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Conference on Agriculture
16-19 July 2012, Athens, Greece

Edited by Gregory T. Papanikos

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Edited by Gregory T. Papanikos

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Preface

This abstract book includes all the abstracts of the papers presented at the *5th Annual International Conference on Agriculture, 16-19 July 2012*, organized by the Athens Institute for Education and Research. In total there were 33 papers and 36 presenters, coming from 18 different countries (Australia, Bangladesh, Brazil, Canada, Chile, China, Egypt, India, Iraq, Iran, Mexico, Nigeria, Philippines, Poland, Saudi Arabia, Thailand, Turkey and USA). The conference was organized into 8 sessions that included areas such as Policy Issues, Crops, Soils etc As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
5th Annual International Conference on Agriculture, 16-19 July 2012,
Athens, Greece
PROGRAM

Conference Venue: [Metropolitan Hotel of Athens](#), 385 Syngrou Ave., 175 64,
Athens, Greece

ORGANIZING AND SCIENTIFIC COMMITTEE

1. Dr. Gregory T. Papanikos, President, ATINER.
2. Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
3. Dr. Nicholas Pappas, Vice-President Academics, ATINER & Professor, Sam Houston University, USA.
4. Dr. Theofilos Theophanides, Head, Environment & Agricultural Research Unit, ATINER & Emeritus Professor, Department of Chemical Engineering, National Technical University of Athens, Greece.
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8. Mr. Vasilis Charalampopoulos, Researcher, ATINER & Ph.D. Student, University of Strathclyde, U.K.

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C O N F E R E N C E P R O G R A M

(The time for each session includes at least 10 minutes coffee break)

Monday 16 July 2012

08:00-08:30 Registration

08:30-09:00 Welcome and Opening Remarks

1. Dr. George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.
2. Dr. Gregory T. Papanikos, President, ATINER.
3. Dr. Nicholas Pappas, Vice-President Academic, ATINER & Professor, Sam Houston University, USA.

09:00-10:30 Session I: Crops I

Chair: Pappas, N., Vice-President Academics, ATINER & Professor, Sam Houston University, USA.

1. Ezz, T., Professor, Alexandria University, Egypt. Storagability of Mango fruits Improvement by Some natural Preharvest Applications.
2. Matta, F., Professor, Mississippi State University, USA. Effects of Organic Manures and Pine Needle Mulch on Muscadine Production and Soil Properties.
3. Akin, A., Assistant Professor, University of Selcuk, Turkey & Cital, O.B., Professor, University of Selcuk, Turkey. Fatty Acid Compositions of Seeds of Some Grape Cultivar (*Vitis vinifera* L.) Grown in Turkey.
4. Malhi, S., Researcher, Agriculture and Agri Food, Canada. Potential of Various Amendments and Management Practices in Preventing Nutrient Deficiencies and Improving Yields for Sustainable Organic Crop Production.
5. Alsoqeer, A., Associate Professor, Qassim University, Saudi Arabia. Evaluation of Emergence and Nutritional Value of Three Introduced Cultivars and Twenty Local Genotypes of Buffelgrass (*Cenchrus Ciliaris* L.).

10:30-12:00 Session II: Soils I

Chair: Ezz, T., Professor, Alexandria University, Egypt.

1. Zwiazek, J., Professor, University of Alberta, Canada. Role of Water Relations In Growth Stimulation and Improved Drought Resistance of Plants Colonized by *Piriformospora Indica*.
2. Salih Duhoky, M., Professor, University of Duhok, Iraq, Omer, M.S., Professor, University of Duhok, Iraq, Yaseen, S.A.H., Professor, University of Duhok, Iraq. In Vitro Rooting of Apple MM106 (*Malus Domestica* Borkh.) and Pear (*Pyrus Calleryana*) Rootstocks.
3. Haque, M.S., Professor, Bangladesh Agricultural University, Bangladesh. High Efficient in Vitro Regeneration in Blackgram (*Vigna Mungo*).
4. *Ghadiri, H., Associate Professor, Griffith University, Australia, Yu, B., Professor, Griffith University, Australia & Akram, S., Ph.D. Student, Griffith University, Australia. Modelling the Impact of Grass Buffer Strips on Runoff Flow Hydrology and Sediments Transport on Agricultural

Lands.

5. Majchrzak, L., Assistant Professor, Poznan University of Life Sciences, Poland, Skrypczak, G., Professor, Poznan University of Life Sciences, Poland & Piechota, T., Professor, Poznan University of Life Sciences, Poland. Effects of Soil Tillage System and Crop Residue on Maize Yield.

12:00-13:30 Session III: Policy

Chair: *Ghadiri, H., Associate Professor, Griffith University, Australia

1. Exner, M., Professor, University of Nebraska, USA. Measured Response of Groundwater Nitrate Concentrations to Management Regulations in Nebraska's Central Platte Valley.
2. Friend, T., Professor, Texas A+M University, USA. Unintended Consequences for Slaughter Horse Welfare in the United States.
3. Ja'afar-Furo, M.R., Lecturer, Adamawa State University, Nigeria. Training Needs Assessment of Mid-Career Agricultural Extension Officers: Evidences from Sasakawa Africa Fund for Extension Education (SAFE) Intervention in North-East Nigeria.

13:30-14:30 Lunch (details during registration)

14:30-16:00 Session IV: Issues on Crops

Chair: Friend, T., Professor, Texas A+M University, USA.

1. Seied Mehdi Miri, Assistant Professor, Department of Horticulture, Karaj Branch, Islamic Azad University, Iran, Amir Mousavi, National Institute of Genetic Engineering and Biotechnology, Tehran, Iran, Mohammad Reza Naghavi, Department of Agronomy and Plant Breeding, Faculty of Agriculture, University of Tehran, Karaj, Iran & Behnam Naserian Khiabani, Agricultural, Medical and Industrial Research School, Atomic Energy Organization of Iran, Karaj, Iran. Characterization of Salinity-Resistant Mutants of Banana Cultivar Dwarf Cavendish (Musa AAA) by Morphological Traits.
2. Rezaee, M., Scientific Member, Department of Agronomy, Karaj Branch, Islamic Azad University, Karaj, Iran & Farhadi, H., Teacher, Department of Mechanization, Science and Research Branch, Islamic Azad University, Tehran, Iran. The Correlations between Physioco-Chemical Characteristics Of Potato Tubers After Post-Harvest Gamma Irradiation.
3. Ghosh, B.C., Professor, Indian Institute of Technology, India. Organic Waste Recycling and Vermicomposting: Effect of Wastes Type, Worm Species and Population Density on Quality of Vermicompost.
4. Chatterjee, M., Professor, Bidhan Chandra Agriculture University, India & Ghosh, A., Professor, Bidhan Chandra Agriculture University, India. Sulfoximine- A New Insecticide from New Class of Chemistry to Manage sap Feeding Insect Pests of Rice.
5. Araya, J., Full Professor, University of Chile, Chile, Salles, J., Professor,

University of Chile, Chile & Undurraga, A., Professor, University of Chile, Chile. Feasibility of Biological Control the Hawkweeds Hieracium Pilosella and H. Patagonicum with the Cecidomyiid Macrolabis Pilosellae in the XII Region of Chile.

