



THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book:

5th Annual International Forum on
Water

10-13 July 2017, Athens, Greece

Edited by
Gregory T. Papanikos

2017

Abstracts
5th Annual International Forum
on Water
10-13 July 2017, Athens, Greece

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Preface

This book includes the abstracts of all the papers presented at the *5th Annual International Forum Water, 10-13 July 2017*, organized by the Athens Institute for Education and Research (ATINER).

In total 41 papers submitted by over 50 presenters, coming from 23 different countries (Belgium, Benin, Brazil, Bulgaria, Cameroon, Canada, Chile, China, Costa Rica, Egypt, Israel, Lithuania, Mexico, Pakistan, Romania, Russia, Saudi Arabia, South Africa, South Korea, Spain, Turkey, UK and USA). The conference was organized into 14 sessions that included a variety of topic areas such as marine ecology, water supplies and more. A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER 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 to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into seven research divisions and 37 research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

5th Annual International Forum on Water
10-13 July 2017, Athens, Greece
Organizing and Academic Committee

All ATINER's conferences are organized by the Academic Committee (<https://www.atiner.gr/academic-committee>) of the association.

This conference has been organized with the additional assistance of the following academics, who contributed by chairing the conference sessions and/or by reviewing the submitted abstracts and papers:

1. Gregory T. Papanikos, President, ATINER.
2. Chansheng He, Professor and Director, Lanzhou University, China.
3. Janusz Zwiazek, Professor, University of Alberta, Canada.
4. Sinan Ogun, Academic Member, ATINER & Head, RR Research & Development Ltd., Turkey.
5. Tala Awada, Professor and Associate Dean of Research, University of Nebraska-Lincoln, USA.
6. Anisul Islam, Professor, University of Houston-Downtown, USA.
7. Monif AlRashidi, Dean of Scientific Research, University of Ha'il, Saudi Arabia.
8. Carlos Enrique Guanziroli, Professor, Fluminense Federal University, Brazil.
9. Stefan Gandev, Associate Professor, Fruit Growing Institute, Bulgaria.
10. Ofir Degani, Research Group Leader, Molecular Phytopathology Lab, Migal - Galilee Research Institute, Israel.
11. Muhammad Farooq Hussain Munis, Assistant Professor, Quaid-i-Azam University, Pakistan.
12. Christos Tachtatzis, Lecturer - Chancellor's Fellow, University of Strathclyde, UK.
13. Vassilis Skianis, Research Fellow, ATINER.
14. Olga Gkounta, Researcher, ATINER.
15. Hannah Howard, Research Assistant, ATINER.

FINAL CONFERENCE PROGRAM
5th Annual International Forum on Water,
10-13 July 2017, Athens, Greece

PROGRAM

Conference Venue: Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece

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

Monday 10 July 2017

08:00-09:00 Registration and Refreshments

09:00-09:30 (Room B-10th Floor) Welcome and Opening Address

Gregory T. Papanikos, President, ATINER.

**09:30-11:00 Session I (Room B-10th Floor):
Plant Production I**

Chair: Olga Gkounta, Researcher, ATINER.

1. Tala Awada, Professor and Associate Dean of Research, University of Nebraska-Lincoln, USA, Rae-Landa Gomez-Pond, Graduate Student, University of Nebraska-Lincoln, USA, Harel Bacher, Graduate Student, University of Nebraska-Lincoln, USA, Sruti Das Choudhury, Research Assistant Professor, University of Nebraska-Lincoln, USA, Harkamal Walia, Associate Professor, University of Nebraska-Lincoln, USA, Yufeng Ge, Assistant Professor, University of Nebraska-Lincoln, USA & Vincent Stoerger, Plant Phenotyping Facility Manager, University of Nebraska-Lincoln, USA. High Throughput Plant Phenotyping Application in Addressing Current and Emerging Issues in Agricultural Research.
2. Janusz Zwiazek, Professor, University of Alberta, Canada & Xiangfeng Tan, Graduate Student, University of Alberta, Canada. Aquaporins and Oxygen Transport in Plants: Consequences for Waterlogging Tolerance and Crop Productivity.
3. Stefan Gandev, Associate Professor, Fruit Growing Institute, Bulgaria. Performance of the Apple Cultivars 'Braeburn' and 'Granny Smith' on M9 Rootstock, Trained to the Systems Slender Spindle, Solen and Vertical Axis.
4. Dongdong Qiu, PhD Student, Beijing Normal University, China. The Effective Retention and Germination Mechanism of the Suaeda Salsa Seeds under the Effect of Tides in a Chinese Intertidal Salt Marsh.

**09:30-11:00 Session II (Room C-10th Floor):
Animal Production**

Chair: Vassilis Skianis, Research Fellow, ATINER.

1. Christos Tachtatzis, Lecturer – Chancellor's Fellow, University of Strathclyde, UK, Craig Michie, Reader, University of Strathclyde, UK & Ivan Andonovic, Professor, University of Strathclyde, UK. Cloud-based Animal Health Service Provision.
2. Jonas Jatkauskas, Senior Scientist, Lithuanian University of Health Sciences, Lithuania & Vilma Vrotniakiene, Senior Scientist, Lithuanian University of Health Sciences, Lithuania. Using Various Lactic Acid Bacteria Inoculants during Ensiling Different Forages towards Fermentation, Nutritive Value and Aerobic Deterioration.
3. Gulsah Kanbur, Researcher, Selcuk University, Turkey, Yusuf Cufadar, Professor, Selcuk University, Turkey & Rabia Gocmen, Research Assistant, Selcuk University, Turkey. Effect of Different Sources and Levels of Zinc on some Tissues Mineral Concentration in Laying Hens.
4. Kingsley Agbor Etchu, Director, Scientific Coordinator for Animal Production and Fisheries, Institute of Agricultural Research for Development (IRAD), Cameroon, Julius Enow Tabot, Researcher, Institute of Agricultural Research for Development (IRAD), Cameroon, Annabella Abongwa Ngengwi, Researcher, Institute of Agricultural Research for Development (IRAD), Cameroon & Olivier Sandra Ghomsi, Head of Poultry Unit, Institute of Agricultural Research for Development (IRAD), Cameroon. Reproductive Performance of Rabbit Does Fed Moringa Oleifera Leaf Meal (Molm) as a Protein Substitute to Soya Bean Meal.

