

2016

# Water Abstracts

Fourth Annual International  
Forum on Water, 11-14 July 2016,  
Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH





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4<sup>th</sup> Annual International  
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# Preface

This abstract book includes all the abstracts of the papers presented at the 4<sup>th</sup> Annual International Forum on Water, 11-14 July 2016, Athens, Greece, organized by the Athens Institute for Education and Research. In total, there were 39 papers and 44 presenters, coming from 23 different countries (Algeria, Australia, Benin, Brazil, Bulgaria, Canada, Colombia, Costa Rica, Germany, Iran, Jordan, Mexico, Nigeria, Norway, Poland, Romania, Russia, South Africa, Spain, Taiwan, Thailand, Turkey, USA). The conference was organized into ten sessions that included areas such as Environmental and Ecological Issues, Farming Techniques, Plant Growth and Crop Production, Water Pollution and Water Management, Climate Change Impacts, Mitigation and Adaptation and other related fields. 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 six research divisions and twenty-seven 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**  
**9<sup>th</sup> Annual International Symposium on Agricultural Research**  
**11-14 July 2016, Athens, Greece**

**Conference Venue:** [Titania Hotel](#), 52 Panepistimiou Street, 10678 Athens, Greece

**Monday 11 July 2016**

(all sessions include 10 minutes break)

**08:00-08:30 Registration and Refreshments**

**08:30-09:00 Welcome & Opening Address (ROOM B--Mezzanine Floor)**

- Gregory T. Papanikos, President, ATINER.
- George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

**09:00-10:30 Session I (ROOM B--Mezzanine Floor): Environmental and Ecological Issues I**

**Chair:** George Poulos, Vice-President of Research, ATINER.

1. Derya Esen, Professor, Head of the Department of Forest Engineering, Düzce University, Turkey. Chemical Silviculture in the Mesic Forests of Black Sea Region of Turkey: A Review.
2. \*[Teresa Cristina Tarle Pissarra](#), Professor, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil, Anildo Monteiro Caldas, Professor, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil, Paulo Bonini Boneti, Graduate Student, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil, Marcelo Zanata, Graduate Student, Instituto Florestal, Brazil & Renata Cristina Araujo Costa, Graduate Student, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil. Spatial Variability of Ca and Mg in Pine Areas of the Forest Institute of Batatais – SP.
3. \*[Piotr Nowicki](#), Associate Professor, Jagiellonian University, Poland, Terezie Bubová, Ph.D. Student, Czech University of Life Sciences, Czech Republic & Vladimir Vrabec, Research Assistant, Czech University of Life Sciences, Czech Republic. How Can Proper Land Management Support the Conservation of European Butterflies?
4. Svetlana Pugach, Associate Professor, Kursk State University, Russia. Economic Mechanism of Agro-Industrial Complex Sustainable Development.
5. \*[Asbjorn Bergheim](#), Senior Researcher, IRIS – International Research Institute of Stavanger, Norway & Arve Nilsen, Veterinarian / Scientist, Norwegian Veterinary Institute, Norway. Production of Atlantic Salmon in Floating, Closed Cages – Is It Possible to Achieve Both Improved Fish Health and a Reduced Environmental Impact? (AQC)

<b>10:30-12:00 Session II (ROOM B--Mezzanine Floor): Farming Techniques, Plant Growth and Crop Production I</b>	<b>10:30-12:00 Session III (ROOM C--Mezzanine Floor): Water Pollution and Water Management I</b>
<p><b>Chair:</b> *Teresa Cristina Tarle Pissarra, Professor, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil.</p>	<p><b>Chair:</b> *Asbjorn Bergheim, Senior Researcher, IRIS – International Research Institute of Stavanger, Norway.</p>
<ol style="list-style-type: none"> <li>1. <u>Juan-Enrique Rodriguez-Perez</u>, Professor, Universidad Autonoma Chapingo, Mexico, <u>Zamny Hernandez-Gonzalez</u>, Graduate Student, Universidad Autonoma Chapingo, Mexico, <u>Jaime Sahagun-Castellanos</u>, Professor, Universidad Autonoma Chapingo, Mexico, <u>Alejandro F. Barrientos-Priego</u>, Professor, Universidad Autonoma Chapingo, Mexico, <u>Joel Pineda-Pineda</u>, Professor, Universidad Autonoma Chapingo, Mexico &amp; <u>Juan Martinez-Solis</u>, Professor, Universidad Autonoma Chapingo, Mexico. Xilem Anatomic Changes in Grafted Tomato.</li> <li>2. <u>Jaime Sahagun-Castellanos</u>, Professor, Universidad Autonoma Chapingo, Mexico, <u>Juan-Enrique Rodriguez-Perez</u>, Professor, Universidad Autonoma Chapingo, Mexico &amp; <u>Alejandro Ibarra-Sanchez</u>, Graduate Student, Universidad Autonoma Chapingo, Mexico. Inbreeding of the Synthetics derived from Three-Way Line Maize Hybrids.</li> <li>3. *<u>Cezary Sempruch</u>, Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland, <u>Golan Katarzyna</u>, Assistant. Professor, University of Life Sciences in Lublin, Poland, <u>Gorska-Drabik Edyta</u>, Assistant Professor, University of Life Sciences in Lublin, Poland, <u>Czerniewicz PaweL</u>, Siedlce University of Natural Sciences and Humanities, Poland, <u>Lagowska Bozena</u>, Professor, University of Life Sciences in Lublin, Poland, <u>Kot Izabela</u>, University of Life Sciences in Lublin, Poland, <u>Kmieć Katarzyna</u>, University of Life Sciences in Lublin, Poland, <u>Magierowicz Klaudia</u>, University of Life Sciences in Lublin, Poland, <u>Leszczyński BogumiL</u>, Professor, Siedlce University of Natural Sciences and Humanities, Poland &amp; <u>Marta Chwedczuk</u>, Siedlce University of Natural Sciences and Humanities, Poland. Accumulation and Metabolism of Amino Acids and Phenolic Compounds in Biochemical Plant Responses against Different Species of Herbivorous Arthropods.</li> </ol>	<ol style="list-style-type: none"> <li>1. <u>Horst Junker</u>, Professor, IMBC GmbH, Germany. IT Supported Sustainability in Corporate Water Resource Management.</li> <li>2. *<u>Kevin Mearns</u>, Professor, University of South Africa, South Africa &amp; <u>Hannes Grobler</u>, MSc Candidate, University of South Africa, South Africa. Managing Water for Tourism in the Phinda Private Nature Reserve, KwaZulu-Natal, South Africa.</li> <li>3. *<u>Camilo Lesmes Fabian</u>, Professor, Universidad Santo Tomás Tunja, Colombia, <u>Carlos Andres Caro Camargo</u>, Dean, Civil Engineering Faculty, Universidad Santo Tomas Tunja, Colombia &amp; <u>Ernest Blade i Castellet</u>, Professor, University Polytechnic of Catalonia, Spain. Drying and Transport Processes in Distributed Hydrological Modelling based on Finite Volume Schemes (IBER Model).</li> <li>4. <u>Dimitrios Athanasiou</u>, Ph.D. Student, Texas Tech University, USA, <u>Danny Reible</u>, Professor, Texas Tech University, USA, <u>Magdalena Rakowska</u>, Postdoctoral Researcher, Texas Tech University, USA, <u>Balaji Rao</u>, Postdoctoral Researcher, Texas Tech University, USA &amp; <u>Ilektra Drygiannaki</u>, Ph.D. Student, Texas Tech University, USA. Quantification of PAHs in Bulk and Size Fractioned Water Samples during Storm Event in an Urban Water Shed.</li> </ol>

<p><b>12:00-13:30 Session IV (ROOM B--Mezzanine Floor): Farming Techniques, Plant Growth and Crop Production II</b></p>	<p><b>12:00-13:30 Session V (ROOM C--Mezzanine Floor): Climate Change Impacts, Mitigation and Adaptation</b></p>
<p><b>Chair:</b> Sinan Ogun, Researcher, Red Rock Agricultural Pastoral R&amp;D, Turkey.</p>	<p><b>Chair:</b> *Piotr Nowicki, Associate Professor, Jagiellonian University, Poland.</p>
<ol style="list-style-type: none"> <li>1. *Genlou Sun, Professor, Saint Mary's University, Canada. Genetic Divergence in Domesticated and non-Domesticated Gene Regions of Barley Chromosomes.</li> <li>2. <u>Raul Pinto</u>, Lecturer, Izmir University of Economics, Turkey, Paul Atkinson, Professor, Sheffield Hallam University, U.K., Joaquim Vieira, Assistant Researcher, University of Aveiro, Portugal, Miguel Carvalhais, Assistant Professor, University of Porto, Portugal, Derya IrkdasDogu, Lecturer, Izmir University of Economics, Turkey &amp; A. Can Ozcan, Izmir University of Economics, Turkey. From Design-by-Doing to Co-Designing: An Exploratory Case Study with a Beehive Producer.</li> <li>3. <u>Ruveyde Tuncturk</u>, Associate Professor, Yuzuncu Yil University, Turkey, Haluk Kulaz, Yuzuncu Yil University, Turkey, Vahdettin Ciftci, Abant Izzet Baysal University, Turkey &amp; Murat Tuncturk, Yuzuncu Yil University, Turkey. Effects on Nutrient Contents of Fenugreek (<i>Trigonella foenum-graecum</i> L.) of Different Organic Materials and <i>Rhizobium meliloti</i> Strains.</li> </ol>	<ol style="list-style-type: none"> <li>1. Raymond A Younis, Coordinator and Core Curriculum, University of Notre Dame, Australia. <i>Eudaimonian</i> Questions: On the "Moral Tragedy" of Climate Change.</li> </ol>

**13:30-14:30 Lunch**

<p><b>14:30-15:30 Session VI (ROOM B--Mezzanine Floor): Farming Techniques, Plant Growth and Crop Production III</b></p>
<p><b>Chair:</b> *Kevin Mearns, Professor, University of South Africa, South Africa.</p>
<ol style="list-style-type: none"> <li>1. <u>Muien Qaryouti</u>, Researcher, National Center for Agriculture Research and Extension, Jordan, <u>Mustafa Edwan</u>, Research Assistant, National Center for Agriculture Research and Extension, Jordan, Rana Muhaisen, Researcher, National Center for Agriculture Research and Extension, Jordan &amp; Manal Hiary, Research Assistant, National Center for Agriculture Research and Extension, Jordan. Screening of Local Jordanian Purslane (<i>Portulaca oleracea</i> L.) Accessions under Saline Soil Conditions.</li> <li>2. *<u>Kgabo Martha Pofu</u>, Researcher, Agricultural Research Council (ARC), South Africa, Phatu Mashela, Senior Professor, University of Limpopo, South Africa, Hintsu Araya, Researcher, Agricultural Research Council (ARC), South Africa &amp; Christian du Plooy, Programme Manager, Agricultural Research Council (ARC), South Africa. Intergeneric Grafting of Nematode-Susceptible Watermelon Cultivars on Nematode-Resistant Wild <i>Cucumis</i> Species: A Success Story in Nematode Management.</li> </ol>