21:00–23:00 Greek Night (Details during registration)

Tuesday 17 July 2012

09:00-10:30 Session V: Crops II

Chair: Klein, K., Professor, University of Lethbridge, Canada

1. Naika, M., Researcher, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bellary Road, India & University of Agricultural Sciences, India, Khader, S., Ph.D. Student, Mayo Clinic, USA & Ramanathan, S., Professor, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bellary Road, India. An Update of Stifdb Database: Insight into Additional Plant Stress-Responsive Genes and Transcription Factors.
2. Romualdo, L.M., Ph.D. Student, FZEA, Brazil. Evaluation of Artificial Vision System for Potassium Diagnosis in Plants of Maize.
3. Idziak, R., Assistant Professor, Poznan University of Life Sciences, Poland, Woznica, Z., Professor, Poznan University of Life Sciences, Poland & Piechota, T., Professor, Poznan University of Life Sciences, Poland. Effects of Tank-Mix Adjuvants on Liquid Physical Properties and Postemergence Weed Control in Maize.

10:30-12:00 Session VI: Environment - Waste

Chair: Foster, K., Professor and Head of Department, Purdue University, USA.

1. Klein, K., Professor, University of Lethbridge, Canada, Bewer, R., Researcher, University of Lethbridge, Canada, Ali, K., Assistant Professor, University of Lethbridge, Canada & Kulshreshtha, S., Professor, University of Lethbridge, Canada. Estimating Technical and Economic Water Use Efficiency on Irrigated Crops in Canada. (Tuesday, 17th of July, 2012)
2. Awada, T., Associate Professor, University of Nebraska, USA. Milby, J., Ph.D. Student, University of Nebraska, USA, Schacht, W., Professor, University of Nebraska, USA, Yarina, A., Ph.D. Student, University of Nebraska, USA, Velosky, J., Professor, University of Nebraska, USA & Gates, J., Assistant Professor, University of Nebraska, USA. Role of leguminous shrub *Amorpha canescens* in a C4 native grassland community in the Nebraska Sandhills, USA. (Monday, 16th of July, 2012. Morning session)
3. Benabise, M., Assistant Professor, Quirino State College, Philippines. Assessment of Organic Fertilizer Use in Cagayan Valley.
4. Ren, H., Professor, Chinese Academy of Sciences, China. Establishment of Efficient Eco-Agriculture Systems in Southern China.

5. Sabziparvar, AA., Lecturer, Bu-Ali Sina University, Iran. Application of some Empirical and Semi-Empirical net Solar Radiation Models in Penman-Monteith-FAO56 Model.

12:00-13:30 Session VII: Animals

Chair: Benabise, M., Assistant Professor, Quirino State College, Philippines.

1. Foster, K., Professor and Head of Department, Purdue University, USA. Economic Assessment of Ddgs Diets for Crop-Hog Farms.
2. Castellanos-Ruelas, A.F., Researcher, Autonomous University of Yucatan, Mexico. Copper Status in Ovines in Relation to their Source of Drinking Water.
3. Abdel-Fatah, A., Researcher, National Research Centre, Egypt. Urban Sprawl of Al-Fayoum Governorate and its Impact on the Agricultural Land using Remote Sensing and Digital Soil Map.

13:30-14:30 Lunch (Details during registration)

14:30-16:00 Session VIII: Soils II

Chair: Pappas, N., Vice-President Academics, ATINER & Professor, Sam Houston University, USA.

1. Nabhadalung, N., Lecturer, Buriram Rajabhat University, Thailand. DNA Extraction, Cloning and Sequence Analysis of ITS Regions in AM Fungal Spores.
2. Nilawonk, W., Lecturer, Maejo University, Thailand & Kattiya, P., Student, Maejo University, Thailand. Effects of Vermicompost on Plant-Available Nitrogen Content in Organic Cropping Soils in Chiangmai, Thailand.
3. Spalding, R., Professor, University of Nebraska, USA. Agricultural Deep Vadose Zone and Groundwater Nitrate and Atrazine Contamination.

17:00-20:00 Urban Walk (Details during registration)

20:00-21:00 Dinner (Details during registration)

Wednesday 18 July 2012

Cruise: (Details during registration)

Thursday 19 July 2012

Delphi Visit: (Details during registration)

A.Abdel-Fatah

Researcher, National Research Centre, Egypt

**Urban Sprawl of Al-Fayoum Governorate and its
Impact on the Agricultural Land using Remote
Sensing and Digital Soil Map**

Aydin Akin

Assistant Professor, University of Selcuk, Turkey

&

Ozcan Baris Cital

Professor, University of Selcuk, Turkey

Fatty Acid Compositions of Seeds of Some Grape Cultivar (*Vitis vinifera* L.) Grown in Turkey

In this study, fatty acid compositions of seeds of Horoz Karası, Büzgülü, Kara Dimrit and Göküzüm grape varieties (*Vitis Vinifera* L.) grown in Konya Province in Turkey were determined by gas chromatography method. It was identified 18 different fatty acids in seeds of the cultivars. The polyunsaturated fatty acid (PUFA) content was found to be more than the monounsaturated fatty acid (MUFA) and saturated fatty acid (SFA) content in the cultivars. Unsaturated fatty acids are the most. Linoleic acid (C18:2) was determined the most dominant fatty acid, 69.79% in Horoz Karası, 61.51% in Büzgülü, 59.33% in Kara Dimrit and 58.29% in Göküzüm grape varieties.

Abdulrahman Alsoqeer

Associate Professor, Qassim University, Saudi Arabi

Evaluation of Emergence and Nutritional Value of Three Introduced Cultivars and Twenty Local Genotypes of Buffelgrass (*Cenchrus Ciliaris* L.)

The present study was conducted to compare seedling emergence and to determine feeding value of 20 accessions of Buffel grass (*Cenchrus ciliaris* L.) and three introduced varieties, (Gayndah, USA, and Biloela). Accessions were collected from different areas of the central region of Saudi Arabia between November and December, 2010, seeds were sown in plastic pots. The experiment was arranged in a completely randomized block design, with two replications. Twenty seeds were sown in each pot at 2cm depth in a greenhouse on 20 April 2011. Two accessions were failed to emerge. The results showed a highly variation in emergence percentage and forage quality among the genotypes. Emergence percentage ranged from 7.5% (accessions 4 and 19) to 55% (accession 10). Considerable variation in crude protein contents was also recorded. The crude protein content was higher in most of the local genotypes compare to the introduced cultivars. Accessions 1 and 2 showed the highest values of crude protein (15.9% and 15.0%, respectively), whereas accession 6 showed the lowest crude protein content (7.0%). Gayndah cultivar had the lowest value in crud fiber (32.9%), while accession 3 had the highest value (41.1%). Accession 16 recorded the lowest value of sugar content (32.6%) however, accession 14 was the highest (41.3%). The results obtained in this work indicate that there is a high genetic variation among buffelgrass genotypes that collected from different areas of the central region of Saudi Arabia, which could permit buffelgrass improvement via selection and breeding.