**11:00-12:30 Session III (Room B-10th Floor):
Agricultural Social Sciences**

Chair: Tala Awada, Professor and Associate Dean of Research, University of Nebraska-Lincoln, USA.

1. Anisul Islam, Professor, University of Houston-Downtown, USA. Bangladesh Trade with India-Trends and Patterns.
2. Carlos Enrique Guanzioli, Professor,

**11:00-12:30 Session IV (Room C-10th Floor):
Marine Ecology**

Chair: Christos Tachtatzis, Lecturer – Chancellor's Fellow, University of Strathclyde, UK.

1. Gad Degani, Professor, MIGAL, Israel. Building a Model Based on the Morphology, Biology, Behaviour and Life Cycle of *T. v. Vittatus* Adaptation.

<p>Universidade Federal Fluminense, Brazil. Family Farming in Brazil: Evolution between the 1996 and 2006 Agricultural Censuses.</p> <p>3. <u>Shehu Folaranmi Gbolahan Yusuf</u>, Senior Lecturer, University of Fort Hare, South Africa, Olubunmi Oluwaseun Popoola, PhD Student, University of Fort Hare, South Africa & Nomakhaya Monde, Dean, Faculty of Science and Agriculture, University of Fort Hare, South Africa. Perception to Climate Change and Impact on Agricultural Productivity: An Assessment of Smallholder Farmers in Amathole District Municipality, Eastern Cape Province, South Africa.</p>	<p>2. Jerome Canei, PhD Student, Université de Mons, Belgium. Sandy Substrates: Morphological Adaptations of <i>Heteroconger hassi</i> (Congridae) & <i>Ammodytes tobianus</i> (Ammodytidae).</p>
<p>12:30-14:00 Session V (Room B-10th Floor): Pastoralism</p>	<p>12:30-14:00 Session VI (Room C-10th Floor): Water I</p>
<p>Chair: Anisul Islam, Professor, University of Houston-Downtown, USA.</p>	<p>Chair: Chansheng He, Professor and Director, Lanzhou University, China.</p>
<p>1. Naifeng Lin, Research Assistant, Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection, China. The Dynamic Changes of Grass Yield during the Growing Season in Tibetan Grasslands and the Sustainable Development Strategies.</p> <p>2. Dan Wu, Research Assistant, Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection, China. Assessment of Effects on Vegetation Rehabilitation in Southwest China.</p> <p>3. <u>Sinan Ogun</u>, Head, RR Research & Development Ltd., Turkey, Ugur Sahbaz & Levent Inan. Transhumant Pastoralism: Efficient Natural Resource Management.</p>	<p>1. <u>Jungwon Ji</u>, Researcher, Ajou University, South Korea, Eunkyung Lee, PhD Student, Ajou University, South Korea, Youngje Choi, PhD Student, Ajou University, South Korea, Heechan Chae, Graduate Student, Ajou University, South Korea & Jaeung Yi, Professor, Ajou University, South Korea. Flood Forecasting for Hydropower Reservoirs Using Neuro-Fuzzy Technique in North Han River.</p> <p>2. <u>Jaehwang Ahn</u>, PhD Student, Ajou University, South Korea, Youngje Choi, PhD Student, Ajou University, South Korea & Jaeung Yi, Professor, Ajou University, South Korea. Analysis of Diversion Tunnel to Supply Water in Severe Drought Situation.</p>
<p>14:00-15:00 Lunch</p>	
<p>15:00-16:30 Session VII (Room B-10th Floor): Plant Production II</p>	<p>15:00-16:30 Session VIII (Room C-10th Floor): Ecology</p>
<p>Chair: Stefan Gandev, Associate Professor, Fruit Growing Institute, Bulgaria.</p>	<p>Chair: Muhammad Farooq Hussain Munis, Assistant Professor, Quaid-i-Azam University, Pakistan.</p>
<p>1. <u>Sabreen Pibars</u>, Associate Professor, National Research Centre, Egypt, Kamel El-Tohamy, Assistant Researcher, National Research Centre, Egypt, Khalid El-Bagoury, Associate Professor, Ain Shams University, Egypt, Mona Soliman, Professor, National Research Centre, Egypt & Ahmed Abdel-Aziz, Professor, Ain Shams University, Egypt. Estimating Actual Crop Evapotranspiration using FAO Single and Dual Crop Coefficients approaches under SDI and SSDI in Arid and Semi-Arid Regions.</p> <p>2. <u>Karina Sandibel Vera Sanchez</u>, MSc Student, Universidad Autónoma Chapingo, Mexico, Raúl Nieto-Ángel, Research Professor, Universidad Autónoma Chapingo, Mexico, Alejandro F. Barrientos-Priego, Research Professor, Universidad Autónoma Chapingo, Mexico, Juan Martínez-Solís, Research</p>	<p>1. <u>Anastasios Mazis</u>, PhD Student, University of Nebraska-Lincoln, USA, Jeremy Hiller, Research Manager, University of Nebraska-Lincoln, USA, Pat Morgan, Senior Scientist, Environmental Division, LICOR Biosciences, USA, Vincent Stoerger, Plant Phenotyping Facility Manager, University of Nebraska-Lincoln, USA & Tala Awada, Professor and Associate Dean of Research, University of Nebraska-Lincoln, USA. High Throughput Plant Phenotyping: A New Window to Natural Resources Management and Agricultural Research.</p> <p>2. Jixi Gao, Professor, Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection, China. Construction of Technique System of China's Ecological Protection Redlines.</p>

Professor, Universidad Autónoma Chapingo, Mexico & Fernando González-Andrés, Research Professor, Universidad de León, Spain. Technique for the Study of the Internal Morphology of Seeds and Endocarp in Tejocote (*Crataegus* spp.).