**15:30-17:00 Session VII (ROOM B--Mezzanine Floor): Environmental, Ecological and Other Issues**

**Chair:** \*Cezary Sempruch, Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland.

1. Zarbakht Ansari Pirsaraei, Scientific Staff, Sari Agricultural Sciences and Natural Resources University, Iran & Eissa Dirandeh, Scientific Staff, Sari Agricultural Sciences and Natural Resources University, Iran. Effect of Service Number on Resynchronization Responses in Lactating Dairy Cows.
2. Tiberius Balaes, Researcher, Anastasie Fatu Botanical Garden, Alexandru Ioan Cuza University of Iasi, Romania & Catalin Tanase, Professor, Alexandru Ioan Cuza University of Iasi, Romania. Non-Target Affected Organisms by the Use of Pesticides and Resistant Basidiomycete Species.
3. Juan Camilo Gil Fuquene, Research Assistant, Universidad Santo Tomas Tunja, Colombia, Carlos Daniel Rincon Suescun, Research Assistant, Universidad Santo Tomas Tunja, Colombia, Camilo Lesmes Fabian, Professor, Universidad Santo Tomás Tunja, Colombia, Gloria Lucia Camargo Millan, Associate Professor, Universidad Pedagógica y Tecnológica de Colombia, Colombia & Carlos Andres Caro Camargo, Dean of the Faculty of Civil Engineering, Universidad Santo Tomas Tunja, Colombia. Environmental Impact Assessment of Brick Production in the Region of Boyaca, Colombia.

**21:00-23:00 Greek Night and Dinner (Details during registration)**

**Tuesday 12 July 2016**

**08:00-11:00 Educational and Cultural Urban Walk Around Modern and Ancient Athens (Details during registration)**

**11:00-12:30 Session VIII (ROOM B--Mezzanine Floor): Environmental and Ecological Issues III**

**Chair:** Derya Esen, Professor, Head of the Department of Forest Engineering, Düzce University, Turkey.

1. Harnpon Phungrassami, Assistant Professor, Thammasat University, Thailand & Phairat Usubharatana, Assistant Professor, Thammasat University, Thailand. Environmental Performance Indicators of Canned Sweet Corn Industry. (Monday July 11 or Tuesday July 12, morning session)
2. Alexandre Chikalanov, Lecturer, University of Library Study and Information Technology, Bulgaria, Roumen Nikolov, Professor, Head of Department of Computer Science and UNESCO Chairholder, University of Library Study and Information Technology, Bulgaria & Maiyana Lyubenova, Associate Professor, University of Library Study and Information Technology, Bulgaria. Future of Internet, Ecosystem Services and Sustainable Regional Development.
3. Miriam Torres-Miralles, Lecturer, Universidad Complutense de Madrid, Spain, Ioanna Grammatikopoulou, CzechGlobe Research Institute, Czech Republic & Alejandro Javier Rescia Perazzo, Universidad Complutense de Madrid, Spain. Employing Contingent and Inferred Valuation Methods to Evaluate the Preservation of Olive Groves and of the Associated Ecosystem Services in the Andalusia Region.
4. Carlos Daniel Rincon Suescun, Research Assistant, Universidad Santo Tomas Tunja, Colombia, Juan Camilo Gil Fuquene, Research Assistant, Universidad Santo Tomas Tunja, Colombia, Camilo Lesmes Fabian, Professor, Universidad Santo Tomás Tunja, Colombia, Gloria Lucia Camargo Millan, Associate Professor, Universidad Pedagógica y Tecnológica de Colombia, Colombia & Carlos Andres Caro Camargo, Dean, Civil Engineering Faculty, Universidad Santo Tomas Tunja, Colombia. Definition of a System of Indicators for the Sustainability Assessment in the Production of Construction Materials in the Region of Boyaca, Colombia.
5. Remus Pravalie, Ph.D. Student, University of Bucharest, Romania & Georgeta Bandoc, Professor, University of Bucharest, Romania. Analysis of the Current Land Degradation Sensitivity Areas in Europe using the DISMED Framework.

12:30-14:00 Session IX (ROOM B--Mezzanine Floor): Technology and (Sustainable) Agriculture Practices	12:30-14:00 Session X (ROOM C--Mezzanine Floor): Water Pollution and Water Management II
<p><b>Chair:</b> Tiberius Balaes, Researcher, Anastasie Fatu Botanical Garden, Alexandru Ioan Cuza University of Iasi, Romania.</p>	<p><b>Chair:</b> Horst Junker, Professor, IMBC GmbH, Germany.</p>
<ol style="list-style-type: none"> <li>1. <u>Giovanna Fachini Dellaqua</u>, MSc Student, University of São Paulo, Brazil, Marcelo Machado Leão, Post-doctoral, University of São Paulo, Brazil, Marta Helena Fillet Spoto, Research and Professor, University of São Paulo, Brazil, Márcia Ortiz Maio Marques, Scientific Researcher, Instituto Agrônômico of Campinas, Brazil &amp; José Otávio Brito, Research and Professor, University of São Paulo, Brazil. Essential Oil Production from a Brazilian Native <i>Myrtaceae</i>—Cambuci (<i>Campomanesia Phaea</i>).</li> <li>2. *Tomas de Jesus Guzman Hernandez, Titular Researcher, Costa Rica Institute of Technology, Regional Headquarters of San Carlos, Costa Rica. Solar Energy in Agricultural Systems: Results of a Local Pilot Program in the Northern Region of Costa Rica.</li> <li>3. <u>Emilie Didier Fiofibe</u>, Director of Laboratory of Research on Wetlands, University of Abomey-Calavi, Benin, Clement Bonou, Lecturer, University of Abomey-Calavi, Benin &amp; Herve Akodogbo, Assistant, University of Abomey-Calavi, Benin. Use of Pig Dung as Fertilizer and Substrates to Produce Live Foods for Larvae (Zooplankton) and Juvenile's Fish.</li> </ol>	<ol style="list-style-type: none"> <li>1. Thomas Pietsch, Professor, HTW Berlin, Germany. Process Maturity Assessment of Water Consumption in the Wine Industry.</li> <li>2. <u>Joachim Osuagwu</u>, Senior Lecturer, Federal University of Technology, Nigeria, N.L. Nwakwasi, Federal University of Technology, Nigeria &amp; A.N. Nwachukwu, Federal University of Technology, Nigeria. Low Cost Technique for Treatment of Iron Contaminated Water.</li> <li>3. <u>Carlos Alberto Valera</u>, Ph.D. Student, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil, Teresa Cristina Tarlé Pissarra, Professor, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil, Marcílio Vieira Martins Filho, Professor, Universidade Estadual Paulista “Júlio De Mesquita Filho”, Brazil &amp; Renato Farias Do Valle Júnior, Professor, Instituto Federal Do Triângulo Mineiro, Brazil. The Polluter Pays Principle and Soil-Water Conservation - Potencial Erosion Study of Uberaba River Watershed, Brazil.</li> </ol>

**14:00-15:00 Lunch**

15:00-16:00 Session XI (ROOM B--Mezzanine Floor): Nutrition and Food Security
<p><b>Chair:</b> Marcelo Machado Leao, Post-doctoral Researcher, University of São Paulo, Brazil.</p>
<ol style="list-style-type: none"> <li>1. <u>Phatu William Mashela</u>, Professor, University of Limpopo, South Africa, Kgabo Pofu, Researcher, University of Limpopo, South Africa, Zakheleni Dube, Researcher, University of Limpopo, South Africa &amp; Kagiso Shadung, Researcher, University of Limpopo, South Africa. Managing Phytonematicide Phytotoxicities in Tomato Production: The Dosage Model.</li> <li>2. *<u>Arturo Francisco Castellanos Ruelas</u>, Professor-Researcher, Autonomous University of Yucatan, Mexico, Riccardo Lorenzini, Medical Student, Università degli Studi di Verona, Italy, David A. Betancur-Ancona, Professor-Researcher, Autonomous University of Yucatan, Mexico &amp; Luis A. Chel-Guerrero, Professor-Researcher, Autonomous University of Yucatan, Mexico. The Impact of Lifestyle on the Nutritional Status of University Students from Mexico.</li> </ol>

**16:00-18:00 Session XII (ROOM B--Mezzanine Floor): Farming Techniques, Plant Growth and Crop Production IV**

**Chair:** \*Arturo Francisco Castellanos Ruelas, Professor-Researcher, Autonomous University of Yucatan, Mexico.

1. Li-Sen Young, Associate Professor, National Formosa University, Taiwan. Dissemination of Rice Endophytes into Rhizosphere under Gnotobiotic P-stress.
2. \*Bo Zhang, Ph.D. Candidate, University of Miami, USA, Xianwu Zhang, Planning Institute of State Forestry Administration, China, Zhiyuan Fu, Nanjing Forestry University, China & Jinchi Zhang, Nanjing Forestry University, China. Detecting the Effect of Elevation Gradient on Plant Demography and the Impact of Climate Change on Shifts in Elevation Distribution 20 Years Data.
3. Ines Bellil, Doctor, Université des frères Mentouri Constantine, Algeria, Ouahiba Hamdi, Doctor, Université de Tebessa, Algeria & Douadi Khelifi, Professor, Université des frères Mentouri Constantine, Algeria. Assessing Genetic Diversity Based on High and Low Molecular Weight Glutenin Subunits within Bread Wheat (*Triticum aestivum* ssp. *aestivum* L. em. Thell.) Germplasm Cultivated in Algeria.
4. Onai Mtengwa, Researcher and Lecturer, University of Venda, South Africa. Effect of Varying Phosphorus Rates on Nodulation in Different Genotypes of Desi Chickpea (*Cicer Arientinum*).
5. Marcelo Machado Leao, Post-doctoral Researcher, University of São Paulo, Brazil, Giovanna Fachini Dellaqua, MSc Student, University of São Paulo, Brazil, Marta Helena Fillet Spoto, Research and Professor, University of São Paulo, Brazil, Márcia Ortiz Maio Marques, Scientific Researcher, Instituto Agronômico of Campinas, Brazil & José Otávio Brito, Research and Professor, University of São Paulo, Brazil. The Potential of *Campomanesia phaea* (cambuci) as Natural Source of Vitamin C.