Jaime Araya

Full Professor, University of Chile, Chile,

Jocelyn Salles

Professor, University of Chile, Chile

&

Andres Undurraga

Professor, University of Chile, Chile

Feasibility of Biological Control the Hawkweeds Hieracium Pilosella and H. Patagonicum with the Cecidomyiid Macrolabis Pilosellae in the XII Region of Chile

Two studies were done, under the quarantine facilities in SAG-Lo Aguirre, Santiago Chile, to evaluate the effect of the cecidomyiid fly *Macrolabis pilosellae* Binnie during three and four insect cycles, in the growth of stolons, aerial part, flowers, and fresh and dry weight of plants of the hawkweeds *Hieracium patagonicum* Hook, a Chilean native Asteraceae weed, and *H. pilosella* L., a species from Eurasia. Both have invaded large cattle areas in the southernmost region of Chile and their effect translates into a loss of forage production. The fly produced crown galls only in *H. pilosella* but not in *H. patagonicum*, and did not affect growth, biomass, and production of flower stems of *H. patagonicum* in the laboratory. The great affinity of *M. pilosellae* for *H. pilosella* indicates that biological control of this weed with this fly is feasible.

Tala Awada

Associate Professor, University of Nebraska, USA,

Jessica Milby

Ph.D. Student, University of Nebraska, USA,

Walter Schacht

Professor, University of Nebraska, USA,

Adam Yarina

Ph.D. Student, University of Nebraska, USA,

Jerry Velosky

Professor, University of Nebraska, USA

&

John Gates

Assistant Professor, University of Nebraska, USA

**Role of leguminous shrub *Amorpha canescens* in a
C4 native grassland community in the Nebraska
Sandhills, USA**

Deeply-rooted shrubs are a common component of grasslands. We investigated the ecophysiological role of *Amorpha canescens*, a common leguminous shrub, in Sandhills grassland, and response of herbaceous plants to the presence or absence of *A. canescens*. Two sites were selected for the study one with *A. canescens* (G-L) and one without (G-NL) *A. canescens*. Canopy cover and aboveground biomass were characterized and seasonal trends in net photosynthesis (A), stomatal conductance (gs), transpiration (E), water use efficiency (WUE), and predawn (Ψ_{pre}) and midday (Ψ_{mid}) water potentials of *A. canescens* and five representative herbaceous species were determined at 2-week intervals during the growing season. The herbaceous species included two C3 grasses (*Hesperostipa comata* and *Koeleria macrantha*), two C4 grasses (*Andropogon hallii* and *Calamovilfa longifolia*), and one forb (*Helianthus pauciflorus*). Differences in rates of A, gs, and WUE were species dependent and were not impacted by the presence of *A. canescens*. Net photosynthesis exhibited seasonal variability, increasing through the early growing season and peaking by midsummer. *H. pauciflorus* had the highest rates of A, E, and gs; and C4 grasses had the greatest WUE. Significant site impact (G-L vs. G-NL) was only observed in E, which was likely related to higher soil water content in the G-L site. There were differences in Ψ_{pre} and Ψ_{mid} among sampling dates and species, but not between sites. The C3

grasses exhibited the lowest (most negative) Ψ_{pre} and Ψ_{mid} . Soil nitrogen content was significantly greater on the G-L site, leading to higher photosynthetic nitrogen use efficiency (PNUE) on the G-NL site, but lower plant leaf quality. *A. canescens* presence had positive impacts on soil and associated plants' nitrogen content and soil water content, but did not have consistent effects on water status or gas exchange of associated herbaceous plants. Ecological significance of the results is discussed.

Mila Benabise

Assistant Professor, Quirino State College, Philippines

Assessment of Organic Fertilizer Use in Cagayan Valley

Organic farming is continuously becoming popular in Cagayan Valley. The study aims to assess the demographic and farm profile of farmers; their level of awareness on the environment, health and nutrition and economic benefits; their awareness status as compared to their level of adoption; and the problems and constraints that affect the use of organic fertilizer. Seven hundred twenty (720) respondents were drawn from the three provinces of Cagayan Valley using purposive, quota and convenience sampling.

The respondents are mostly females with a mean age of 44.28. Majority of them have received formal education and they had been using organic fertilizer for four (4) years; most of the farms are rolling, mostly with clay loam type of soil and receives irrigation from NIA and communal irrigation system. The respondents owning small parcel of land, planted vegetable crops applied with organic fertilizers while the farmers who own more than one hectare farm planted rice and corn. The farmers are more aware on the environmental impact of organic farming than its economic and health benefits. The DA technicians are the main source of information for the environment and economic benefits of organic farming while the health workers, television and radio are the primary sources of information for the health and nutrition benefits of organic farming. The level of awareness of farmers on the benefits of organic fertilizers is higher than their level of adoption. Among the problems encountered by the farmers in using organic fertilizers are its slow effect and labor intensive. Lack of technical skills of the farmers and lack of political support to organic farming are among the top constraints identified by the farmers. Awareness and adoption are highly correlated.

Arturo F. Castellanos-Ruelas

Researcher, Autonomous University of Yucatan, Mexico

Copper Status in Ovines in Relation to their Source of Drinking Water

Copper is an essential trace element in animals, plants and humans. Productivity of farm animals is highly dependable of its oral acquisition. Therefore the estimation of copper status in animals is of the utmost importance. The objective of this trial was to estimate copper status of tropical sheep on pasture and to relate it to the copper content in their drinking water. Copper status was carried out taking bone biopsys. Samples form the twelve rib were taken in 107 animals in different physiological situations (recently weaned, growing females and ewes). Also samples form forty different wells that provided water to the animals were taken. Copper was analyzed by means of the atomic absorption methodology. Sampling was carried out in the four distinctive agro-ecological zones of the Yucatán state, México. Data was analyzed by means of the least square method. Results showed a low copper content in bone tissue in all types of animals: weaned $0.66 \text{ mg/kg} \pm 0.4$; growing $0.57 \text{ mg/kg} \pm 0.40$ and ewe's $0.64 \text{ mg/kg} \pm 0.47$ (mean \pm standard deviation). Range of data oscillated form low values such as 0.07 up to 2.23 mg/kg. Considering that it is recognized that normal copper content in bone is between 2-3 mg/kg, this results were inferior, showing a deficiency in the sampled animals. Copper content in well water was $0.15 \pm 0.04 \text{ mg/L}$, $0.12 \pm 0.04 \text{ mg/L}$, $0.16 \pm 0.07 \text{ mg/L}$ and $0.19 \pm 0.03 \text{ mg/L}$ in the center, east, west and south part of the state respectively. Copper content in the east was lower ($P < 0.05$) than in the other zones of the state. These results can be considered low since water for human consumption may have as much as 2 mg/L; and water used for pig production may have up to 5 mg/L. Low content in well water, may be attributed to the reduced amount of copper in the soil. In conclusion a copper deficiency was diagnosed in grazing sheep that could be associated to low copper content in the drinking water. Supplementary dietary copper must be incorporated in sheep production farms to increase productivity.