3. Delin Xu, Research Assistant, Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection, China. Spatial Heterogeneity in the Food Web of a Large Shallow Eutrophic Lake (Lake Taihu, China): Implications for Eutrophication Process and Management.

16:30-18:00 Session IX (Room B-10th Floor): Special Issues I

Chair: Carlos Enrique Guanziroli, Professor, Universidade Federal Fluminense, Brazil.

1. Derya Arslan (Danacioglu), Associate Professor, Necmettin Erbakan University, Turkey. The Effects of Ultrasound and Microwave Pre-Treatments and Enzyme Addition on Some Physical and Chemical Properties of Olive Oil.
2. Galina Konarbaeva, Leading Researcher, Institute for Soil Science and Agricultural Chemistry, Russia & Boris Smolentsev, Head, Laboratory of Geography and Soil Genesis, Institute for Soil Science and Agricultural Chemistry, Russia. Influence of Various Factors on the Iodine Content in Soils of Western Siberia.
3. Muhammad Farooq Hussain Munis, Assistant Professor, Quaid-i-Azam University, Pakistan. Sensitive Detection of *Aspergillus Tubingensis* causing Heart Rot in Pomegranate (*Punica Granatum* L.) and its Biocontrol by Indigenous Phyto-Extracts.

21:00-23:00 The Pragmatic Symposium of the Conference as Organized in Ancient Athens with Dialogues, Food, Wine, Music and Dancing but fine tuned to Synchronous Ethics

Tuesday 11 July 2017

07:30-10:30 Session X: An Educational Urban Walk in Modern and Ancient Athens

Chair: Gregory Katsas, Vice President of Academic Affairs, ATINER & Associate Professor, The American College of Greece-Deree College, Greece.

Group Discussion on Ancient and Modern Athens.

Visit to the Most Important Historical and Cultural Monuments of the City (be prepared to walk and talk as in the ancient peripatetic school of Aristotle)

11:00-12:30 Session XI (Room B-10th Floor): Special Issues II

Chair: Janusz Zwiazek, Professor, University of Alberta, Canada.

1. Ofir Degani, Research Group Leader, Molecular Phytopathology Lab, Migal - Galilee Research Institute, Israel, S. Dor, Migal – Galilee Research Institute, Israel, A. Meerson, Migal – Galilee Research Institute, Israel, O. Rabinowitz, Ministry of Agriculture and Rural Development, Israel, Y. Goldblat, Tel-Hai College, Israel & D. Movshowitz, Tel-Hai College, Israel. qPCR-based Method for Evaluating the Efficiency of Seed Coating against Maize Late Wilt Disease.
2. Monif AlRashidi, Dean of Scientific Research, University of Ha'il, Saudi Arabia. Behavioural Mechanisms Adopted by Incubating Seabirds to Cope with Extreme Hot Environments: a Case Study on the Incubation of Lesser Crested Terns (*Thalasseus Bengalensis*).
3. Ilse Michelle Mancilla-Infante, MSc Student, Universidad Autónoma Chapingo, Mexico, Juan Enrique Rodríguez-Pérez, Research Professor, Universidad Autónoma Chapingo, Mexico, Jaime Sahagún-Castellanos, Research Professor, Universidad Autónoma Chapingo, Mexico & Alejandro F. Barrientos-Priego, Research Professor, Universidad Autónoma Chapingo, Mexico. Interspecific Rootstocks (*Solanum lycopersicum* L. x *Solanum pimpinellifolium*) in Tomato Production.
4. Esra Per, Researcher, Gazi University, Turkey. The Common Bird Composition, Abundance and Distribution in the Developed and Industrialized Provinces of Turkey.
5. Ece Dereagzi, Research Assistant, Istanbul Bilgi University, Turkey. Population Density Estimation of *Lyciasalamandra Flavimembris* in Paradise Island (Marmaris).

12:30-14:00 Session XII (Room B-10th Floor): Energy	12:30-14:00 Session XIII (Room C-10th Floor): Marine Ecology & Water
Chair: Ofir Degani, Research Group Leader, Molecular Phytopathology Lab, Migal - Galilee Research Institute, Israel.	Chair: Monif AlRashidi, Dean of Scientific Research, University of Ha'il, Saudi Arabia.
<ol style="list-style-type: none"> 1. <u>Ebun Akinsete</u>, Associate Lecturer, Robert Gordon University, UK and Senior Researcher, International Centre for Research on the Environment and the Economy (ICRE8), Greece & Victor Osu, Researcher, Robert Gordon University, UK. The Sustainability Nexus: Developing Resilient Communities in Emerging Nations via Clean Energy Access. 2. <u>Eugenio Romantchik</u>, Professor, University Agricultural Chapingo, Mexico & Eduardo Urban Rios, University Agricultural Chapingo, Mexico. Selection of Photovoltaic Systems to the Greenhouses. 3. Lidi Wang, Associate Professor, Shenyang Agricultural University, China. Design on Cooling Cycle System in Rural Areas. 	<ol style="list-style-type: none"> 1. Chansheng He, Professor and Director, Lanzhou University, China. Watershed Hydrology: Advancement, Opportunities and Challenges. 2. <u>Pedro G. Toledo</u>, Professor, University of Concepcion, Chile & Gonzalo Quezada, PhD Student, University of Concepcion, Chile. Replacing Fresh Water by Seawater in mineral Processing. Effect of Electrolytes on the Viscoelastic Behaviour of Flocculated Silica Suspensions in Concentrated Seawater Salts by Experiments and Molecular Simulations. 3. Emile Didier Fiogbe, Director of Laboratory, University of Abomey-Calavi, Benin. Complete Replacement of Fish Meal by other Animal Protein Sources on Growth Performance of Clarias gariepinus Fingerlings.