**21:00-22:30 Dinner (Details during registration)**

**Wednesday 13 July 2016**  
**Cruise: (Details during registration)**

**Thursday 14 July 2016**  
**Delphi Visit: (Details during registration)**



**Zarbakht Ansari Pirsaraei**

Scientific Staff, Sari Agricultural Sciences and Natural Resources  
University, Iran

&

**Eissa Dirandeh**

Scientific Staff, Sari Agricultural Sciences and Natural Resources  
University, Iran

**Effect of Service Number on Resynchronization Responses  
in Lactating Dairy Cows**

Effect of service number on the percentage of cows that responded to the resynchronization and fertility in lactating dairy cows during warm season. Lactating dairy cows ( $n = 750$ ) with different service number according to last service (AI1= 150, AI2= 150, AI3=150, AI4=150, AI $\geq$ 5 =150) were assigned to receive Ovsynch56 starting on day 28 after AI. Ultrasonography was done during Ovsynch56 injections and also for confirmation of pregnancy in all cows at 32 d and 60 $\pm$ 4 d after fixed timed AI. Results showed proportion of cows that ovulated in response to the first GnRH injection of Ovsynch was greatest ( $P = 0.01$ ) in first service cows compared with other service. In addition, cows that ovulated in response to first GnRH of Ovsynch had greater response to PGF2 $\alpha$  of Ovsynch (91.8 vs. 74.2%, respectively) and finally greater conception rate (CR) at 32 d after AI (32.1 vs. 24.6%, respectively) than those that did not ovulate. Conception rate at 32 and 60 d after AI was similar up to third service (29.1 and 21.8% at d 32 and 60 respectively) but after that decreased (19.75 and 10.4% at d 32 and 60 respectively,  $P = 0.02$ ). In conclusion results of this study showed service number affected proportion of cows responded to resynchronization protocol. Conception rate was reasonable up to third service but after third breeding proportion of cows responded to resynchronization decreased and CR drops below 20%.

**Dimitrios Athanasiou**

Ph.D. Student, Texas Tech University, USA

**Danny Reible**

Professor, Texas Tech University, USA

**Magdalena Rakowska**

Postdoctoral Researcher, Texas Tech University, USA

**Balaji Rao**

Postdoctoral Researcher, Texas Tech University, USA

&

**Ilektra Drygiannaki**

Ph.D. Student, Texas Tech University, USA

## **Quantification of PAHs in Bulk and Size Fractioned Water Samples during Storm Event in an Urban Water Shed**

Due to extensive urban development, highly loaded watersheds exert significant environmental pressure on receiving water bodies (e.g., marine bay or lake) with loading spikes attributed to runoff during storm events. This work describes methods used to quantify the bulk water PAHs concentration as sampled in an urban watershed during episodic storm events. Liquid-Liquid Extraction (LLE) with dichloromethane is used for the extraction of the samples. Furthermore, particle size fractionation techniques shall be employed to evaluate the concentration of USEPAs 15 priority pollutant PAHs of the size fractioned water, measured in different reaches of the watershed. Details of the LLE method development and preliminary results of water samples obtained from the urban watershed will be discussed.

**Tiberius Balaes**

Researcher, Anastasie Fatu Botanical Garden, Alexandru Ioan Cuza  
University of Iasi, Romania

&

**Catalin Tanase**

Professor, Alexandru Ioan Cuza University of Iasi, Romania

**Non-Target Affected Organisms by the Use of Pesticides  
and Resistant Basidiomycete Species**

The use of pesticides in agriculture has been for a long time a matter of debate concerning their toxic effect on non-target organisms and their possible negative impact on human health. Commercialization of pesticides is regulated by corresponding authorities and every new product requires approval before entering the market, but a general public opinion is that chemically synthesized pesticides have a negative impact over environment.

In this study, thirteen fungicides, insecticides and acaroinsecticides, currently commercialized in Romania have been tested *in vitro* concerning their effects on different groups of organisms. In this respect, 2 basidiomycete species, 1 anamorphic fungi, 1 yeast, 1 unicellular green algae and 1 cyanobacteria have been cultured on media supplemented with different concentrations of pesticides. Addition of the pesticides was done as commercial formulation per se and not as pure active compounds, through filter sterilization. All the species were cultured on standard media, solidified or liquid, corresponding to the species requirements. The minimum inhibition concentrations have been calculated.

Our results suggest that formulations containing petroleum compounds as solvents have a general toxic effect over different groups of organisms, even at low doses and lignicolous basidiomycetes are the most resistant. In this work, discussions over possible mechanism for resistance of basidiomycetes and ecological implications over pesticides use are offered.

**Ines Bellil**

Doctor, Université des frères Mentouri Constantine, Algeria

**Ouahiba Hamdi**

Doctor, Université de Tebessa, Algeria

&

**Douadi Khelifi**

Professor, Université des frères Mentouri Constantine, Algeria

**Assessing Genetic Diversity Based on High and Low  
Molecular Weight Glutenin Subunits within Bread Wheat  
(*Triticum aestivum* ssp. *aestivum* L. em. Thell.) Germplasm  
Cultivated in Algeria**

Wheat endosperm storage proteins are the major components of gluten. They play an important role in dough properties and in bread making quality in various wheat varieties. In the present study, the different alleles encoded at the 6 glutenin loci were identified from a set of 71 hexaploid wheat germplasm cultivated in Algeria using SDS-PAGE. At *Glu-A1*, *Glu-B1* and *Glu-D1*, encoding high molecular weight glutenin subunits (HMW-GS), 3, 6 and 5 alleles were observed, respectively. Low molecular weight glutenin subunits (LMW-GS) displayed similar polymorphism, as 4, 9 and 3 alleles were identified at loci *Glu-A3*, *Glu-B3* and *Glu-D3*, respectively. A total of 52 patterns resulted from the genetic combination of the alleles encoding at the six glutenin loci. This led to a significantly higher Nei coefficient of genetic variation in *Glu-1* and *Glu-3* loci (0.54). The Algerian hexaploid wheats exhibited allelic variation in HMW and LMW glutenin subunit composition and the variation differed from that of hexaploid wheats of other countries. The presence of high quality alleles in glutenin loci have led the Algerian wheat cultivars to be considered as an asset in breeding programs aimed for wheat quality.

**Asbjorn Bergheim**

Senior Researcher, IRIS – International Research Institute of Stavanger,  
Norway

&

**Arve Nilsen**

Veterinarian/Scientist, Norwegian Veterinary Institute, Norway

**Production of Atlantic Salmon in Floating, Closed Cages –  
Is It Possible to Achieve Both Improved Fish Health and a  
Reduced Environmental Impact? (AQC)**

In Norwegian aquaculture transfer of production from sea to on-shore sites or introducing closed, floating sea cages have been suggested as possible solutions to the problems with sea lice and as a way to minimize the risk of fish escapees. Production in closed confinement systems could also make it possible to collect and utilize the solid waste otherwise released directly to the marine environment. It is expected that more controlled rearing conditions compared to in traditional open cages could lead to better survival and a more effective production. It could also be possible to raise the level of biosecurity in such closed systems by filtration and disinfection of inlet water and effluents in order to remove pathogens.

The development and testing of new prototype of closed floating cages has been monitored from 2012 to 2015. The effect on sea lice, fish health and welfare as well as water quality and collection of feed-based wastes has been documented throughout this period. The conclusion is that closed cages with water intake from 25 m depth gives an effective protection against sea lice, including both *Lepeoptheirus salmonis* and *Caligus elongatus*. Fish growth rate (TGC) and survival rate was in general not significantly different from parallel groups in open net cages. A model for the connection between specific water consumption (Q), feeding intensity (Load) and the important water quality parameters pH and CO<sub>2</sub> was developed for high temperature (summer) and low temperature (winter) scenarios. Without stripping of CO<sub>2</sub>, levels of CO<sub>2</sub> would be the most important water quality parameter in such flow-through floating enclosures. Harmful levels of TAN and suspended solids (SS) were not recorded. Levels of CO<sub>2</sub> above 10 to 15 mg min<sup>-1</sup> will lead to reduced fish welfare; nephrocalcinosis, loss of appetite and ultimately (in severe cases) to lethargy. The cages used water pumped from 25 m deep to avoid infective sea lice larvae, and during winter this could also give the possibility to get warmer water from the deep layers in the water column. This resulted in faster growth and at the same time a reduced feed conversion ratio (FCR). A small

scale experiment comparing fish growth rate and FCR at different water speed indicates that the higher water speed in closed confinements also could contribute to the same effect. Initial testing of efficiency of sludge removal and the chemical composition of sedimented effluents from these cages showed good quality sludge with high levels of nitrogen and phosphorous, but too low removal efficiency, probably caused by the insufficient filter technology used in the pilot project period.

**Arturo Francisco Castellanos Ruelas**

Professor-Researcher, Autonomous University of Yucatan, Mexico

**Riccardo Lorenzini**

Medical Student, Universita degli Studi di Verona, Italy

**David A. Betancur-Ancona**

Professor-Researcher, Autonomous University of Yucatan, Mexico

&

**Luis A. Chel-Guerrero**

Professor-Researcher, Autonomous University of Yucatan, Mexico

## **The Impact of Lifestyle on the Nutritional Status of University Students from Mexico**

The change in lifestyle and nutrition has led to growing obesity; in Mexico there has been significant increase in its prevalence. The problem was thought limited to adult population, but it also affects children, adolescents and young adults. Obesity at an early stage of life, subsequently leads to obesity in adult life. Apparently few attempts with College students have being reported. The objectives of this research was to relate the effect of anthropometry and physical condition with dietary habits, physical activity and smoking addiction in students of a public university of Mexico, in order to establish a diagnosis of their nutritional status.

One hundred and seventy eight students, were measured obtaining: body weight, height, waist and hip circumference ratio (WHCR), body composition and blood pressure. A questionnaire to determine their physical activity was applied, a dietary assessment was also collected and socioeconomic status was established. Data were analyzed statistically by the method of least squares. The results showed that individuals classified as over-weighted, with obesity class 1 and class 2, accounted for 48.87% of the total population; more overweight and obesity was found in men compared with women (Table 1).