Monilal Chatterjee

Professor, Bidhan Chandra Agriculture University, India
&

Amalendu Ghosh

Professor, Bidhan Chandra Agriculture University, India

Sulfoximine- A New Insecticide from New Class of Chemistry to Manage sap Feeding Insect Pests of Rice

In India as well as Asia, rice sap feeding insect, brown planthopper (*Nilaparvata lugens*) is a key pest in most of the rice growing geographies. It can assume serious proportions to cause severe yield loss if proper and timely management practices are not implemented. Many conventional insecticides were used for a long time with growers obtaining average control of this pest. In the last 15 years, different neonicotinoid insecticides introduced helped growers to successfully manage that insect pest. Due to continuous and indiscriminate use of neonicotinoids, frequent control failures by this class of insecticide became evident over the last few years, especially in the China, Japan, Indonesia and Indian subcontinent. Farmers resorted to using various methods due to non-availability of suitable insecticides to control brown planthopper. Industry and academicians suspected that it has evolved resistance to neonicotinoid chemistry, as the pest is notorious for resistance development and resurgence are frequently occurs.

Sulfoxaflor, the first product from sulfoximines a new class of insect control agents, exhibits broad spectrum insecticide efficacy against rice sap feeding insect pests, brown planthopper (*Nilaparvata lugens*), white-backed plant hopper (*Sogatella furcifera*), and green leafhopper (*Nephotettix virescens*). In particular, sulfoxaflor, due to its novel mode of action, exhibits high potency and lack insecticidal cross-resistance that is particularly useful in insecticide resistance management programs.

Field experiments were conducted to evaluate its efficacy against sap-feeders of rice. Sulfoxaflor at 75 g.ai ha⁻¹ provided better management of rice brown planthopper (BPH) for more than two weeks, equivalent to that of buprofezin (200 g. ai ha⁻¹) and better than of imidacloprid at 75 g. ai ha⁻¹. Sulfoxaflor showed excellent fit with high levels of insecticidal potency in all field experiments against all sap feeders and showed fewer hazards to natural enemies.

It has novel mode of action with high acute toxicity to all hemipteran pests, because of insecticidal symptoms accompanied by discriminative action with quick knock down effect. Sulfoxaflor is very

safe to non-target organisms that prove the high selectivity action to hemipteran group of insect pests particularly planthoppers and leafhoppers.

Mary Exner

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**Measured Response of Groundwater Nitrate
Concentrations to Management Regulations in
Nebraska's Central Platte Valley**

Thanaa Ezz

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Storagability of Mango fruits Improvement by Some natural Preharvest Applications

This investigation was carried out during two consecutive seasons (2003 and 2004) on "Alphonse" and "Badami" (*Mangifera indica* L.), grown at Daraneet orchard, Beheira- Governorate to evaluate the effect of some preharvest natural treatments on store fruit. The results showed that, in both experimental seasons in "Alphonse" and "Badami" cultivars, weight loss percentage, T.S.S., reducing sugars, total sugars, peroxidase and polyphenoloxidase increased progressively through the storage period, whereas, fruit firmness, ascorbic acid and total phenols decreased in both cultivars. During storage period, fruit of both "Alphonse" and "Badami" mangoes treated with CaCl₂ at 0.5, 1.0 and 1.5 % decreased fruit weight loss, firmness, peroxidase and polyphenoloxidase activities, while T.S.S, ascorbic acid and total phenols content increased as compared to control. However, reducing sugars and total sugars were not greatly affected during storage time. Also, results revealed that, during storage period, fruit of both "Alphonse" and "Badami" mangoes treated with ascorbic acid or citric acid at 200, 300 and 400 ppm, in addition active dry yeast treatment (3g/l) decreased fruit weight loss, firmness loss and peroxidase and polyphenoloxidase activities compared to control. In contrast, T.S.S, ascorbic acid, reducing sugars and total soluble sugars increased compared to control.

Ken Foster

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Economic Assessment of DDGS Diets for Crop-Hog Farms

The production of Ethanol in the United States has increased the availability of dried distiller's grains with soluble (DDGS) to swine producers and may provide an alternative to traditional corn and soybean meal based feed rations. This study examines the impact on whole farm net returns when DDGS are available for feeding on a typical hog-crop farm. The modeled farm has 1,500 acres divided among six land types. The farm has the capacity to raise 24,000 grow-finish hogs per year. The crops considered include rotation corn, continuous corn, rotation soybeans and wheat. A non-linear math programming model was used to jointly determine the expected management decisions of crop mix, pig diet selection, manure management, and herd size while also choosing the optimal DDGS inclusion in the diet. The study concludes that a 10% DDGS inclusion rate maximizes returns above variable costs and decreases fertilization costs compared to an identical crop mix fertilized with manure from a non-DDGS diet. It is estimated that farmers utilizing DDGS diets will increase their profits by 2.61%, or \$1.85 per unit of pig space. If the model is constrained to use all manure on the farm, then it becomes optimal to change cropping patterns and utilize a 5% DDGS diet. The study concludes that the optimality of the 10% DDGS diet is robust with respect to land availability, *ceteris paribus*. Farms with increased pig capacity above 24,000 pigs per year also benefit from a 10% DDGS diet and the crop choices remain essentially unchanged. In addition, DDGS diet selection helps to mitigate increasing commercial crop fertilization costs and dependence on custom manure application by producing more nutrient dense manure that more adequately supplies crop nutrient needs. Fertilization costs decrease by 35.63% when a 10% DDGS diet is utilized compared to the non-DDGS diet case. Diets with DDGS inclusion rates greater than 10% incur carcass quality discounts that are greater than the fertilizer and feed cost savings they impart.

Theodore Friend

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Unintended Consequences for Slaughter Horse Welfare in the United States

This paper will review the events that reduced the welfare of slaughter horses in the US, with the goal that other countries might learn from our mistakes. The slaughter of horses for export and eventual consumption by humans was an ideal target for activists because the meat was not consumed in the US, and the industry did nothing to position themselves as responsible stewards of unwanted horses. The welfare of slaughter horses was an emotional issue in the US for many years. A progressive set of US regulations that were based on research and input from a series of meetings with stakeholders went into effect in February, 2002. Upon arrival at the slaughter plants, each load of horses was inspected by three independent people, two with jurisdiction over animal welfare and one who verified animals were not stolen. This was the most highly regulated trade in livestock to exist in the US. Despite the predictions by experts that closing the slaughter plants would make conditions worse for US horses, increasing pressure by well-intended animal activists caused the closing of the last of the slaughter plants in 2007. Comparing 2005 with 2008, the number of US horses exported to Mexico for slaughter increased 725%, while the number exported to Canada increased 318%. The total number of horses being slaughtered has remained the same, but the horses are now being transported an additional 18 hours after crossing into Mexico without the benefit of the US regulations. The U.S. Government Accountability Office investigated and issued a report in 2011 that urged Congress to reconsider its position because of the unintended consequences on the welfare of horses. Although Congress reversed itself, no US plants have opened and we have only succeeded in making conditions worse for our horses.