14:00-15:00 Lunch

15:00-16:30 Session XIV (Room B-10th Floor): Special Issues III
Chair: Sinan Ogun, Academic Member, ATINER & Head, RR Research & Development Ltd., Turkey.
<ol style="list-style-type: none"> 1. <u>Dolores Valentina Mariscal-Aguayo</u>, Professor, Universidad Autónoma Chapingo, Mexico, Heriberto Estrella-Quintero, Professor, Universidad Autónoma Chapingo, Mexico & Jose Enrique Salas-Barboza, Independent Consultant, Agropec Star, S.A. de C.V., México. Coffee Value Network Characterization using the Advisory and Consulting Model Chapingo - AGROPEC Star®. 2. <u>Phokele Maponya</u>, Project Manager, Agricultural Research Council, South Africa, Venter SL, Agricultural Research Council, South Africa, Du Plooy CP, Agricultural Research Council, South Africa & Van Den Heever E, Agricultural Research Council, South Africa. The Status of Drought in the Winterveldt Area: A Case of Smallholder Farmers in Tshwane, South Africa. 3. <u>Javier Mauricio Obando Ulloa</u>, Researcher, Costa Rica Institute of Technology, Costa Rica, Mikel Rivero Marcos, Researcher, Universidad Pública de Navarra, Spain, María Fernanda Sanchez-Ramírez, Student, Costa Rica Institute of Technology, Costa Rica, Esteban Martinez-Mora, Student, Costa Rica Institute of Technology, Costa Rica, Guillermo Castro-Badilla, Professor, Costa Rica Institute of Technology, Costa Rica, Freddy Araya-Rodríguez, Professor, Costa Rica Institute of Technology, Costa Rica & Tomas de Jesus Guzman-Hernandez, Professor, Costa Rica Institute of Technology, Costa Rica. Solar Energy as an Alternative Productive Tool in Agricultural Units in Costa Rica.

16:30-16:50 Closing Remarks

Sinan Ogun, Academic Member, ATINER & Head, RR Research & Development Ltd., Turkey.
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21:00- 22:30 Dinner

Wednesday 12 July 2017
Educational Island Tour or Mycenae and Epidaurus Visit
Thursday 13 July 2017
Delphi Visit

Jaehwang Ahn

PhD Student, Ajou University, South Korea

Youngje Choi

PhD Student, Ajou Univeristy, South Korea

Eunkyung Lee

PhD Student, Ajou University, South Korea

&

Jaeeung Yi

Professor, Ajou University, South Korea

Analysis of Diversion Tunnel to Supply Water in Severe Drought Situation

Drought is a natural disaster affecting water supply directly. There have been periodically big and small droughts in south Korea. Due to the drought occurring around the central region of Korea from 2014 to 2015, storage rate of multi-purpose reservoirs located in the central region of south Korea diminished to below 50%. In particular, the storage of Boryeong reservoir located in Western Guem river basin had continuously diminished during these 2 years. To solve such a problem, the Ministry of Land, Infrastructure and Transport decided to install Boryeong dam diversion tunnel, an emergency water supply facility connecting the downstream of Geum River's Baekje weir and Bangyo stream, the upper stream of Boryeong dam, in order to supply the Geum River downstream water to the Boryeong reservoir. This study aimed to analyze the operation effect of Boryeong dam diversion tunnel according to the diversion tunnel's operation conditions. To this end, this study simulated operations of the Boryeong dam by applying the measured reservoir inflow data and water supply adjustment standard for 19 years from 1998 to 2016. As a result, the normal operation of the diversion tunnel can meet the basic planned water supply of Boryeong reservoir during the release operation except the initial period. However, the release through a spillway increased about two times, compared to the case not operating the diversion tunnel. In the cases of operating the diversion tunnel only during drought period, the water supply is increased, but there was no big difference in spillway discharge compared to the case of not operating the diversion tunnel.

Acknowledgement

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**The Sustainability Nexus: Developing Resilient
Communities in Emerging Nations via Clean Energy Access**

Now more than ever, sustainability is at the forefront of global consciousness. In addition to a landmark climate change agreement, 2015 saw the inauguration of the 'Sustainable Development Goals' which seek to address wide ranging issues from carbon emissions to education, health and social justice. However fundamental to achieving these ambitions is a key catalyst – access to clean energy. This remains a pipe dream for a majority of the world's population, with approximately 1.4 billion people in developing nations living without access to electricity. This has far reaching impacts considering an estimated 1.3 million deaths per annum in developing nations are attributed to complications arising from pollutant exposure due to the use of inefficient biomass sources.

This paper explores clean energy access as a catalytic point of entry to developing resilient and sustainable communities in developing nations. The research outlines a model for sustainable development at a local level which integrates community participation and energy delivery, while creating a framework for to scaffold policies and interventions at a national level. The paper is based on ongoing research into the implementation of real-world projects in Nigeria, and examines two case studies from both urban and rural parts of the country.