**Table 1.** *Percentage Distribution of Body Mass Index (BMI) in the Students of the Engineering Campus*

	<b>Under weight (&lt;18.5)</b>	<b>Normal weight (18.6-24.9)</b>	<b>Overweight (25.0-29.9)</b>	<b>Obese Class 1 (30.0-34.9)</b>	<b>Obese Class 2 (&gt;35)</b>
<b>Male (M)</b>	2.25	35.96	43.82	13.48	4.49
<b>Female (F)</b>	1.12	62.92	30.35	1.12	4.49
<b>M+F</b>	1.69	49.44	37.08	7.30	4.49

BMI affected negatively the blood pressure (Table 2).

**Table 2.** *Effect of Gender\* on Blood Pressure of the Students of the Engineering Campus (Mean ± S.D.) n= 89*

Gender	Low P.		High P.	
	$\bar{X}$	s <sup>2</sup>	$\bar{X}$	s <sup>2</sup>
Male	72	12	134	13
Female	68	9	115	11

\*P<0.01

All anthropometry traits were higher in males than in females, except fat content (Table 3)

**Table 3:** *Effect of Gender\* on the anthropometry of the students of the Engineering Campus (Mean ± S.D.) n= 89*

Gender	BMI		WHCR		% Water		% Fat		Bone		Muscle	
	$\bar{X}$	s <sup>2</sup>	$\bar{X}$	s <sup>2</sup>	$\bar{X}$	s <sup>2</sup>	$\bar{X}$	s <sup>2</sup>	$\bar{X}$	s <sup>2</sup>	$\bar{X}$	s <sup>2</sup>
Male	26.4	4.7	0.85	0.07	56.9	5.0	21.6	7.7	3.0	0.4	55.8	7.4
Female	24.0	4.3	0.76	0.05	51.3	5.0	26.6	8.0	2.2	0.2	40.2	4.0

\*P<0.01 in all variables.

This deteriorating health was attributable to poor eating habits: skipping breakfast and consumption of fast food. Smoking was revealed as a major risk factor since it adversely affected nutritional status.



**Alexandre Chikalanov**

Lecturer, University of Library Study and Information Technology,  
Bulgaria

**Roumen Nikolov**

Professor, Head of Department of Computer Science and UNESCO  
Chairholder, University of Library Study and Information Technology,  
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&

**Maiyana Lyubenova**

Associate Professor, University of Library Study and Information  
Technology, Bulgaria

**Future of Internet, Ecosystem Services and Sustainable  
Regional Development**

Internet gradually turns into one of the most important critical infrastructures for all economic sectors, education, etc. The Future Internet research and innovation take a solid part across all other H2020 sections and challenges, including Climate Action, Environment, Resource Efficiency and Ecosystem Services, trying to bridge the fundamental research and the need to conduct experimentally-driven research in real environment with participation of all stakeholders. Internet of Things (IoT) refers to the set of devices and systems that interconnect real world sensors and actuators to the Internet. There will be over 50 billion Internet-connected devices by 2020. This makes possible implementation of the Quintuple Helix model which supports the formation of a win-win situation between ecology and innovations, creating synergies between science, economy and society. The paper presents a use-case - Smart Forest Ecological Management System (ForEco) for assessment and management of ESof forests for different customers. ForEco will integrate a set of models to support the adaptive management of forest ecosystems to achieve their sustainable development and operation as a natural resource. The ESassessment will be based on a large quantity of open data from different international initiatives for satellite data exploitation to support decision-making processes. ForEco is supported by the FIWARE Finodex accelerator.

**Derya Esen**

Professor, Head of the Department of Forest Engineering, Düzce  
University, Turkey

## **Chemical Silviculture in the Mesic Forests of Black Sea Region of Turkey: A Review**

The Black Sea Region of Turkey has the most productive forest resources of Turkey with relatively favorable growing conditions for trees. Due to high productivity, the region has a high plant diversity. These favorable growing conditions also foster the establishment of and rapid invasions by herbaceous and woody weed species on natural and artificial forest regeneration sites. For example, purple flowered rhododendron (*Rhododendron ponticum* L.) is the major impediment to regeneration of eastern beech (*Fagus orientalis* Lipsky) and accompanying forest trees including wild cherry (*Prunus avium* L) in the region. Turkish Forest Service predominantly employs manual and mechanical control methods to eradicate forest weeds on forest sites. However, these methods are mostly expensive and have short-term efficacy on weeds. In the last 17 years, research has focused on the potential uses of chemical silviculture with herbicides for natural and artificial regeneration of major broadleaved tree species in the region. This paper reviews and compare the commonly used weed control methods including chemical silviculture for forest regeneration in terms of efficacy and site productivity in the light of research and practice in the last 17 years.

**Giovanna Fachini Dellaqua**

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**Marcelo Machado Leão**

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**Marta Helena Fillet Spoto**

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**Márcia Ortiz Maio Marques**

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&

**José Otávio Brito**

Research and Professor, University of São Paulo, Brazil

**Essential Oil Production from a Brazilian Native**

***Myrtaceae*–Cambuci (*Campomanesia Phaea*)**

Bioprospecting molecules of native Brazilian flora enables the discovery of active principles that help enterprises to battle in the competitive market always lacking innovation.

This study investigated the chemical composition of the essential oil of leaves of the species *Campomanesia phaea* (O. Berg.) Landrum (cambuci) in the botanical family Myrtaceae that has restricted occurrence in the Atlantic Forest biome.

The studied sites are located in the Tropical Rain Forest (TRF) in the microregion of Paraibuna-SP and in the Seasonal Semideciduous Forest (SSF) in the microregion of Limeira-SP, both belonging to the Atlantic Forest biome.

We studied the possibility to develop new products with essential oils for industries of foods, beverages, perfumes, pharmaceuticals, and cosmetics. Thus, essential oils were extracted at a pilot plant of steam distillation under controlled conditions of pressure and temperature.

The average yield of essential oils from leaves of *Campomanesia phaea* collected in microregion of Limeira -SP (SSF) showed higher values compared to those from leaves collected in Paraibuna -SP (TRF).

The analysis of the chemical composition of the essential oils extracted from *Campomanesia phaea* allowed to detect the presence of 29 chemical substances. The main compounds found were: *trans-beta-ocimene*, *linalool*, *trans-caryophyllene*, *bicyclogermacrene*, *trans-nerolidol* and *caryophyllene oxide*.

The use of *Campomanesia phaea* (cambuci) species could be a good alternative from a social, economic and environmental perspective, as it has potential to provide employment opportunities and income increases to traditional communities, including, indigenous peoples, allowing a sustainable use of inputs from the Brazilian biodiversity.

**Emilie Didier Fiogbe**

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**Clement Bonou**

Lecturer, University of Abomey-Calavi, Benin  
&

**Herve Akodogbo**

Assistant, University of Abomey-Calavi, Benin.

## **Use of Pig Dung as Fertilizer and Substrates to Produce Live Foods for Larvae (Zooplankton) and Juvenile's Fish**

In one study, two techniques of the zooplankton mass production (renewed and non-renewed medium) were compared to determine the most efficient. The experimentation was realized in triplicate in plastic buckets, grouped in three treatments with fertilization (T1, T2 and T3) and a control (T0) during 27 days. Initial density (D0) of zooplankton was 37individual.l-1. From D12, those of T2 and T3 were periodically fertilized and have respectively sustained a partial and periodical renewal and fishing (50%) in the production medium. The optimization in non-renewed medium has given the best zooplankton production.

Seven substrates were used for the production of maggots: dejections of pigs (P), chicken viscera (V), and soybean oil cake (T) and their respective mixture dejections of pigs-chicken viscera (PV), dejections of pigs-soybean oil cake (PT), chicken viscera-soybean oil cake (VT) and chicken viscera-soybean oil cake-dejections of pigs (VTP). At the end of the experiment, the best productivities of maggots of 8.89g.100g-1 and 7.20 g.100g-1 are respectively obtained with substrates VT and VTP.

A study is conducted to evaluate the effect of different animal product wastes and plant compost on survival and growth of earthworm (*Eisenia fetida*). The study is realized of 90 days. Maximum weight gain and highest growth rate were attained with cow dung. Earthworm biomass gain in different animal wastes is in the order of: cow pig rabbit poultry sheep compost vegetable. The animal wastes (cow, sheep, pig, rabbit and poultry) and vegetable compost can be used to produce the earthworm.

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**Carlos Daniel Rincon Suescun**

Research Assistant, Universidad Santo Tomas Tunja, Colombia

**Camilo Lesmes Fabian**

Professor, Universidad Santo Tomás Tunja, Colombia

**Gloria Lucia Camargo Millan**

Associate Professor, Universidad Pedagógica y Tecnológica de  
Colombia, Colombia

&

**Carlos Andres Caro Camargo**

Dean of the Faculty of Civil Engineering, Universidad Santo Tomas  
Tunja, Colombia

**Environmental Impact Assessment of Brick Production in  
the Region of Boyaca, Colombia**

The modern civilization depends on the building sector but the consumption of non-renewable resources makes it one of the least sustainable industries in the world. The environmental impact of building construction contributes with 30% of the global carbon footprint. This issue is of great importance in countries where coal is used as source of energy and the emissions are not controlled during the emissions. In the case of Colombia, there are around 1500 to 2000 units which produce around 350.000 ton of bricks per month and around 4.200.000 ton of bricks per year, using an average of 0,22 ton of coal per ton of brick produced. This suggests that an environmental impact assessment of the brick production system is necessary to develop new techniques to promote innovative solutions in the production processes, to reduce the depletion of the non-renewable resources, and furthermore to reduce the negative environmental impact. The goal of this research is to make an inventory analysis of the brick production in the region of Boyaca, Colombia, based on the material flow analysis methodology, taking into account the different processes involved, and making a comparison between the different production systems, which differ mainly in the type of kilns. The results show the brick production system considering processes like mining of the raw material, manufacturing and transportation; the flows of energy and water consumption; and the emissions of particulate matter, sulfur dioxide, carbon dioxide, carbon monoxide and oxides of nitrogen. Finally, an environmental policy analysis is made focusing on changes in the environmental regulations in the last decades which promote changes in the type of kilns and this issue had a positive effect on the decrease in the environmental impact caused by the gas

emissions. This research was funded by the Research Unit of the Saint Thomas University in Tunja, Colombia.

**Tomas de Jesus Guzman Hernandez**

Titular Researcher, Costa Rica Institute of Technology, Regional  
Headquarters of San Carlos, Costa Rica

**Solar Energy in Agricultural Systems: Results of a Local  
Pilot Program in the Northern Region of Costa Rica**

Today, we must work on the implementation of clean energy as an alternative to the adaptability to climate change to mitigate the greenhouse effect in the planet, working at the local level to have an impact in the global level.