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Modelling the Impact of Grass Buffer Strips on Runoff Flow Hydrology and Sediments Transport on Agricultural Lands

Vegetative buffer strips are widely employed as a conservation measure to reduce fluxes of sediments and associated pollutants from overland flow in catchments. Buffer strips generally reduce sediment and pollutant loads through a combination of deposition and infiltration processes. A model has been developed by Griffith University researchers to predict sediment deposition in and around vegetative buffer strips. Unlike other models, the Griffith model is able to interactively measure the bed slope in every time step, calculate the new water profile and compute the sediment concentration dependent to the new profile in each time step. This linkage between hydrology and sedimentation parts of the model makes it unique in predicting the effectiveness of vegetated buffer strips on sediment retention and pollutant transport control. A series of runoff experiments were carried out in the flume of Griffith University rainfall simulator to quantify reduction in sediment and sorbed nutrients as a result of runoff passing through grass buffer strips and the collected data were used to test the model. The model successfully predicted water and sediment profiles giving high coefficients of model efficiency while masses of deposited sediment were generally simulated within acceptable range. Further study is underway to modify the model to take into consideration the infiltration rate and the processes taking place inside and downstream of the buffer strips during the erosion and sediment transport processes. A new theoretical approach based on momentum theory and a gradually varied flow equation has been adopted to incorporate all three zones of before, within and downstream of the buffer in the predictive model.

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&

Debabrata Das

Organic Waste Recycling and Vermicomposting: Effect of Wastes Type, Worm Species and Population Density on Quality of Vermicompost

Vermicompost is a stable organic manure produced as vermicast by earthworm feeding on biological waste material. The quality of vermicompost varies with use of type of waste material, earthworm species and its population density. A control experiment was conducted by using various organic wastes like tea waste, paddy straw, saw dust, kitchen waste, water hyacinth, weed biomass, guatemala (green manure crop) and animal waste (cowdung) and three exotic earthworm species, *Eisenia foetida*, *Perionyx excavatus* and *Eudrillus eugineae* with varying population density (increasing by 2 to 5 fold than standard).

Multiplication rate of worm was maximum in *Perionyx excavatus* (doubling time 40 days) followed by *Eisenia foetida* (45 days) and *Eudrillus eugineae* (56 days).With increase in population density by 2 to 5 fold, the vermicompost quality was increased in terms of attaining desire level of C: N ratio, high nutrient and as well as humic acid content. After maturity of vermicompost, the pH level was in acidic range in tea waste and weed biomass, while at neutral in guatemala and in alkaline range in paddy straw, sawdust, kitchen waste and water hyacinth. Highest level of organic carbon was observed in sawdust and lowest in water hyacinth. High value of total N was recorded in Guatemala and tea waste. Incase of total P and total K, the content was maximum in kitchen waste and minimum in saw dust.

Thus, the quality of vermicompost is depended on type of waste material and earth worm species used and its population density.

Muhammad Shahidul Haque

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High Efficient in Vitro Regeneration in Blackgram (*Vigna Mungo*)

Blackgram (*Vigna mungo* L. Hepper, syn. *Phaseolus mungo* L.) is one of the most important pulse crops grown in Bangladesh. Cultivated grain legumes, a valuable source of protein, are recalcitrant to in vitro regeneration rendering them difficult to improve through gene transfer technology. This study aimed to improve regeneration and rooting efficiency of blackgram. The study comprised of experiments for shoot regeneration and plantlet formation from cotyledonary node explants by culturing them on low concentration of cytokinin followed by transfer to hormone free MS medium. Cotyledonary node explants were cultured on different concentrations of BAP (0.0, 1.0, 2.5 and 5.0 mg l⁻¹). Shoot regeneration occurred from cotyledonary nodes irrespective of the presence or absence of BAP in the medium. However, culture of cotyledonary node explants for 10 days on medium containing 1.0 mg l⁻¹ BAP followed by transfer to hormone free medium gave higher number of shoots (9.33/explant) compared to culture of the explants on hormone free medium for 15 days followed by transfer to medium containing 1.0 mg l⁻¹ BAP (8.33/explants). The regenerated shoots were transferred to rooting medium supplemented with different concentrations of IBA and NAA. The high frequency (100.0%) of rooting was observed with MS medium supplemented with 0.5 mg l⁻¹ IBA. The rooted plants were transferred to pots for hardening. The technique developed has the potential applicability in genetic improvement of this crop by gene transfer.

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Effects of Tank-Mix Adjuvants on Liquid Physical Properties and Postemergence Weed Control in Maize

Lack of adequate weed control in maize may have a devastating effect on yield, harvest and processing efficiency. Maize plants are sensitive to weeds and require timely applications of several products in combination. Weed control is effective when a minimum amount of herbicide is used in a timely manner to achieve the required efficacy with minimal off-target loss. Adjuvants are used to improve efficacy for weed control especially when herbicides are used at reduced rates.

A field study was conducted in middle west Poland from 2009 to 2010 to determine the effect of methylated seed oil (MSO), petroleum oil (PO), surfactant (S) and ammonium nitrate (UAN) on physical properties of spray liquid containing terbuthylazine + mesotrione + S-metolachlor applied at recommended and reduced rates after plant emergence in maize. All herbicide treatments were applied broadcast at the stage of 3-5 maize leaves (BBCH 13-15) with a plot sprayer equipped with flat fan nozzles Lurmark 02110, calibrated to deliver 200 L/ha at 220 kPa. Plot four rows wide (4 x 0.7 m) and 9 m long were arranged in a randomized complete block design. Surface tension (ST) of spray liquid was assessed by means of modern optical tensiometer KSV Theta Lite (made in Finland). The results were subject to statistical evaluation with a variation analysis method. Means were separated using Tukey protected LSD at $P < 0.05$.

There was no maize injury from the postemergence mixture of herbicide with adjuvants evaluated. Total weed control varied between 90-99%, depending on adjuvants used in mixtures. Generally herbicide with MSO and PO adjuvants provided higher weed control than with surfactant, and similar when UAN was added. Low rate of herbicide applied with all adjuvants provide similar grain yield to standard treatment but higher than standard was used at reduced rate without any adjuvant. The addition of MSO and S led to slight reduction in surface tension relative to herbicide spray liquid without adjuvants.

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Training Needs Assessment of Mid-Career Agricultural Extension Officers: Evidences from Sasakawa Africa Fund for Extension Education (SAFE) Intervention in North-East Nigeria

The primary objective of this paper is to assess the stakeholders' needs for mid-career agricultural extension training Programmes in north-east Nigeria taking cognisance of the Sasakawa Africa Fund for Extension Education (SAFE) intervention in the region and beyond. The major source of data was a survey of agriculture-related private and public agricultural extension organisations in the six States that constitute the geo-political zone, using structured questionnaire. Although empirical results indicated that majority of the organisations preferred full-time/regular training of their agricultural extension staff and minority of the institutions showed interest in the part-time and short duration Programmes for reasons of shortage of staff and financial constraints, many staff still require further training in these organisations. The implications of these for the implementation of the Programmes in Adamawa State University, Mubi and North-east Nigeria are explored.

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Estimating Technical and Economic Water Use Efficiency on Irrigated Crops in Canada

Irrigation accounts for the largest consumption of water in many areas of the world. The province of Alberta has the largest area under irrigation in Canada, more than 600 million hectares. As water supplies dwindle under the threat of climate change, the efficiency of water use in irrigation is likely to come under greater scrutiny. Increasing criticism of water used for irrigating crops could threaten its long-term sustainability while relieving long-term global food shortages necessitate improved productivity in water used to grow crops.