Monif Al Rashidi

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**Behavioural Mechanisms Adopted by Incubating Seabirds
to Cope with Extreme Hot Environments:
A Case Study on the Incubation of Lesser Crested Terns
(*Thalasseus Bengalensis*)**

Seabirds (about 346 species) are a diverse group with a worldwide distribution that are adapted to all types of marine environments. Some seabird species breed in the most hostile environments, which range from extreme cold polar zones to extreme hot desert zones. In this study, the Lesser Crested Tern (*Thalasseus bengalensis*) was used as a model species to evaluate how incubating seabirds cope with extremely hot environments and the behavioural mechanisms they adopt to prevent eggs from hyperthermia, since it breeds in nests without any isolation materials, and egg laying is usually during the summer (May - June). This study was carried out on Jana Island, north-eastern Saudi Arabia where the midday ground temperature may exceed 60°C during the summer. To test the above mentioned hypothesis, trail cameras with night vision were used to record the incubation behaviour of adults every minute for at least 24 hours. In addition, the ground surface temperature was measured at one-minute intervals for at least 24 hours using temperature data loggers which were placed on the ground surface in open areas. The results showed that the Lesser Crested Terns attended their eggs continuously during a 24 hour period without leaving the nests, except when a disturbance occurred. This behaviour prevents the eggs from reaching lethal temperatures. Moreover, the incubating adults changed their body orientation in relation to the sun. Most incubating adults faced west in the morning, and began rotating clockwise until they faced east in the evening, which could be a behavioural mechanism that plays a vital role in preventing both incubating adults and eggs from overheating.

Derya Arslan (Danacioglu)

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The Effects of Ultrasound and Microwave Pre-Treatments and Enzyme Addition on Some Physical and Chemical Properties of Olive Oil

Phenolic compounds found in olive oil are pharmacologically active molecules and are known to be effective in lesser cases of cancer and cardiovascular diseases in Mediterranean diet. Furthermore, the link between oxidative stability and olive oil phenolics is well known. The phenolic profile of olive oil varies depending on the internal factors resulting from the olive fruit and the technological conditions such as the olive oil process. For this reason, various applications have been developed to increase the content of dietary and phenolic components in olive oil. In this sense, ultrasound power and microwaves are considered as useful and open technologies in the food processing industry.

In this study, olive oil was obtained by applying laboratory scale microwave and ultrasonic technologies after olive crushing. The effects of these technologies on some physical and chemical properties of olive oil have been examined. The aim was to evaluate the effect of microwave, ultrasound application and enzyme addition applied to olive paste by comparing with traditional production.

At the same time this study provides information about different new technological processes that have been started to be applied in olive oil extraction in recent years, their application forms and effects on chemical properties of olive oil, prevention of losses caused by extraction of olives with traditional method. No significant change was observed in the free acidity and peroxide values of oils while the applied processes increased oil yield. Increases in antioxidant activity were observed after pre-treatments, even though microwave and ultrasound applications caused decreases in the amount total of phenols.

Microwave and ultrasound pre-treatments significantly increased the oil yield, but also considerably increased free acidity, peroxide and carotenoid levels in the oils. The pretreatments when applied alone or together led to decline in total phenolics and many of the individual compounds. For instance, the secoiridoids were present with lower values in ultrasound applied samples; as an example the amount of 3-4, DHPEA-EDA in ultrasound treated sample was 59.36 mg/kg oil whereas its amount was 92.36 mg/kg in control sample.

The distribution of phenols along the extraction and the determination of the effects of certain process parameters on such components are believed to provide possible benefits for the future of olive processing technology.

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**High Throughput Plant Phenotyping Application in
Addressing Current and Emerging Issues in Agricultural
Research**

The interaction and balance between water and energy availability and climate is critical for food security. As climate continues to change and temperatures rise, water shortages and drought events are expected to rise in several regions, jeopardizing agricultural systems and their ability to deliver on the demands for food, fuel, feed and fiber to meet the growing population needs. Sensing technologies such as high throughput plant phenotyping, and leaf to field scale measurements play an important role in speeding up the selection process and development of new genotypes with valuable traits such as improved photosynthetic, water and nutrient efficiencies that can better adapt to changing environment. This presentation focuses on some of the ongoing research using high throughput plant phenotyping to address the genotype by environment by management interactions with emphasis on plant responses in economically important crops to water and other abiotic stresses.

Daniel Bucur

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Consideration on the Drought Phenomenon in Prut River Basin

Drought is one of the most important factors which affect the exploitation of water resources infrastructure. Regarded as a three-dimensional phenomenon, drought can be characterized by intensity, duration and geographic spread. Dryness and drought can be considered the most complex phenomena, because on their onset take part several factors: rainfall, soil water reserves, moisture and air temperature, evapotranspiration, wind speed, soil type, etc.

Previous research indicates that, in Romania, dry periods succeed without describing a real cyclical character, with the rainy ones at an interval of 12 - 15 years. Massive deforestation made before 1989 to extend agricultural land in the Moldavian Plain, have caused major imbalances: landslides, phreatic drainage and increased frequency of droughts, that's why the climate became hostile.

Placed in south-eastern Europe, Prut River basin is influenced by a rainfall regime with large monthly variations, specific to the temperate - continental climate. Drought occurs in majority of the years, but it is not very pronounced as in the steppe zone from extreme eastern part of the continent.

In Prut River catchment area, Jijia - Bahlui Depression is the most intense geomorphological unit of erosion, where the altitudes range from 150 to 200 m and reception areas of Jijia, Baseu and Bahlui have a parallel disposal and drain the entire area. This study aims to analyze droughts in this region, where the rainfall regime shows monthly and annual large fluctuations. It highlights the impact of drought as a hydroclimatic risk and the implications of its consequences on the local economy.

The most common methods to characterize dryness and drought phenomena are mathematical (indices) and graphical ones. In this study we used the following mathematical methods: Hellmann's criterion, standardized precipitation index (SPI), Topor aridity index.