This work has managed to design, build, install and start generating data showing the potential for energy generation from the use of solar energy in agricultural activities in the Northern Region Costa Rica through the use of energy solar thermal systems in thermosiphonic and forced, and the generation of power through a photovoltaic systems.

The selected production units include two dairy and two cheese manufacturing plants in the Northern Region of Costa Rica. The use of these systems allows us to achieve 30-50 percent of the production unit in electricity consumption.

In the case of the production of energy to heat water with solar system it generates froms 20 and 37 C<sup>0</sup>, per day. With these temperatures, over 50 percent of the energy required to raise the water temperature is provided. A total of 70 C<sup>0</sup> is demanded by the system for washing and sterilizing milking equipment and other types of equipment.

Furthermore, awireless recording data transmission equipment using thermal energy was installed to register the use of energy in the tanks as well as the energy production.

The results of correlation between solar energy production potential, electric bill, and the generation of hot water, for the months from May to November of 2015 and the mathematical models are shown to both systems.

This use of solar energy brings us to use sustainable production in Costa Rica, as well as a significant reduction in the carbon footprint in the animal production systems in the country.

**Horst Junker**  
Professor, IMBC GmbH, Germany

## **IT Supported Sustainability in Corporate Water Resource Management**

Since more than 20 years companies have to submit the postulate of sustainability. Because of the complexity of sustainability companies necessarily need comprehensive support by efficient information for remaining competitive taking sustainability into account even if water is an essential corporate resource. But such type of information systems are neither existing in practice nor are they treated scientifically anyhow. Merely, concerning sustainability mission statements and reporting knowledge and results are available. But this will describe but not actively support or force corporate sustainability. Sustainability is defined as the optimization of not only its three components (economy, environment, social issues) but also its mutual integration.

Corporate water information systems touch all departments in companies, they have a cross sectional character which can be supported by complex, strategic relevant information system only. Strategic information management suggests strategic situation analysis, strategic target planning, strategy development and strategic information system planning as sequence of process steps for developing corporate relevant portfolio of information systems. Precondition for an individual design of such a portfolio is the availability of a common sustainability target system. Therefore, it will be necessary to prepare a hierarchical target system for each of the three components of sustainability and to examine the relationships between all identified target elements in how far they are harmonic or whether it will be possible to harmonize them. By the availability of such a harmonized integrative sustainability target system precondition are given to develop sustainability corporate water information systems.



**Camilo Lesmes Fabian**

Professor, Universidad Santo Tomás Tunja, Colombia

**Carlos Andres Caro Camargo**

Dean, Civil Engineering Faculty, Universidad Santo Tomas Tunja,  
Colombia

&

**Ernest Blade i Castellet**

Professor, University Polytechnic of Catalonia, Spain

### **Drying and Transport Processes in Distributed Hydrological Modelling based on Finite Volume Schemes (IBER Model)**

The drying-wet process is one of the topics to be more careful in distributed hydrological modeling using finite volume schemes as a means of solving the equations of Saint Venant. In a hydrologic and hydraulic computer model, surface flow phenomena depend mainly on the different flow accumulation and subsequent runoff generation. These accumulations are generated by routing, cell by cell, from the heights of water, which begin to appear due to the rain at each instant of time. Determine when it is considered a dry cell and when considered wet to include in the full calculation is an issue that directly affects the quantification of direct runoff or generation of flow at the end of a zone of contribution by accumulations flow generated from cells or finite volume.

In IBER, wet-dry fronts are modeled, both stationary and non-stationary, that may appear in the domain working with a fixed finite volume mesh, and allowing volumes may have water or not depending on the flow conditions. Among the volumes that do not have water and those who do have water, appears a dry-wet front needed to treat properly from a numerical point of view to prevent the occurrence of instabilities and non-physical oscillations in the solution. For the treatment of dry-wet front, flood front, or front tide, appears a wet-dry tolerance  $\epsilon_{wd}$ , so that if the height of water in a cell is less than  $\epsilon_{wd}$ , it is considered that the cell is dry and is not included in the calculation

**Marcelo Machado Leao**

Post-doctoral, University of São Paulo, Brazil

**Giovanna Fachini Dellaqua**

MSc Student, University of São Paulo, Brazil

**Marta Helena Fillet Spoto**

Research and Professor, University of São Paulo, Brazil

**Márcia Ortiz Maio Marques**

Scientific Researcher, Instituto Agronômico of Campinas, Brazil

&

**José Otávio Brito**

Research and Professor, University of São Paulo, Brazil

### **The Potential of *Campomanesia phaea* (cambuci) as Natural Source of Vitamin C**

Bioprospecting molecules of native Brazilian flora enables the discovery of essential active principles to innovation in the market. The L-ascorbic acid (vitamin C), compound found naturally in fruits and vegetables, is widely used as an indicator of the quality of vegetables and foods during processing and storage.

The present study used the HighPerformance Liquid Chromatography to quantify the L-ascorbic acid in the fruit of *Campomanesia phaea* (cambuci) species. The purpose of the study was to evaluate the loss of vitamin C during the storage of the species *Campomanesia phaea* (O. Berg.) Landrum (cambuci) frozen pulp, comparing the pasteurized product with the one that was not submitted to a thermal treatment that has a restricted occurrence in the Atlantic Forest biome.

This study found a significant amount of L-ascorbic acid. The initial level of vitamin C showed to be 2 times higher than orange. The loss of vitamin C between cambuci freezing pulp thermally treated and in freezing pulp was measured during 90 days of storage. Both pulps presented significant decrease of vitamin C during the freezing storage, the pulp that was pasteurized evidenced higher loss.

The inclusion of fruit of *Campomanesia phaea* (cambuci) in the diet could be an alternative source to increased consumption of natural vitamin C, also encouraging the marketing of a fruit native to Brazil, providing employment opportunities and income increases to traditional communities, allowing a sustainable use of inputs from the Brazilian biodiversity.

**Phatu William Mashela**

Professor, University of Limpopo, South Africa

**Kgabo Pofu**

Researcher, University of Limpopo, South Africa

**Zakheleni Dube**

Researcher, University of Limpopo, South Africa

&

**Kagiso Shadung**

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## **Managing Phytonematicide Phytotoxicities in Tomato Production: The Dosage Model**

Nemarioc-AL phytonematicide, developed from fruits of wild *Cucumis* species, is highly effective in managing nematode population densities under different conditions. However, most similar highly effective phytonematicides cannot go beyond *in vitro* testing due to their inherent allelopathic effects on crops protected against nematode damage. The dosage model was developed to manage phytotoxicities of phytonematicides in various cropping systems. The objective of this study was to develop the dosage model for Nemarioc-AL phytonematicide on tomato crop production for managing root-knot (*Meloidogyne* species) nematodes. The Mean Concentration Stimulation Point (MCSP) was established by subjecting *M. incognita*-inoculated tomato plants to various concentrations of the phytonematicide. Significantly affected plant variables were subjected to the Curve-fitting Allelochemical Response Dosage (CARD) computer-based model to generate biological indices, with the first two ( $D_m$ ,  $R_h$ ) used to compute MCSP [ $D_m + (R_h/2)$ ]. The MCSP was used in the second trial to develop the application interval (T) using the life cycle of *M. incognita*. At harvest, significantly affected plant variables were subjected to lines of the best fit to generate the appropriate T for the applied MCSP concentration. Using the proportion of the crop cycle ( $T_{cc}$ ) to T, the application frequency ( $T_{af} = T_{cc}/T$ ) was derived and dosage (D) computed as:  $D = MCSP \times T_{af}$ . In conclusion, the model had been successfully validated under diverse environments to manage root-knot population densities without causing phytotoxicities to tomato crops.

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## **Managing Water for Tourism in the Phinda Private Nature Reserve, KwaZulu-Natal, South Africa**

Tourism is heavily dependent on a consistent sustainable supply of good quality water for tourism. Water is used in the tourism industry for domestic purposes such as hygiene, food and drink preparation as well as recreational activities such as swimming, water sports and snow making (Gössling *et al.*, 2012). Tourism in protected areas provides the opportunity for conservation initiatives to become financially viable this can however only be possible a consistent supply of good quality water is readily available. Changing weather patterns and persistent drought conditions in many part of southern Africa have necessitated the careful investigation of water as a critical resource for the sustainability of tourism. This study investigates the water sources, water quality and consumption rates of six tourism lodges located in the Phinda Private Game Reserve in KwaZulu-Natal, South Africa. The per capita consumption of water was also determined in order to provide benchmarks and guidelines for future water consumption and management. Alternative water sources such as rainwater harvesting and water production from humid air were investigated to determine if these could supplement existing supplies. The loss in potential income from the lodges is also calculated in order to determine what the indirect cost would be if lodges would need to be closed as a result of water scarcity. These calculations provide management with a decision making mechanism should the closure of certain lodges be inevitable.

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### **Effect of Varying Phosphorus Rates on Nodulation in Different Genotypes of Desi Chickpea (*Cicer Arientinum*).**

Phosphorus (P) is an important element in chickpea production as it enhances roots development. It also promotes legume nodulation which leads to biological nitrogen fixation (BNF). Inorganic nitrogen (N<sub>2</sub>) fertilizers are relatively expensive to poor resourced farmers. Introducing chickpea legume in cropping system to establish BNF through nodulation could be beneficial. Optimum rate of P is required to achieve maximum nodulation rate that suits each genotype. The purpose of the study was to evaluate the effect of phosphorus (0g/cm<sup>2</sup>, 18g/cm<sup>2</sup> and 30g/cm<sup>2</sup>) in nodulation potential in three genotypes (ACC#4, ACC#6 and ACC#8) of desi chickpea. The study was conducted at the School of Agriculture Experimental Farm (22°58'32"S, 30°26'45"E; 596 m above sea level) at the shed house. It was conducted in winter season. Seeds were inoculated with rhizobia. Factorial experiment was laid out in a complete randomized design and it was replicated 3 times. The data was analyzed using GENSTAT 17th edition and significant difference between the treatments will be determined at 5% level using LSD of the mean. Moderated rate of phosphorus had the positive effect on plant growth and yield biomass. Genotypes had no effect in yield biomass and in inducing nodulation; it was significant in flowering of the plants and in the number of pods. The interaction between the genotypes and different rates of P were not significantly different for the yield biomass. Different phosphorus rates were significantly different in nodulation. The number of nodules decreased with the increase in phosphorus rate. Different genotypes had no effect although ACC#6 performed better in growth development and yield biomass. Therefore it can be concluded that maximum development of nodules can be achieved at moderate (18 g/cm<sup>2</sup>) rate of P, and the genotype that is recommended at that rate is ACC #4. Future studies must be done in the field to evaluate the difference between pots experiment with field experiment so that the information can be useful for commercial farmers.