In this study, water use technical efficiency and three types of water use economic efficiency are estimated for the four river sub-basins that encompass the 13 irrigation districts in southern Alberta for five years: 2004 - 2008. The average level of water use technical efficiency over the five-year period varied from 3.5 - 6.2 metric tonnes/dam³. The gross economic value of crop production per unit of water used varied from \$345- \$592/dam³. The net economic value of crop production per unit of water used varied from \$163-\$268/dam³. Another measure of water use economic efficiency was defined as the marginal increase in net value of crop production under irrigation over what it would have been under dry land conditions; that measurement varied from \$130-199/dam³.

The three measures of water use economic efficiencies - WUEE(gross), WUEE(net), and WUEE(marginal) - are all related to each other. But the scale of data requirements in their calculations is progressively more stringent. Correlation coefficients between WUEE(net) and WUEE(marginal) vary between 0.86 (p-value=0.06) to 0.93 (p-value=0.02), which means that WUEE(net) can be considered as a good alternative of the measurement of economic efficiency if data unavailability prevents estimation of the WUEE(marginal). This is because calculations of WUEE(marginal) requires entirely different set

of data on the production systems under non-irrigated conditions which may or may not be readily available in all basins over time. Even if the calculations of WUEE(net) prove to be difficult in some cases where data on the costs of production of irrigated crops are not available, one can still use WUEE(gross) measure of the economic efficiency since the correlation between the WUEE(gross) and WUEE(net) are also quite high (0.87 to 0.97).

Results from this study demonstrate that measurements of water use efficiency are not straight-forward and interpretation of calculated values of water use efficiency need to consider factors such as crops grown, output prices, input prices, methods of irrigation and amount of net water used to irrigate, which tends to vary greatly from one year to the next. The economic efficiency measure is an improvement over technical efficiency since it provides a measurement that is closer to the overall objective of irrigation farmers - improve their profitability and thereby overall social well-being. However, refinements in this indicator also can be suggested, in addition to those noted above. These include defining the numerator as the extra revenue obtained above what would have occurred under a dryland system. This is a more complicated calculation and requires data on yields and costs.

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Effects of Soil Tillage System and Crop Residue on Maize Yield

A field study was conducted in middle west Poland from 2005 to 2007 to determine the effect of different soil tillage system: conventional, direct seeding and crop residue control – stubble, wheat straw, spring vetch, oat and white mustard on maize yield and yield components structure. Plot four rows wide (4 x 0.7 m) and 12,5 m long were arranged in a randomized complete block design. The results were subject to statistical evaluation with a variation analysis method. Means were separated using Tuckey protected LSD at $P < 0.05$.

Conducted research showed significant influence of the soil tillage system in relation to a fresh matter yield of maize. Plough tillage systems increased yield of maize about 16,4% as compared to treatment with direct seeding. Maize yielding was the highest after spring vetch as stubble catch crop, but the difference between other crop residue was not statistically significant. Average fresh matter yield of cobs on plowing plots was 16,3 t/ha, however on no tillage objects yield was 13,8 t/ha. The yields of fresh mass of maize and yield of cobs with and without leaves were higher after traditional tillage. There was not statistically significant influence of kind of crop residue on yield components structure of maize.

Sukhdev Malhi

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Potential of Various Amendments and Management Practices in Preventing Nutrient Deficiencies and Improving Yields for Sustainable Organic Crop Production

In organic farming, inorganic fertilizers/chemicals are not applied to increase crop yields, but adequate amounts of nutrients are essential for high crop production. Field experiments are being conducted in Saskatchewan and Alberta, Canada, to determine the feasibility of amendments [compost, alfalfa pellets, wood ash, rock phosphate, *Penicillium bilaiae* and MykePro, thin stillage, fish food additive, distiller grain, glycerol, gypsum, rapid release micronized elemental S (RRMES)] and management practices [intercropping non-legumes (cereals, oilseeds) with legumes (pea), legumes grown for green manure or in rotations, diversification of deep taproot and shallow fibrous root crops] in improving yield and nutrient uptake for organic crops. In the two 3-year experiments on organic farms, compost and alfalfa pellets increased yield and nutrient uptake of wheat, barley and pea, but rock phosphate, *Penicillium bilaiae* and MykePro had little effect on crop yield and N, P, K or S uptake. In other field experiments where comparisons were made between organic and conventional treatments, legumes in rotations, legume green manure, crop residue return, thin stillage, fish food additive and distiller grain helped to improve crop yields. Our results also suggested the use of gypsum and RRMES in preventing S deficiency, and wood ash in improving P and/or S availability to increase crop yield, provided N was not lacking in the soil. Intercropping of wheat, barley or canola with pea usually produced higher yield per unit area basis than when these crops were grown as sole crops. Compared to conventional input system, organic system, in spite of 30-40% lower crop yields, resulted in favourable economic performance and energy use efficiency because of lower input costs and price premiums. In conclusion, the findings suggest that the integrated use of amendments and management practices has the potential for high sustainable crop production, most likely by preventing nutrient deficiencies in organic crops.

Frank Matta

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Effects of Organic Manures and Pine Needle Mulch on Muscadine Production and Soil Properties

The objective of this research was to evaluate the effects of cow and poultry manure and pine needle mulch on biomass production, yield, fruit quality of muscadine grapes and soil properties. The cultivar used in the study was 'Summit'. Plants were spaced 6.1 meters x 6.1 meters and were 8 years old. The experimental design was a completely randomized design with 4 replications. Poultry manure plus pine bark increased plant stem diameter and ground cover. Fruit diameter, fruit length, and fruit weight were not affected by the manures. Cow and poultry manure plus pine bark increased yield compared to the control. All treatments increased soil moisture and reduced soil compaction. It was concluded that organic manures and pine mulch was as effective as inorganic fertilizer and produced beneficial soil properties. Therefore, controlled application of manures can be an economically, horticultural, and environmentally sound system.

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Characterization of Salinity-Resistant Mutants of Banana Cultivar Dwarf Cavendish (Musa AAA) by Morphological Traits

A collection of 21 banana (Musa AAA (Cavendish subgroup) 'Dwarf Cavendish') induced mutants resistant to salinity was evaluated using morphological descriptors. One quantitative and 29 qualitative traits were analyzed and considerable variation among mutants were found for most morphological features. Two traits, leaf habit and blotches color, were distinguished by non-irradiated clone (control). Cluster analysis using Dice coefficient and UPGMA algorithm detected genetic variation within induced mutant clones. It is concluded that mutation breeding technique would be an ideal approach to improve banana.