Statistical analysis integrated data recorded during 1980 - 2014 at the rainfall stations located in the floodplains of Prut River (Oroftiana, Radauti - Prut, Ungheni and Prisacani) and Jijia (right tributary, of the first order - Dangeni, Todireni și Victoria).

The analysis of discrete continuous variables of 35 terms shows that the Prut River watershed is influenced by a rainfall regime with large monthly variations, specific to the temperate - continental climate. The months with precipitations deficit prevail and causes droughts. Statistical analysis of the dryness on the middle floodplain of Prut River emphasizes their accidental character, with a higher frequency in the last 13 years.

Large differences that arise between the two indicators are caused further by the calculation process and less by local variation of climatic elements. Results show that standardized precipitation index has disadvantages in approximate the water deficiency, because does not take into account the temporal distribution of rainfall.

The incidence of droughts in the Moldavian Plain prints a sharp decrease of the runoff and the appearance of drying - up phenomenon in the middle basin of Prut River. It is not long, due to the unstable nature of the rainfall regime. Rivers dried - up with a frequency of 40 - 50 % in basins with the surface between 15 and 20 km² and over 90 % in basins with areas less than 5 km².

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**Sandy Substrates: Morphological Adaptations of
Heteroconger hassi (Congridae) & *Ammodytes tobianus*
(Ammodytidae)**

Sandy substrates, marine or terrestrial, cover a large part of our planet. Numerous species, including the vertebrates, have developed adaptations to live in these environments. One group of vertebrates was here investigated, the Teleosts. Among them, two species, *Heteroconger hassi*, the spotted garden eel, and *Ammodytes tobianus*, the lesser sand eel, were studied. Histological and immunocytochemical analyses were performed on those species. The aim of this study was to describe the structural adaptations of the skin according to sand abrasion. The results show differences between the two species; *H. hassi* exhibiting two kinds of secretory cells and possessing microridges at the epidermal level. Moreover, the proliferation of those cells is weak. No distinctive scales were observed. On another side *A. tobianus* exhibits only one type of secretory cell, presents thick scales and has a higher number of epidermal proliferating cells. The other hypothetical morphological adaptations of these two Teleosts species are discussed.

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Building a Model Based on the Morphology, Biology, Behaviour and Life Cycle of *T. v. Vittatus* Adaptation

The contribution of the present paper is in building a model based on the results collected on the distribution, life cycle, behaviour and genetic variations among different populations in northern Israel down to the central coastal plains and near the desert of this species. More specifically, this model is based on the morphology, biology, behaviour and life cycle of *T. v. vittatus* adaptation. The adaptation to and selection of habitats depends mainly on the terrestrial phase and less on the aquatic phases. There are various breeding places in all of the habitats, however, the newts are mainly used to winter ponds, many of which dry up in summer where the larvae can grow and complete metamorphosis. The adaptation of the breeding ponds is not under ecological conditions during larvae growth and complete metamorphosis, but the time of adult breeding and larvae growth occur year-round. The molecular genetic variation in the different areas support our hypothesis that climate is affected by altitude and proximity to the desert. During the life cycle the newts have two habitats aquatic and terrestrial and the adaption to terrestrial habitats is more affected on the newts distribution than the aquatic habitat. The quality model of fitness *T. v. vittatus* to extreme conditions was suggested.

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qPCR-based Method for Evaluating the Efficiency of Seed Coating against Maize Late Wilt Disease

Late wilt is a severe vascular disease of maize characterized by relatively rapid wilting of maize plants after fertilization. The disease is caused by the fungus *Harpophora maydis* and is currently controlled using resistant varieties. Earlier, several fungicides were tested against the disease, one of which, Azoxystrobin, that was applied using irrigation lines, inhibited the development of wilt symptoms in the field and recovered cob yield by 100%. Nevertheless, this treatment is not economical. The current work aimed at developing a Real-Time PCR (qPCR)-based method for detecting and monitoring *H. maydis* DNA inside the host tissues. This method was applied to evaluate the efficiency of seed coating with Azoxystrobin against late wilt. The chemical treatment completely reduced the pathogen DNA appearance in seeds *in vitro*, and minimized damage to the plants' biomass and development. In sprouts (up to 40 days, four leaves), the seed dressing treatment produced similar results. These results were supported by the new qPCR-based detection method, which proved to be much more sensitive than the traditional PCR method. In a field experiment (summer 2016) with Azoxystrobin-coated seeds, the qPCR method enabled the detection of the pathogen 20 days after sowing, a month before the first detection using the PCR method. The chemical coating caused a reduction in fungal DNA in the plants on most days, but did not prevent the disease symptoms or yield loss. This work encourages further examination of other fungicides using the qPCR detection method to evaluate their influence.

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Population Density Estimation of *Lyciasalamandra flavimembris* in Paradise Island (Marmaris)

Aim: In this study, calculation of population density of *Lyciasalamandra flavimembris* in Paradise Island (Marmaris), identification of population threatening factors and detection of protection strategies with respect to that are aimed.

Content: Individuals of *Lyciasalamandra flavimembris* population in Paradise Island (Marmaris) were captured at different days. Coordinates, which are the capture point of individuals, were flagged via Global Positioning System (GPS). Counts of individuals -that were seen for the first time and that were marked before- were used to calculate population density.

Methods: Paradise island is a peninsula that is in Marmaris borders of the city Muğla. The peninsula is 8 kilometers far from the center of the town. Natural marking were used in the existing population of Paradise Peninsula. Photographed individuals were compared with the individuals that were captured in different dates with respect to their cryptic coloring. Firstly seen and marked individuals were detected. Coordinates were recorded the capturing location. These coordinates were flagged in Google Earth and the area was measured. Data was used to calculate population density. Population density was compared with the density of similar species and population status was detected.