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## **How Can Proper Land Management Support the Conservation of European Butterflies?**

Large-scale land use changes that occurred in Europe in the twentieth century, in particular the intensification of agriculture and forestry as well as the abandonment of traditional grassland management, have resulted in a serious biodiversity decline across the continent. Butterflies are among the taxa the most negatively impacted by these changes. Nevertheless, appropriate management of butterfly habitats, applied at the small-scale of nature reserves or Natura 2000 sites, can help greatly in the conservation of these organisms, many of which are currently endangered in Europe. Based on an extensive literature review we provide practical recommendations for conservation-oriented management of butterfly sites. While specific actions may require profound knowledge of the ecology of focal species, generally applicable rules-of-thumb can easily be proposed. As vegetation succession is the most important threat to butterfly communities, there is a need for activities suppressing this process. Extensive grazing and rotational mowing, imitating the traditional ways of grassland use, serve optimally for this purpose. Both activities should be of low intensity and follow a mosaic design, in which different land fragments are successively used. Occasional habitat disturbances in form trampling by livestock and humans, or occasional small-area burning also proved to benefit many butterflies. Woodland species can be supported through maintaining open habitats within forests and thinning forest stands. Furthermore, harmful activities such as afforestation of open lands or drainage works must be stopped at butterfly sites in order to ensure their effective conservation. Details of the study can be found in Bubová et al. (2015; Journal of Insect Conservation).

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## **Low Cost Technique for Treatment of Iron Contaminated Water**

Iron has become one of the most troublesome water contaminants as various quantities of iron are present in water. This study focused on the use of Expanded Polystyrene as an artificial media for the removal of iron from raw water. The experimental set-up consisted of continuous flow process and the mechanism for iron removal was by adsorption. The water sample of known iron concentration was stored in a 50l container situated at an elevation of 4.4m above the floor and was connected to a plastic transparent container which contained the filter media "Polystyrene". Water released from the container flowed downwards and was forced to rise to the filtration container under capillary action. The filtered water was harnessed through a pipe located above the filtration container and subsequently tested for iron concentration. The effects of adsorbent dosage, contact time, pH and temperature were studied. Results showed that adsorption capacity increased with time and slightly with an increase in increase in temperature until 40°C when it began to decrease, suggesting favorable adsorption at medium temperatures. The equilibrium data were analyzed using Langmuir and Freundlich adsorption isotherms. The results showed that procedure was efficient in reducing iron concentration from about 5.0mg/l to 3.5mg/l in the water samples. Moreover, Adsorption processes which do not produce sludge are simple and require low initial capital and operating costs. Iron filtration using Polystyrene can therefore be a cost effective alternative to most widely used conventional methods due to simplicity and flexibility in design coupled with ease of operation. The use of the material would also offer an avenue for recycling polystyrene widely used in packaging of equipment.

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## **Environmental Performance Indicators of Canned Sweet Corn Industry**

Environmental problem is the global issue which many countries around the world pay attention to and realize its impacts on the earth. Thailand is also the one of those paying attention to the environment. Solving the environmental problems requires assessment and indicator setting with the purpose of consumption reduction, which helps to directly decrease impacts on the environment. The research is to study how to determine proper environmental performance indicators (EPIs) in agricultural industry based on case study of canned sweet corn. Life cycle assessment (LCA) methodology is used to evaluate the impacts, consider percent contribution to each affected impact categories, as well as assess sensitivity analysis. Global warming, water, acidification and eutrophication are also those 4 impact categories. In this study, the functional unit is a 12-oz can of sweet corn and scope of the study starting from cultivation until production is defined from cradle to factory gate. The study shows that production process of 1 canned sweet corn releases 333 gCO<sub>2</sub>eq, 0.422 m<sup>3</sup> of water, 1.73 gSO<sub>2</sub>eq and 0.02 gP<sub>eq</sub> to the environment and proper environmental performance indicators for this industry are the amount of nitrogen (N) and phosphorus (P) fertilizer, yield, weight of can, quantity of biomass fuel for high-pressure steam production, quantity of waste water and BOD (Biochemical Oxygen Demand) and the amount of electricity for production process.



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## **Process Maturity Assessment of Water Consumption in the Wine Industry**

In the desert region at the foot of the Andes, the water is a very scarce resource. But water is an essential production factor in the wine production, one of the most important industries in this region. Fermentation processes of wine must not exceed certain temperatures. Water is used for cooling and for this much water is wasted.

One of the aims of the project described in this paper is to introduce an instrument with which the water consumption in the production processes can be monitored and reduced. In addition to the classical business process instruments the maturity assessment of processes has proven a very useful tool.

It evaluates the performance of processes through a structured, transparent approach. Assessors examine systematically selected processes based on predefined performance criteria. The result of this analysis is the process maturity of the company.

But for practical use, a very pragmatic approach is to be developed for the project described. It aims to ensure technical correctness, and must be able to be easily and quickly inserted into the wine production companies.

Therefore, the implementation of maturity determination has to be based on international standards for the evaluation (assessment) of business processes, such as CMMI. But it has to be adapted to environmental requirements. For this purpose, the business processes are compared with a reference model.

The process dimension defines all the processes that exist within the field of view. Each process contains activities and products. The defined processes are divided into process categories, each covering an area of responsibility.

In the capability dimension, the evaluation criteria (environmental characteristics) are stored and assigned to defined maturity levels. The achieved criteria define the maturity of the processes.

The full paper explains how the maturity level for water consumption is to be determined concretely. It also shows which results are to be expected and what conclusions can be drawn from the results.

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### **From Design-by-Doing to Co-Designing: An Exploratory Case Study with a Beehive Producer**

Designing is an innate ability to humans, and in hands-on professions like farming, this activity is even more evident and in some cases essential: from customized tooling to pruning, from crop selection to adapting and repurposing practices; in some way or another we can observe some kind of “design-by-doing” activities. One may argue that when the farmer generates new artifacts or adapts existing ones, this cannot be considered a design practice, at least in most cases it certainly is not done with the methodological approach that is employed by a professional designer. The objective of the design approach is to research through methods that differentiate in actions, tools and strategies applied to investigate and develop strategic design approaches to everyday problems. Understanding artifacts and solutions developed by non-designers requires careful analysis in understanding its experimental behavior and their peculiar ability to design.

In this paper we intend to present a case study of a Turkish Beekeeper from the Aegean region with an engineering background that has been “designing” a new polystyrene beehive for more than 25 years, mostly in a trial-error exercise that resulted into a large number of functional prototypes. Although the beehive in question has been perfected constantly over time and presents itself as an alternative with many advantages to the traditional wood hives, it seems to be having difficulty in penetrating the local market in a convincing way. Difficulties in promotion and convincing beekeepers to shift to this new technology and the inability to meet the specific legislation may be some factors contributing to this fact.

The goal is to, with field research and interviews, map the beekeeper's design activities and analyze his methodological approach to discover the factors that motivated the need for constant change. In a second phase we aim to cross these findings with the problem solving approach of professional designers and their methodological way of doing. The objective is not only to see the problem/opportunity merely from the technology transfer perspective but to get a broader understanding of the metasystem of beekeeping and look to ideate *designerly* solutions that fit the market's needs, based on a broad understanding and not one a focused one.

Our approach and method is to support eco-innovation in beekeeping with co-designing approach. We believe that co-designing approach that crosses the beekeepers empirical knowledge with the *Designerly Ways* of problem solving will produce a more strategic and systematic approach to the challenges beekeeping is facing, looking to contribute to a more sustainable reality.

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**Spatial Variability of Ca and Mg in Pine Areas of the Forest  
Institute of Batatais - SP**

This study aimed to analyze the spatial variability of calcium (Ca) and magnesium (Mg) in *Pinus* sp. cultivation, in the Forest Institute of Batatais, São Paulo State, Brazil. For mapping these nutrients, soil samples were collected at depths of 0 to 0.2 m and 0.2 to 0.4 m, using Dutch auger. It was measured the diameter at breast height (DBH) and height of each pine tree. The average values of Ca element ( $\text{mmol}_c/\text{dm}^3$ ) ranged from 2.55 in the layer of 0-0.2 m depth and 2.3 at 0.2-0.4 m depth; and 1.40 and 1.13 for Mg, respectively. In relation to the Mg content, the same situation occurred: with Mg levels from 4 to 5  $\text{mmol}_c/\text{dm}^3$  in depths of 0 to 0.2 m and from 3 to 4  $\text{mmol}_c/\text{dm}^3$  in the 0.2-0.4 m layer, the trees had higher height and DAP means. The Ca and Mg are concentrated in high and flat regions of the area. For the characteristics of this study, the sites of highest concentrations of Ca and Mg had greater development of trees of *Pinus* sp.

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**Intergeneric Grafting of Nematode-Susceptible  
Watermelon Cultivars on Nematode-Resistant Wild  
*Cucumis* Species: A Success Story in Nematode  
Management**

Intergeneric grafting between plant genera within the same family results in incompatibilities characterised by low survival ratios due to unequal stem diameters. Intergeneric grafting procedures between the highly nematode-susceptible *Citrullus* cultivars and the highly nematode-resistant indigenous *Cucumis* genus were developed to equate the stem diameters, with survival being as high as 100%. The objective of this study was to investigate the performance of the intergrafts with respect to whether nematode-resistant *Cucumis* seedling rootstocks would retain their nematode-resistance status to *M. incognita* and *Citrullus* intergrafts would retain their productivity under field conditions. Treatments, namely (a) ungrafted watermelon, (b) watermelon onto *C. africanus* rootstock and (c) watermelon onto *C. myriocarpus* rootstock, were each inoculated with 6000 eggs and second-stage juveniles of *M. incognita*. Relative to ungrafted watermelon cultivars, grafting cv. 'Congo' on *C. africanus* and *C. myriocarpus* reduced the reproductive potential of *Meloidogyne* species by 92-93%, whereas for cv. 'Charleston Gray' the reduction was by 94-96%. Similarly, root galls were reduced by 94-96% and 90-98% for cv. 'Congo' and cv. 'Charleston Gray', respectively. Intergeneric grafting improved early flowering and higher fruit yield than in controls for both cultivars. In conclusion, nematode-resistant *Cucumis* seedling rootstocks invariably retained their non-host capabilities to *Meloidogyne* species, while intergeneric grafting improved the productivity of the two *Citrullus* cultivars.