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DNA Extraction, Cloning and Sequence Analysis of ITS Regions in AM Fungal Spores

In this paper we present finding from a molecular characterisation study of arbuscular mycorrhizal species isolated from field grown maize plants in Thailand using rDNA sequence analysis of internal transcribed spacer regions (ITS). Several methods were examined for purification and PCR amplification of genomic DNA from either multiple spores or single spores of a morphologically characterised isolate of *Scutellospora fulgida*, *Glomus mossese*, *Acaulospora* sp.1, *Entrophospora schenckii*, *Glomus* sp.1, *Glomus* sp.2, *Glomus* sp.3, *Glomus* sp.4, *Glomus* sp.5, *Glomus coremioides* and *Glomus Sinuosum*. The products of PCR amplification were cloned and the DNA inserts sequenced. The best amplification results were obtained when spores were lysed directly in the buffer used for PCR or when using a commercial product based on Chelex 100 resin. However, neither method proved to be efficient for routine extraction and amplification of ITS sequences from single spores. DNA sequence analysis of cloned ITS regions indicated that more than one ITS sequence was present in the multiple spore extracts. Sequence analysis of single spores was hampered by an inability to routinely amplify sufficient amounts of DNA for cloning. Only single spores of *Glomus mosseae* and *Scutellospora fulgida* provided complete sequences. The results suggested the AMF which was large spore size (more than 200µm) gave the good band of PCR product and could be cloned for getting the good sequence. It was concluded that future work is needed to optimized methods for genomic DNA extraction and PCR amplification of DNA from single spore for sequence analysis.

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**An Update of Stifdb Database: Insight Into
Additional Plant Stress-Responsive Genes and
Transcription Factors**

Major worldwide agricultural losses occur due to biotic and abiotic stress conditions affecting plant growth and development which prevents them from reaching their complete genetic potential. They overcome this by reprogramming metabolism and differential gene expression by gaining a new equilibrium between growth, development and survival. This is controlled by the binding of transcription factors to their promoter region. Various genes get up-regulated in plants during adverse environmental conditions, which alter the metabolic functions to mitigate the stress-effects for adaptation. Therefore, it is important to know the regulatory motifs of stress induced genes for given stress tolerance. We provide comprehensive and updated information for abiotic stress responsive genes and their transcription factors, with addition of one agriculturally important model plant *Oryza sativa* and options to identify probable transcription factor binding sites in their promoters. In the response to abiotic stresses like ABA, drought, cold, salinity, dehydration, high light, heat, heavy metals etc, additional number of stress-responsive upregulated genes from different microarray experiments are reported and HMM-based models are used to identify binding sites for the transcription factors belonging to these stress-inducible genes. STIFDB (Stress Responsive Transcription Factor Database) would be a very useful database particularly to understand abiotic transcriptome and the regulatory positions of abiotic stress genes in *Arabidopsis* and Rice.

Weena Nilawonk

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Effects of Vermicompost on Nutrients Release in Organic Cropping Soils in Chiangmai, Thailand

The vermicompost is produced by earthworms, it's contained NPK, micronutrient and beneficial to soil microbes, and proving to be highly nutritive 'organic fertilizer'. The objective of this study was to evaluate the effectiveness of the vermicompost on plant nutrients release in organic cropping soils. The experiment was investigated in a laboratory incubation study for ten soils (clay loam, loam, and sandy loam soils) which were collected from the organic cropping fields in Chiangmai, Thailand. The treatments consisted of two level of vermicompost (soil : vermicompost is 1:0.5 and 1:0.25 w/w) and a control, and the treated soils were incubated at 8 weeks at 30oC, and analyzed for total N, P and K contents on 1, 2, 4, 6, and 8 weeks of incubation. The resulted showed that the total amount of total N P and K was most release from 1:0.5 w/w of soil: vermicompost treatment. Total release of N P and K from soils increased with time, and the clay loam soils showed highest total amount of N P and K release. The results suggested that the vermicompost affected to the increase of N P and K release in the organic cropping soils in Chiangmai, Thailand.

Hai Ren

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Establishment of Efficient Eco-Agriculture Systems in Southern China

South China is an area with rapid economic development in the last 3 decades. However, the agriculture in this region now faces serious problems such as farmland loss and labor shortage as a result of industrialization, agricultural pollution, and low economic efficiency. Either central government or local government tries to promote agricultural sustainable development by establishing efficient agriculture, recycling agriculture, ecological agriculture, by popularizing ecological civilization and strengthening environmental protection. The only way to resolve so-called “three agro-problems” i.e. rural society, agriculture and farmer, is to develop eco-agriculture.

Establishment of eco-agriculture system must be considered on three scales including landscape, ecosystem and species. At level of landscape, pattern of ecological security and pattern of agricultural production and citizen’s living of a region should be reasonably taken into account. At level of ecosystem, recycle of natural resources and high efficiency of resource use based on energy and matter flow principal should be emphasized. At level of species, a proper use of gene diversity and species diversity are crucial. In this respect, traditional and innovative eco-agriculture models can work well.

In considering globalization and integration of world markets, we should combine the high technique and agri-infrastructure construction to develop macro-agriculture to make scale-management by systematization and cooperation, and to enforce comprehensive industrial economy.

We need to re-establish the Technical Package of Eco-agriculture to extend eco-agriculture, which including production organization, economy system, law system, evaluation system, technology criterion. Successful establishment of agro-ecological patterns at different scale will be a footstone of agricultural modernization in South China.

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The Correlations between Physioco-Chemical Characteristics Of Potato Tubers After Post-Harvest Gamma Irradiation

This study was carried out to determine the correlations between Physioco-chemical Characteristics of Potato tubers of Marfona and Diamant varieties irradiated with Gamma irradiation levels of 0, 50, 100 and 150 Gy at different time 10, 30 and 50 day after harvest and stored for 5 months at 10-15°C and 70% relative humidity. A factorial experiment was done based on a Randomized Complete Block Design with three replication. The non-irradiated tubers and tuber that irradiated on 30th and 50th Day after harvest with 50Gy were not suitable for fresh market being soft and shriveled due to sprouting. There were high positive correlations between sprouting with dehydration (0.82), weight loss(0.86), starch loss(0.56) and reducing sugars(0.69) and negative correlation between sprouting and Ascorbic acid loss(0.80). Irradiation significantly reduced total reducing sugars in comparison to the non-irradiated tubers because of utilization of reducing sugars as substrate for respiration and energy production during sprouting such as there was positive correlation between reducing sugars with dehydration (0.58), weight loss (0.69) and sprouting. The most decrease in starch content was found in non-irradiated tubers (25.4%) and 50 Gy irradiated tubers (21.2%) on 50th day after harvest and least decrease was in 150 Gy irradiated tubers (11.7%) on 30th day after harvest. The decomposition of starch had positive correlation with dehydration (0.43), weight loss (0.39) and sprouting of both varieties tubers. Tubers that irradiated on 50th day after harvest which were physiologically older sprouted and lost 16.7% of ascorbic acid during storage. These results indicted that decrease in effectiveness of sprout inhibition by delayed irradiation of potato tubers may result from the increase in ascorbic acid and reducing sugars in the inner buds at the time of emergence from the dormancy state.

