow aquifer have thickness of 8.6-34 m with average depth of 9.9-22 m. Deep aquifer have thickness of 16.7-65 m with average depth of 33.75-96.25 m (Liyantono, 2001).

Centrifugal pump of deep wells have been installed 1-3 meters below ground surface to lift up groundwater in 1996 in Sukomoro and Gondang Sub-districts. Thereafter in 1998, in the same area centrifugal pump of deep wells must have been installed 1-5 meters below ground surface to lift up groundwater. These states showed that groundwater level became decreasing and affected by activity in recharge area, exploitations in discharge area or climate changes (Liyantono, 2001).

Objective of the research is to analysis groundwater exploitation for irrigation by using GIS.

Materials and Methods

Data were collected from a government office and other studies, i.e., irrigation wells, earth shape map and hydrogeology. All hardcopy of map was transformed to digital spatial data with digitizing process. Field data and GPS data were input as spatial data. Irrigation well density (IWD) was generated from number of wells at agricultural areas in each village. Criteria of IWD based on the radius influent of well in the research area. Radius influent of well in these research areas are varied at 118-348 m (Prastowo 2007 and Liyantono 2001).

Land-use/land-cover map was developed from LANDSAT data using ERDAS 8.4. LANDSAT data was acquisition in DS-II at August 19, 2004. Supervised classification method was used to classification LANDSAT image. Training sites defined by researcher using NDVI, map of Google Earth 4.0.2737 and earth shape map. Overlay analysis was used to get actual utilization of irrigation well in dry season (Fig.1).

Results and Discussion

Dinas Pertambangan Jawa Timur -East Java Mining Service- (1998) stated generally that shallow wells is scattered in central-eastern of Nganjuk District with shallow aquifer depth that is varied 5-30 m. Based on groundwater development project (P2AT) shallow wells data, shallow aquifer depth map was conducted. Around 98.1% of P2AT shallow aquifer depth is deeper than predicted shallow aquifer from Dinas Pertambangan Jawa Timur. This value shows

that the actual shallow aquifers were deeper than predicted shallow aquifer. Based on hydrogeology map (Indonesia Hydrogeology Map by R. Soekardi Poespowardoyo), P2AT shallow wells are located in the same area with medium-high productivity and scattered in wide area. Around 85.2% of P2AT shallow wells have high specific capacity ($>172.8 \text{ m}^2/\text{day}$) and medium specific capacity ($86.4\text{-}172.8 \text{ m}^2/\text{day}$) is around 14.8%.