Results: Species were seen in two different sites of Paradise Island. The density of the population was detected 4,74- 12,63/ha. Decreasing population trend appeared with respect to the population of *Lyciasalamandra luschani* in Meis Island, which has density that is 10000/ha.

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**Characterization of the Cocoa Value Network using the
Advisory and Consulting Model Chapingo - AGROPEC
Star®**

One of the oldest and most widely known agroforestry systems in the tropics in Mexico is cocoa, whose characteristics should be determined in order to improve its productivity. The objective of the study was to characterize the cocoa value network in the Southern region of Mexico. The Chapingo - Agropec Star advisory and consulting model was implemented, which consisted of a digital platform with the AGROPEC Star software and a comprehensive management consulting and advising process, with the participation of 18 advisors and 395 producers from 12 municipalities in Chiapas and Tabasco during a period of nine months. Training was provided to the advisors, as well as a computerized mechanism for the control, monitoring and integral evaluation of agribusinesses was implemented to generate production and cost indicators. 52 % of producers are over 60 years old, with a high level of poverty. The tasks performed were: removal of diseased fruits (95.44 %), weed control (85.19%) and pruning (81.77 %). 18.8 % of the producers have production records and 80.51 % register expenditures only. The average size of the farms is 1.2 ha with an average yield of 94.88 kg/ha and total production average of 106.88 kg. The low production is due to the presence of moniliasis, as well as to the aging of the plantations and poor management. Therefore, the agronomic management of the crop and investment in the rehabilitation and renovation of plantations, technical advice, technology transfer, the use of software and encouraging the integration of producer communities, were recommended.

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**Reproductive Performance of Rabbit Does Fed Moringa
Oleifera Leaf Meal (Molm) as a Protein Substitute to Soya
Bean Meal**

A study was conducted with 32 mixed breed rabbits averaging 2.35-3.11kg and aged between 7-8 months to evaluate the reproductive performance of rabbit does fed graded levels of *Moringa oleifera* leaf meal (MOLM) in a 12- week feeding trial. Four treatment diets were compounded whereby MOLM substituted soya bean meal at 0, 25, 50 and 75% respectively. The animals were allotted to the four treatment diets so that each diet had 6 does and 2 bucks housed individually in each cage. Rabbit does were introduced to the bucks for mating in the early morning in the ratio 1:3 (01 male:03 female) per week during the third week of the study. Feed intake and weight gain were recorded, while the gestation length, percentage conception, litter size at birth, litter weight at birth and survival rate of kids were calculated. The results showed no significant difference ($P>0.05$) in the average weekly weight gain of does, litter size at birth, average litter weight at birth and average survival rate of kids. However, the results revealed a significant difference ($P<0.05$) in the gestation length and average weekly weight gain of kids. The results suggest that MOLM incorporated in the diets of rabbits up to 75% had no detrimental effect on the reproductive performance of rabbit does.

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Complete Replacement of Fish Meal by other Animal Protein Sources on Growth Performance of *Clarias gariepinus* Fingerlings

To completely replace the fishmeal by a mixture of earthworm and maggot meals, experimental diets were tested during 42 days on *Clarias gariepinus* fingerlings. Five isoproteic and isoenergetic diets (40% crude protein and 17.9 ± 0.3 kJ g⁻¹) including the control diet (D1) based on fishmeal, were formulated.

All these diets satisfied the essential amino acids requirements of *C. gariepinus* fingerlings. These diets were tested on triplicate groups of 50 fishes (initial body weight: 3 ± 0.1 g) bred in tank (0.5 m³). The approximate ratios 2:5; 1:4; 1:12 and 0:1 between the earthworm meal and the maggot meal were used, respectively, to formulate four diets D2, D3, D4 and D5 without fishmeal. After the feeding period, significant differences ($P < 0.05$) were observed on growth, feed utilization between control diet (D1) and test diets (D2-D5). Fish fed earthworm- and maggot-based diets were grown better than those fed the control diet. Survival and feed utilization were not significantly affected by the ratio between earthworm meal and maggot meal in the test diets. Lipid content was higher in carcass and fillet of fishes fed earthworm and maggot meals-based diets than that of those fed fish meal-based diet. This study indicates that when the ratio 2:5 between the earthworm meal and the maggot meal is used to entirely replace fish meal and the ratio lysine/arginine of the diet is inferior to 1, the growth performances and feed utilization of *Clarias gariepinus* fingerlings are improved.

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Performance of the Apple Cultivars 'Braeburn' and 'Granny Smith' on M9 Rootstock, Trained to the Systems Slender Spindle, Solen and Vertical Axis

The experimental plantation was established in the territory of the Fruit-Growing Institute in Plovdiv, with geographic coordinates of 42° 9' N latitude, 24° 45' E longitude and 160 meters altitude. The study was carried out during the period 2013-2016, i.e. third- sixth vegetation of the trees, covering the first four fruiting seasons. The aim of the present study was to investigate the effect of the training systems Slender spindle, Solen and Vertical axis on growth and fruiting characteristics of the apple cultivar 'Braeburn' and 'Granny Smith', grafted on M9 rootstock and grown under the conditions of Bulgaria. The results obtained show that the average and cumulative yields per ha were higher when Vertical axis training method was used compared to Slender spindle and Solen training systems. That was due to the better reproductive habits of trees in that variant, as well as to the larger number of trees per ha. Under the conditions of our country, tree training to Vertical axis method is recommended for 'Braeburn' and 'Granny Smith' apple cultivar grafted on M9 rootstocks.