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Evaluation of Artificial Vision System for Potassium Diagnosis in Plants of Maize

The nutrients determination through chemical analysis of leaf tissue involves sampling in advanced stage or visual diagnosis that is dependent of the evaluator. The artificial vision system (AVS) is a set of methods to interpreting images that allows the correction of the nutrient deficiency at the beginning of the crop cycle. This study evaluated the AVS method to identify deficiencies of potassium (K) in corn (*Zea mays* L.). The experiment was carried out in hydroponic condition with nutrient solution in a greenhouse in SP/Pirassununga/Brazil. The treatments were 0, 47, 94 and 234 mg/L of K in the nutrient solution based for Hoagland & Arnon (1950), four replicates. Leaf samples were collected (old leaves and leaf 4) at the V4 stage to obtaining images by a 9600 DPI scanner as well as for chemical analyzes. The AVS techniques evaluated were: Fractal Dimension Volumetric, Gabor Wavelet (GW) and Fractal Dimension Volumetric using canonical analysis. The base, middle and tip of the leaves were analyzed for each technique using gray and color images. The increased of the nutrient concentration in the nutrient solution increased the levels of K in the leaves, consequently were observed specific visual symptoms of situations with absence or even low level of the nutrient. The AVS was able to identify all levels of nutrient deficiency. In the old leaves, GW with gray images resulted in best accuracy, showing 79.0% accuracy in the base of the old leaves. The AVS was effective to diagnose the levels of K in corn leaves.

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Application of some Empirical and Semi-Empirical net Solar Radiation Models in Penman-Monteith-FAO56 Model

The major draw back to the application of PMF-56 model is the fact that its accuracy depends on climate conditions and pre-defined input radiation (i.e. net radiation models). Evapotranspiration is one of the most major components of the hydrological cycle that its accurate estimation is very important in designing of irrigation systems, study of water resources and other relevant cases. Net radiation (R_n) is one of the effective parameters in predicting of evapotranspiration (ET) rate of certain agricultural crops. Majority of the current ET models estimate R_n regardless of climate and geographical conditions. This might lead to an error in the output of evapotranspiration models. In this research, the accuracy of some empirical and semi-empirical R_n models is compared against PMF-56 model in different climates of Iran. Daily reference evapotranspiration was calculated by Penman-Monteith-FAO 56 standard model during a 28-year period (1980-2007). For estimating daily net radiation various net radiation models (Penman-Monteith-FAO 56, Wright 1985, Basic regression, Linacre 1992, Berlind 1970, Irmak 2003 and Monteith 1973) were applied. To specify the climate of the 20 selected sites, the UNESCO and Köppen methods were utilized and six climate types were verified accordingly. Results showed that for 75 percent of the study sites, the linear models of net radiation relations can be suitable candidate instead of non-linear models such as net radiation as used in PMF-56 model. For some sites with low altitude and high relative humidity, Irmak model showed the minimum deviation from the reference FAO-56 reference model. The results are also discussed for other climate types.

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In Vitro Rooting of Apple MM106 (*Malus Domestica* Borkh.) and Pear (*Pyrus Calleryana*) Rootstocks

The present investigation was conducted in Plant Tissue Culture laboratory of the Scientific Research Center at the University of Duhok, Iraqi Kurdistan region during the period from October 2008 to July 2009. The objective of the study was to investigate the effects of different Auxins (Types and concentrations) and MS salts concentrations on rooting ability of in vitro grown shoots of apple MM106 (*Malus domestica* Borkh.) and pear (*Pyrus calleryana*) rootstocks. To stimulate the emergence of adventitious roots on shoots of both apple and pear, which produced from the tissue plantations, two experiments were conducted. The results were recorded after 6 weeks of culture. The first experiment was studied the effect of three-auxin types (IAA, IBA and NAA) with different concentrations each at (0.0, 0.5, 1, 2 and 4 mg.l⁻¹) on shoot rooting ability. The highest mean number of roots per shoot, mean root length and rooting percentage (3.99 roots, 3.5 cm and 90%) and (3.50 roots, 3.20 cm and 90%) for both apple and pear were recorded respectively at 2 mg.l⁻¹ NAA. While IAA or IBA were less effective than NAA on shoot rooting ability at the same concentrations. In the second experiment, the effect of different concentrations of MS salts strength medium on rooting ability was studied. In apple, the best number of roots per shoots, mean root length and rooting percentage (1.95 roots, 2.23 cm and 90%) were obtained on the half strength salt of MS medium, which were significantly differed from other treatments. In pear, the highest mean number of roots per shoots and rooting percentage (1.84 roots and 80%) were obtained on the half strength salts MS medium. On the other hand, the longest mean root was obtained at quarter salt strength MS medium, which estimated as 1.93 cm. Finally, at the acclimatization stage, 85% of both apple and pear plantlets were survived in a mixture of peatmoss, loam and styrofoam at ratio of 1:1:0.5 at the out-air conditions.

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Agricultural Deep Vadose Zone and Groundwater Nitrate and Atrazine Contamination

Nationally, Nebraska (USA) ranks third in corn production, second in cattle on feed, and first in irrigated land. Corn yields are heavily dependent on irrigation, fertilization, and weed control. A footprint of these agricultural activities is revealed through nitrate and herbicide investigations in the deep vadose zone and in groundwater. A recent 2010 site investigation beneath capture zone areas impacting municipal wells which provide drinking water for the city of Hastings, Nebraska (USA) clearly demonstrate the movement of nitrate and atrazine in heavy vadose zone soils to depths up to 20 m below land surface. The water table at ~36 m below land surface was shown to be impacted primarily by nitrogen applied to irrigated crops. Both vadose zone and isotopic data support Hastings Utilities' decision to invest ~\$35 million (US) in a reverse osmosis plant to remove future nitrate-contaminant loading to the aquifer from their municipal well water.

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Role of Water Relations In Growth Stimulation and Improved Drought Resistance of Plants Colonized by *Piriformospora Indica*

Piriformospora indica is a growth-promoting endophyte, which can form mycorrhizal associations with a variety of plant species including those of the Brassicaceae family which until recently were thought not to form mycorrhizal associations. In a world where need for plant products outweighs current supply and land base available for crop production is limited, the use of the growth promoting endophyte *Piriformospora indica* as a possible biofertilizer appears promising. We have studied the mechanisms of growth stimulation and improved drought resistance by *P. indica* in tobacco (*Nicotiana tabacum*) and *Arabidopsis thaliana* using the wild-type plants and genetically-modified lines overexpressing plasma membrane aquaporins (AQPs), since the beneficial effects of mycorrhizal associations frequently involve increased water transport efficiency. Growth stimulation by *P. indica* in tobacco was accompanied by an increase in transpiration and photosynthetic rates and was measured in the wild-type and AQP overexpression plants. Root hydraulic properties and AQP expression did not appear to be altered by the fungus in control plants, however, osmotic hydraulic conductivity of root cells was maintained at the higher level in plants exposed to drought and salinity stress. In tobacco, growth was stimulated in inoculated wild-type plants and in plants overexpressing PIP 2;5 AQP, but not in those overexpressing PIP1;4 from *Arabidopsis*. The immunolocalization techniques revealed a redistribution of AQPs in the root tissues of inoculated plants with an increase in plasma membrane AQPs in the outer cortex layers. It was concluded that the growth promoting benefits of the fungus likely involve changes in water relations and modulation of AQPs. Moreover, it was interpreted that PIP 1;4 may be directly involved in growth stimulation in inoculated plants.