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## **Analysis of the Current Land Degradation Sensitivity Areas in Europe using the DISMED Framework**

Land degradation, similar to desertification if the process occurs in dryland systems, is presently a global environmental threat with drastic consequences related to agricultural productivity decrease, biodiversity loss and ecosystem collapse. This paper aims to deliver new results on current land degradation sensitivity levels in the Mediterranean and central south-eastern regions of Europe, which are known to be the most severely threatened European areas by this environmental issue. The study focuses on 14 states included in Annex IV (Northern Mediterranean) and Annex V (Central and Eastern Europe) of the United Nations Convention to Combat Desertification, which were also part of the DISMED (Desertification Information System for the Mediterranean) project, developed by the European Environment Agency in the early 2000s. This approach attempts to improve the initial DISMED results by updating the SDI (Sensitivity Desertification Index), computed based on three biophysical parameters that determine land sensitivity to degradation, i.e. Climate Quality Index, Soil Quality Index and Vegetation Quality Index. By replacing the initial Climate Quality Index with a new one, based on recently available climate data of high spatial resolution, superior to the initial data set, it was found that in southern and central south-eastern Europe there are lands of high and very high sensitivity to degradation totaling over 400000 km<sup>2</sup>, or ~25% of the total study area of ~1.7 mil km<sup>2</sup>. The results are alarming considering the fact that they exceed the initial estimations of the DISMED project by 75% (~178000 km<sup>2</sup>). In terms of states, while Spain is the continent's most important desertification exposure hotspot, there are also major concerns for other countries such as Greece, Bulgaria, Italy and Romania. The new results can serve as a solid support in the implementation of appropriate measures for fighting the negative effects of desertification.

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## **Economic Mechanism of Agro-Industrial Complex Sustainable Development**

The agroindustrial complex (AIC) is one of the main economic sectors in every country, its efficiency and stability is one of the factors, which affect living standards, economic growth, food supply security and export possibility of products made. Agriculture of the Russian Federation is a main part of gross domestic product, with 3.5% share in 2014, while food and agricultural products export allowed to earn 18.9 billion dollars in this period. But efficiency of AIC enterprises and farms work stands at insufficiently high level and requires reasonable reforming.

Therefore, it becomes an important task to determine the notions of "Economic mechanism of agro-industrial complex sustainable development", participants of this process and its determining factors. There is no consensus about the definition of "mechanism" notion in the economic literature. The analysis revealed that such n is considered either as a process with appropriate forms, methods and institutions as subjects of an activity (Culmann, 1988; Abalkin, 1973;) or as a system with interfacing components (Osipov, 1994) or as games (Hurwicz, 1960; Myerson, 1981; Maskin, 1999).

The research is aimed to specify the definition of "economic mechanism of agro-industrial complex sustainable development" notion. All participants (both direct and indirect) of operation process realize their own interests. Economic activity is impossible without realization of its participant's interests or with absence of these interests. Inside the economic mechanism of AIC functioning the participants realize not only economical (which are predominated) but also social, cultural, ecological and other interests. In research are considered the interests of direct and indirect participants of production process in AIC, the degree of its realization, which is influenced on by both internal and external factors, the conditions wherein the operation are performed.

The result of the research is not only the specification of the notion "economic mechanism of agro-industrial complex sustainable development" definition, but also the determination of the subjects (participants) of this mechanism, both with factors and conditions, which directly influence on its operation. Thereupon the recommendations of effective and stable development of agriculture and process industries will be developed.

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**Screening of Local Jordanian Purslane (*Portulaca oleracea*  
L.) Accessions under Saline Soil Conditions**

Eight accessions of Jordanian Purslane (*Portulaca oleracea* L.) landraces were evaluated during 2014/2015 growing season at Al-Karamah research station in Jordan Valley under saline soil conditions (12.6 dS m<sup>-1</sup>). Seeds of the eight accessions were sown at rate of 20 gm per 100 m<sup>2</sup> and irrigated with (2.5 - 3.0 dS m<sup>-1</sup>) irrigation water. The aerial parts were harvested once every 10 day and for 7 times. The results showed that there were variations between the tested accessions in total (accumulated) yield, shoot, stem, leaf and root fresh and dry weights. The accumulated yield of accession No. 2 was the highest and reached 50.8 kg m<sup>2</sup> with no significant differences with production of accessions number 1,3,4 and 8. Leaf fresh weight was the highest in accession No. 3 (102.7 gm plant<sup>-1</sup>) with no significant differences with those produced from accessions No. 2, and 8, and the maximum stem fresh weight was produced from accession No. 2 (160.4 gm plant<sup>-1</sup>), with no significant differences with those produced from accessions No. 1,3,4 and 8). In all accessions, leaf to shoot fresh weight ratio ranged from 37.3 to 44.4% and stem to shoot fresh weight ratio from 55.6 to 62.7% with no significant differences between the accessions. The largest root fresh weight was produced from accession No. 2 with significant differences with all other accessions. The longest root length was observed in accession No. 3 (29.3 cm) with no significant differences with those of accessions No. 2, 4, and 7, while the highest plant was produced from accession No. 4 (35.7 cm) with no significant differences produced by accession No. 7. Root to shoot ratio was ranged from 1% in accession No. 1 to 3.3% in accession No. 2. Our results showed that the variations in total yield, shoot, leaf and stem fresh weights between the tested accessions were strongly affected by accessions collected area,



and those collected from regions with similar soil conditions were more adopted to our experimental growing conditions as compared with other accessions.

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**Definition of a System of Indicators for the Sustainability  
Assessment in the Production of Construction Materials in  
the Region of Boyaca, Colombia**

In the construction sector, the recent research has been focused in the production of inexpensive, stronger and more durable materials. However, because of the new global issues like the climate change and the depletion of natural resources, the scientific community has evaluated the production of materials taking into account the concepts of sustainable development. In general terms, the production of construction materials includes processes like extraction of raw materials, the production of the materials, and finally the transportation of the raw materials, the required supplies and the final products. All these processes have potential environmental impacts and the mitigation of these impacts requires the definition of a more sustainable system of production. Within the environmental impacts there are physical and chemical changes in the soils, aquifers and surface water, with emissions of particulate matter and gases, and generation of noise and vibrations. In addition, the production system generates social and economic impacts in the local context. Therefore, the sustainability evaluation of the production system is crucial to understand the system and the potential environmental impacts in order to define a mitigation plan. For this purpose, this research makes a sustainability assessment using a system of indicators which evaluates the environmental, economic and social characteristics of the system taking into account different types of production units and important changes in the environmental regulations which played a role in the mitigation of the environmental impacts. The selected case study was the brick production in the region of Boyacá Colombia, which is considered as one of the most critical production systems, because of the high

environmental impact generated by the kilns, and the social and economic importance for the many families in the rural areas which depend on this economic activity. As a result, this research presents the system of indicators to evaluate the sustainability of the brick production system and its application in the study case. This research was funded by the Research Unit and the Civil Engineering Faculty of the Saint Thomas University Sectional Tunja (Universidad Santo Tomas Seccional Tunja).

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### **Xilem Anatomic Changes in Grafted Tomato**

The use of grafting in vegetables like tomato has expanded due to its effect on increasing the water consumption capacity, intake nutrients and tolerance to adverse factors in the soil. However, these advantages depend on the adequate reestablishment of the vascular system in the grafted plant. The aim of this investigation was to study the anatomic xylem characteristics of tomato plants around the grafting point on 10 hetero-grafted (scion/rootstock) combinations, made with the commercial hybrids Juan Diego and Cid with four native selections and a commercial rootstock (Maxifort). Additionally, two self-grafted and two non-grafted plants of the hybrids were evaluated. Tissue samples were obtained from grafted plants 14 days after the grafting in both, scion and rootstock, as well as from non-grafted plants. With a microscope (400x magnification) were assessed the frequency and size of xylem vessels and there were estimated the relative conductivity and the vulnerability index. A complete randomized design with 5 replications was used. In each replication four subsamples were observed. Grafting modified the xylem anatomy because the rootstock and the scion decreased the size and frequency of the xylem vessels with respect to the non-grafted plants. The scion xylem vessels showed larger size, area and roundness index relative to the rootstock's. Maxifort showed larger size vessels relative to some native selections, but did not exceed the non-grafted plants'. There were not differences in vulnerability index and relative cavitation among rootstocks. In non-grafted plants, Juan Diego showed larger vessel area and roundness index than Cid's and in self-grafted plants the vessel frequency of Cid decreased in smaller proportion. Cid and Juan Diego employed as scions showed a decreased vessel size. In addition, Juan Diego showed a larger roundness index. The vessel frequency was not modified in

Juan Diego due to the grafting effect; however, Cid decreased its frequency and increased its vulnerability index. The rootstock/scion interactions should be evaluated carefully due to the detected xylem vessel modifications detected.

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## **Inbreeding of the Synthetics derived from Three-Way Line Maize Hybrids**

In México, some of the farmers who have grown three-way line maize (*Zea Mays* L.) hybrids (TWLHs), to save the cost of the hybrid seed, grow their advanced generations later on. Although the resulting population ( $Syn_T$ ) may be viewed as the synthetic variety (SV) that would be formed by randomly mating the lines ( $Syn_L$ ) that are parents of such hybrids, its inbreeding coefficient (IC) and thereby the genotypic mean may be different relative to  $Syn_L$ 's. This issue has been studied but only for TWLHs derived from fully inbred lines. The objective of this study was to derive the inbreeding coefficient of the  $Syn_T$  ( $FSyn_T$ ). It was supposed that the  $Syn_T$  was derived from the random mating of  $t$  TWLHs derived from  $3t$  unrelated lines whose inbreeding coefficient is  $F$  ( $0 \leq F \leq 1$ ). Each TWLH was represented by a random sample of  $m$  plants taken with replacement from its genotypic array. It was found that if  $1 \leq m \leq 8$ ,  $FSyn_T = [7 + (m - 1)(2 + 3F)] / (14tm)$ , whereas for  $m > 8$ ,  $FSyn_T = 3(1 + F) / (16t)$ . Since  $FSyn_L = (1 + F) / (3t)$ ,  $Syn_T$  and  $Syn_L$ , strictly, must be two different SVs,  $FSyn_T > FSyn_L$ , and thereby the genotypic mean of the  $Syn_L$  must be larger than the  $Syn_T$ 's. To explain this result it has to be considered that the  $Syn_L$  and  $Syn_T$  parents are  $3t$  and  $t$ , respectively, and those  $Syn_L$  includes more interparental crosses; in addition, whereas the gene frequencies of the lines are balanced in the  $Syn_L$ , in the  $Syn_T$  they are not.