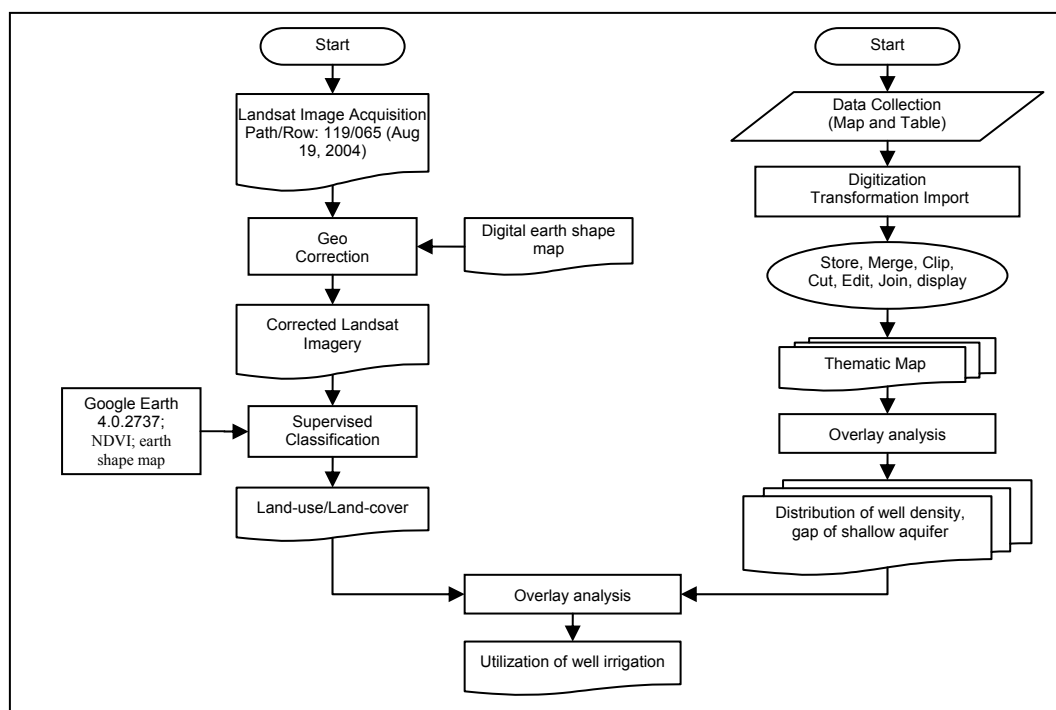


Fig.1. Flowchart of the research

Irrigation well density (IWD) varied from 0 - 2.995 wells/ha. Very high exploitation (IWD > 1 wells/ha) has conducted in 29 villages and 9 sub-districts with agricultural area of 3,703.7 ha and the number of wells was around 6,076 wells. While area with high exploitation (IWD > 0.5 and ≤ 1 well/ha) is 7,521.7 ha with around 5,259 wells and conducted in 50 villages and 13 sub-districts. Both areas should need integrated management of wells and pumps to reduce exploitation. Potential area in 47 villages and 14 sub-districts can be developed irrigation wells around 82-292 wells (IWD < 0.05 well/ha). While 20,492.5 ha of agricultural area has saturated IWD and should be managed to restricted population of irrigation well. IWD in these area is >0.05 and ≤ 0.5 well/ha and conducted in 120 villages and 17 sub-districts.

Table1. Irrigation wells density at agriculture area in Nganjuk District

Class	Well Density (wells/ha)	Number of Villages	Number of sub-districts	Number of Wells	Area	
					ha	%
Low	0	28	13	0	3,214.29	8.02
	$>0 - 0.05$	25	9	127	5,167.84	12.89
Medium	$>0.05 - 0.25$	73	16	1,822	1,4668.4	36.58
	$>0.25 - 0.5$	47	15	2,175	5,824.12	14.52
High	$>0.5 - 1$	50	13	5,259	7,521.71	18.76
	>1	29	9	6,076	3,703.70	9.24

Based on land-use/land-cover 2004 classification (Landsat ETM⁺, August 19, 2004), irrigated area are distributed in central of Nganjuk with area around 43, 094.61 ha. Irrigated

area with crop and IWD >0.05 well/ha has 82.68% of area. Irrigated area with crop and IWD ≤0.05 well/ha has 17.32% of area. This state showed that irrigation wells are used in dry season. The further research will continue to estimate irrigation water requirement and groundwater withdraw to supplement the surface water irrigation in this area.

Table2. Land-use/land-cover in Nganjuk District (Landsat ETM⁺, August 19, 2004)

Class	Area (Ha)	Percentage
Built-up	18,369.99	14.14
Forest	3,614.76	2.78
Plantation	18,925.02	14.57
Bush, grass	20,405.61	15.71
Irrigated with crop	31,276.89	24.08
Irrigated without crop	11,817.72	9.10
Non-irrigated	16,159.23	12.44
Dry-land	7,744.50	5.96
Cloud	1,587.06	1.22