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**Accumulation and Metabolism of Amino Acids and  
Phenolic Compounds in Biochemical Plant Responses  
against Different Species of Herbivorous Arthropods**

Amino acids and phenolic compounds play different roles in plant metabolism and biochemical defence against herbivorous arthropods. Amino acids are primary metabolites limiting the nutritive value of plant tissues for phytophagous insects, therefore secondary phenolic metabolites are generally regarded as defensive molecules.

The study was aimed at comparing the changes in the content of free amino acids, phenols and the activity of such key enzymes of biosynthesis of phenolic compounds as: l-phenylalanine ammonia-lyase (PAL) and l-tyrosine ammonia-lyase (TAL) caused by two piercing-sucking arthropods: the grape mealybug (*Pseudococcus maritimus* Ehrh.) and the two-spotted spider mite (*Tetranychus urticae* Koch) in the leaves of orchid and strawberry, respectively. The results showed that the amino acid content and the ratio of amino acids to total phenols were increased in both plant species infested by the mealybug and the mite. However, these changes were weakly dependent on changes in the activity of the analysed enzymes. Enzymatic changes rather affected the

accumulation of total phenols, because the induction of PAL activity in mealybug-infested orchid leaves during the first five hours, preceded the increase in total phenolics during the first week of insect feeding, while the increased activity of TAL was accompanied by elevated levels of phenolic compounds in the leaves of strawberry infested by mites. Mechanisms of biochemical plant responses against infestation with different herbivorous arthropods are discussed.



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## **Genetic Divergence in Domesticated and non-Domesticated Gene Regions of Barley Chromosomes**

There is no information available on the effect of nature selection pressure acting on the chromosome region with domesticated and non-domesticated genes in the process of barley domestication. The objective of our study is to examine the effect of nature selection on shaping the genetic diversity of the chromosome region with domesticated and non-domesticated genes in barley using SSR markers. Comparison of the level of genetic diversity loss between wild and cultivated barley for each chromosome showed that chromosome 5H had a highest divergence of 35.29%, followed by 3H, 7H, 4H, 2H, 6H. The variable ratio of the domesticated regions on 5H, 1H and 7H was higher than those of non-domesticated regions. The variable ratio of the domesticated region on 2H and 4H is similar to that of non-domesticated region. However, variable ratio of the domesticated region on 3H is lower than that of non-domesticated region. The difference of averaged diversities between wild and cultivated populations of domesticated regions among six chromosomes was 33.73%, and the undomesticated regions' diversity difference was 27.56%. The outcome of this study will enhance our understanding of the impact of selection at different barley chromosomes during crop domestication.

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### **Effects on Nutrient Contents of Fenugreek (*Trigonella foenum-graecum* L.) of Different Organic Materials and *Rhizobium meliloti* Strains**

This study was carried out to determine the effects of various fertilizer sources and *Rhizobium* bacteria inoculation on the nutrient contents of fenugreek (*Trigonella foenum graecum* L.) under irrigated conditions in 2011 and 2012 spring periods. Field trials were conducted at randomized complete block split plot design with three replications on the experimental area of Yuzuncu Yil University, Agricultural Faculty. As factorial, four different fertilizer sources (control, humic acid, aluminium silicat and organic (B5A) fertilizer), three *Rhizobium* bacteria inokulants (No.1, No. 22 and No. 760).

In the study, macro and micro nutrients element rations of fenugreek seed were investigated. It was determined that was effected significantly of nutrient elements contents such as Ca, Fe and Cu except N, K, Zn and Mn by fertilizer applications. Also, it was found significant statistically effects on Mn content while it was found insignificant effects on N, K, Ca, Fe, Zn and Cu content of seed of *Rhizobium* inoculations.

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## **Employing Contingent and Inferred Valuation Methods to Evaluate the Preservation of Olive Groves and of the Associated Ecosystem Services in the Andalusia Region**

Olive groves in Andalusia region are recognized for their significant ecological, cultural, social and economic value. Traditionally, olive crops have been under a rain-fed extensive regime of production but recently many olive farmers shifted to integrated or to organic production while a great number of them abandoned olive farming as there were unable to adjust to the requirements of Common Agricultural policy (CAP) for 'greener' production. Overall CAP initiatives succeeded to raise farmers' environmental awareness but failed to change farmer's mentality towards perceiving agriculture as an ecosystem that is closely linked to the surrounding ecosystems as part of the greater landscape. This perception is even more imperative when landscape includes both farming and natural systems, as in the present case study.

Considering the multidimensional role of olive-grove landscapes in Andalusia and the provision of ecosystem services (ES), the present study explores how people perceive the conservation of an olive agro-ecosystem interspersed with semi-natural and natural ecosystems within a Natural Reserve. Using the contingent and the inferred valuation methods we performed a field survey on the Natural Reserve as well as on the olive crops of the area. The study aims to identify the socio-economic factors that affect willingness to pay (WTP) for the olive crops' conservation and specify the priority that people place on ES. All the specified models show that respondents who rate high cultural and regulating ES are more likely to pay for a preservation plan. WTP is found to be positively and statistically significantly correlated to the ES appreciation. The contingent method reveals that the mean WTP is 31.33€/year/household while the inferred method concludes to a slightly higher WTP, of 37.93€/year/household. Current land prices may be adjusted according to our study's outcome by including the shadow price, i.e. WTP that people place on certain ES. Enhanced land prices may be incorporated in the sustainable management plan of the

region which attempts that the trends of intensification or abandonment will be softened while at the same time ensuring rural development and social cohesion.

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**The Polluter Pays Principle and Soil-Water Conservation -  
Potencial Erosion Study of Uberaba River Watershed,  
Brazil**

This work has the scope to evaluate the polluter pays in Brazilian Law and in the regulatory concepts and principles, and also, in the technical concepts, especially of Soil Science, more specifically the accelerated erosion in a phenomenon which results in soil losses and water quality degradation. Those degraded areas can be evaluated in multidisciplinary concepts of the various areas of human knowledge. The aim is to also demonstrate the importance of the mentioned legal principle in soil and water conservation ensuring sustainable development and ecologically balanced environment for both uses. The study is developed at Rio Uberaba Watershed, through the diagnosis of the land use and land degradation in a geographic information system (GIS) and statistical analyses. The result showed the existence of 905 km<sup>2</sup> in degraded area, demonstrating an environmental damage. In environmental Brazilian law, the polluter pays principle is enacted to make the responsible human for producing pollution responsible for paying for the damage done to the natural environment.

**Li-Sen Young**

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## **Dissemination of Rice Endophytes into Rhizosphere under Gnotobiotic P-stress**

Phosphorus (P) in soil is often bound to calcium, ferrous, magnesium and/or aluminum in clay particles that are insoluble and unavailable to crops. Therefore, it is important to study P absorption and transport to improve P assimilation efficiency in plants. Endophytic bacterial strains are ubiquitously distributed in most plant species and many have been shown to exert P-solubilization activity, which is beneficial to plants (Young et al., 2013). Plant-probiotic endophytes previously presumed to disseminate and colonize rhizosphere to accelerate specific plant growth-promoting or biocontrol effects, which could be of great advantage for the host (Hartmann et al. 2009). A short-term gnotobiotic P stress experiment under acidic condition was performed by using two different cultivars of rice (TCN1 and TK8) to investigate the possible transformation of endophytes into rhizobacteria. Our results suggest that rice cultivars consistently deployed a steady rhizobacterial community that includes P-solubilizers, irrespective of the presence or absence of P. TCN1 found to deploy predominantly P-solubilizing *Acidovorax* sp., whereas TK8 established P-solubilizing *Burkholderia* sp. in soluble P and insoluble P treatments. TCN1 mainly deployed P-solubilizing *Xanthomonas* sp., whereas TK8 deployed P-solubilizing *Paenibacillus* sp. during no P treatments. Inoculation of P-solubilizing bacteria has been reported to increase P-solubilization as well as rice growth (Panhwar et al. 2014), which may partially explain the rhizospheric deployment of P-solubilizers by rice.

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**Eudaimonian Questions:  
On the “Moral Tragedy” of Climate Change**

A number of influential thinkers have recently emphasised the “moral tragedy”, and more broadly, the troubling ethical dimensions, of climate change and our putative role in its acceleration. For example Thomas Hill Jr. argues that “barring special explanation, we can expect that virtuous persons will value nature for its own sake – at least they will not regard the natural environment merely as a means to human welfare or as something whose treatment is constrained only by human rights, for example, property rights.... why it is good to value certain natural phenomena for their own sakes and to recognise and respond appropriately to the value they have, in a sense, independently of human rights and welfare. (2006, pp.332-333) Others like Julia Annas have emphasised virtues such as courage, generosity and fairness as parts of a flourishing life in and among other beings, in and among ecosystems. This paper will examine such questions: 1) what does it mean to “value nature for its own sake”? 2) Why ought human beings to value it as such? 3) What constructive role, if any, does eudaimonian ethics play, and can such an ethics provide a non-egoistic account of the right course of deliberation and action?

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## **Detecting the Effect of Elevation Gradient on Plant Demography and the Impact of Climate Change on Shifts in Elevation Distribution 20 Years Data**

Demographic rates of plants commonly vary along elevation gradients due to the associated gradients in temperature, precipitation and other factors. However, there is little information yet on how such spatial trends may be changing temporally under the influence of recent climate change. Detection of change would be a positive test of the hypothesis that plants are responding to climate change through changes in demographic rates, shifts in elevation distribution, or both. Towards this end, we provide a detailed analysis using measurements of diameter at breast height (dbh) of all woody plants (32 genera) with  $\text{dbh} \geq 5$  cm from 716 1-ha permanent plots in eastern China between 1989 and 2009 at 5-year intervals. We calculated the relative growth rate of each stem, as well as the recruitment rates of new trees into the  $\text{dbh} \geq 5$  cm class for each plot for every 5-year interval to examine the growth and recruitment rates along the elevation gradient and the responses of these elevation-related patterns to regional climate change. Further, we calculated elevation migration as the rate of change of the mean of the elevation distribution of trees of each of 32 genera during the period from 1989 to 2009. Our objective was to detect changes that might be due to climate change over that period.

We found significant strong negative relationships between relative growth rate with elevation for all the 5-year intervals (1989-1994; 1994-1999 and 2004-2009), though the relationship for the interval 1999-2004 was weak. Relative recruitment rate significantly decreased with elevation gradient between 1989 and 1999, but there appears to be no relationship since 1999, possibly due to the impact of rising temperature over that period. We found elevation shifts occurred during the past 20 years and that genera with lower growth rates and higher recruitment rates tended to migrate greater elevation distances.