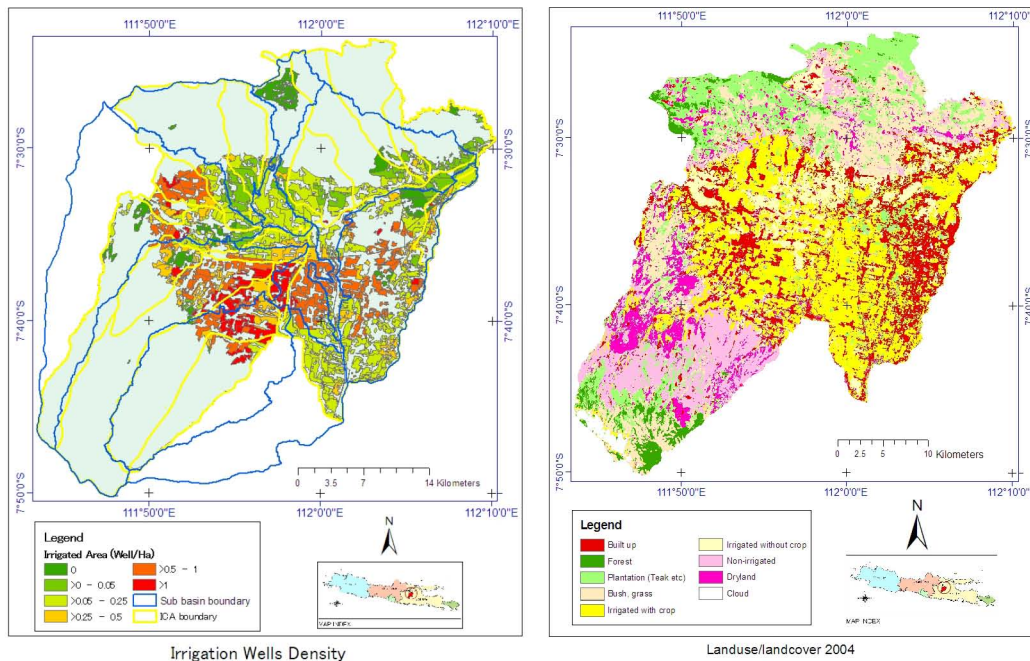


Fig.2. Irrigation wells density 2007 and land-use/land-cover 2004

Table3. Irrigation wells density at class irrigated with crop in Land-use/land-cover 2004

Class	Well Density (wells/ha)	Irrigated with crop ha	%
Low	0	1,260.36	5.61
	0-0.05	2,632.05	11.71
Medium	0.05-0.25	7,882.20	35.06
	0.25-0.5	3,542.85	15.76
Hight	0.5-1	4,626.18	20.58
	>1	2,537.28	11.29
Total		22,480.92	100.00

Conclusion

- The actual shallow aquifers were deeper than predicted shallow aquifer by Dinas Pertambangan Jawa Timur.
- Very high exploitation (IWD >1 well/ha) has conducted in 29 villages and high exploitation (IWD >0.5-1 well/ha) has conducted in 50 villages. Both areas should be integrated management of wells and pumps to reduce exploitation.
- Potential areas in 47 villages can be developed irrigation wells around 82-292 wells.
- While 20,492.5 ha of agricultural area in 120 villages and 17 sub-districts have saturated IWD (>0.05 and ≤ 0.5 well/ha) and should be managed to restricted population of irrigation well.
- Irrigated areas with crop and medium-high exploitation of groundwater have 82.68% of area. This state showed that irrigation wells were used in dry season.

References

- Data Persada Konsultan. Pemetaan Penyebaran Akuifer Bawah Tanah (ABT) di Wilayah Kabupaten Nganjuk. Laporan Utama. Dinas Pertambangan Dati I Jawa Timur. Surabaya. 1998.
- Diperta. Laporan Tahunan 1998. Dinas Pertanian Tanaman Pangan dan Hortikultura Kabupaten Nganjuk. Nganjuk. 1999.
- Liyantono. Kajian Karakteristik Akuifer dan Sumur serta Pola Pengembangan Airtanah untuk Irigasi di Kecamatan Sukomoro, Kabupaten Nganjuk, Jawa Timur. Skripsi. Jurusan Teknik Pertanian, Fakultas Teknologi Pertanian, IPB. Bogor. 2001.
- Liyantono. Potensi dan Pola Pemanfaatan Air Tanah di Kabupaten Nganjuk , Jawa Timur. Laporan Praktek Lapang. Jurusan Teknik Pertanian, Fakultas Teknologi Pertanian, IPB. Bogor. 2001.
- Prastowo, S. Hardjoamidjojo, B. Pramudya, K. Murtilaksono. Performance of Shallow Groundwater Irrigation Schemes in Nganjuk-East Java, Indonesia. Manuscript LW 07 013. Vol. IX. June, 2007.
- Susatya, Z.R. Kajian Potensi Sumur pada Proyek Pengembangan Airtanah Dangkal untuk Pertanian Berskala Kecil. Skripsi. Jurusan Teknik Pertanian, Fakultas Teknologi Pertanian, IPB. Bogor.