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Construction of Technique System of China's Ecological Protection Redlines

There are too many types of ecological protected areas in China, of which present overlapping phenomenon in space, and are managed by different departments with various policies. Aiming to solve the problems of low efficiency of ecological management caused by lack of unified supervision and management system, in this paper, we first provides a comprehensive analysis of the objective and significance about constructing the technique system of ecological protection redlines from the aspects of safeguarding national ecological security, improving the systems of ecological and environmental protection system, ensuring the supply of ecological products, and enhancing the ability of national sustainable development, etc. Then, we built the technique system of ecological protection redlines system, of which includes key ecological function areas redlines, ecologically sensitive or fragile areas redlines, nature culture and genetic resources protected areas redlines, and other kinds of ecological redlines, etc. Generally speaking, there are four categories including 33 subtypes of ecological redlines. Finally, the methods of building ecological protection redlines system are put forward from the view of determining protected object of ecological redlines, assessment of ecological protection importance and ecological sensitivity, and constructing the technique system of regional ecological protection redlines. The purpose of this paper is to hopefully provide scientific support for the ongoing work of ecological protection redlines delineation and supervision, and also provide a key carrier to redesign China's ecological protection and restoration system, of which would achieve the goal of one redline to control all the important ecological areas in China.

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Family Farming in Brazil: Evolution between the 1996 and 2006 Agricultural Censuses

This article compares the main findings of Brazilian agricultural census data of 1996 with the same of 2006 by applying the methodology known as 'FAO/INCRA' (Food Agriculture Organization/Instituto Nacional de Colonização e Reforma Agrária) which allows the characterization of family farms in relation to the total universe of farms. In this comparison several variables are shown, including the share of family farming in the total value of production, in the total number of farms, utilization of modern technology and partial factor productivity. Census data shows that family farming has changed from 37.91 percent of total production value to 36.11 percent during a decade of strong expansion of agriculture as a whole, demonstrating the economic relevance of this segment which, besides producing food, is integrated in the most important productive agricultural chains of the Brazilian agribusiness. Family farming is a heterogeneous segment, with different sub-segments. During the studied period of ten years the most rich of these sub-segments (A) has increased participation in total production, while the poorer sub-segments (C and D) have only grown in absolute terms without a corresponding increase in production.

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Watershed Hydrology: Advancement, Opportunities and Challenges

Rapid population growth, fast urbanization, increasing economic expansion, drastic land cover alterations, and climate change have resulted in a global water crisis. Worldwide, approximately 2.6 billion people lack access to safe drinking water supply and improved sanitation, and water-associated diseases cause serious illness of over 300 million people each year, and by 2025 over 3.5 billion people will have water shortages. The World Economic Forum defines water supply crisis as one of the top 5 crises facing the globe in the next 10 years.

To address this pressing challenge, researchers have called for the development of a predictive science of earth surface dynamics by taking advantage of the advances in tracing, mapping, remote sensing, and modeling technologies over the past few decades to reliably understand, model, and predict the interwoven physical, biological, geochemical, and human dynamics that collectively shape the Earth's surface. This paper reviews recent advances in watershed hydrological research, particularly applications of remote sensing, GIS, and simulation models in estimating rainfall and snowmelt, evapotranspiration, soil moisture, groundwater, discharge and storage at the watershed scale. Subsequently, the paper discusses opportunities and challenges in watershed hydrological research and suggests that 1) long term, detailed spatial coverage, high quality in-situ observation data need to be collected and assimilated with current regional and local datasets to advance watershed hydrological modeling; and 2) regional/watershed hydrology and water resource models need to be developed to integrate components of climate, economy, ecology, and water consumptions through international collaborations to support water resource policy/decision making at the regional/watershed scale.

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Bangladesh Trade with India-Trends and Patterns

Bangladesh is an emerging developing economy in South Asia. India, the second most populous nation in the world and the largest economy in South Asia, is a close neighbouring country of Bangladesh. Given the close physical distance, and its friendly political and diplomatic relationship between the two countries, it is natural that Bangladesh will have a large volume of trade with its largest neighbouring country. Hence, it is no surprise that India is one of the largest trading partners of Bangladesh. Given this importance, the purpose of this paper is to explore the trends and patterns of trade between these two countries. More specifically, it will explore the overall trend in exports to India as well as imports from India, and the trend in trade balance between the two countries. Further analysis will be conducted regarding the commodity composition Bangladesh exports to and imports from India by major product categories. The study will collect historical time series data from as many years as possible or available from published country sources and international organization sources such as the IMF, the World Bank, and the WTO.

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Using Various Lactic Acid Bacteria Inoculants during Ensiling Different Forages towards Fermentation, Nutritive Value and Aerobic Deterioration

Silage production is growing in importance worldwide as the demand of feeds for the milk and beef production increases, as well as, increases the importance of food safety, which depends on the hygienic quality of forages consumed by animals. Researches and farmers emphasized the importance of the efficient forage conservation technologies that minimize nutrient losses during harvesting, fermentation, storage and aerobic deterioration during feeding out, and improve hygienic quality (safety) of conserved feeds. There have been major advances in the science and practice of silage making in the world over the last 45 years. First of all, silage research has focused on the production and ensiling of grass and legume silages with reference to reduction of dry matter losses and improving fermentation. Later on, researches have dealt with the ensiling and use of silages from a wide range of crops including whole crop maize, whole crop cereal, tropical forages and by-products. Moreover, research on silages included studies concerned with aerobic stability, microbial environment, hygiene, silage dry matter intake by animal, animal production, including the effect on animal products, hygiene and safety for humans, and silages technology impact on the environment (Wilkins and Wilkinson, 2015).

The objectives of the reviewed studies were to assess lactic acid bacteria inoculants potential to improve fermentation pattern of the grass, legume and maize silage and to change microbial population profile, and whether the inoculants have an effect on the extent of deterioration occurring during the exposure to air aerobic stability in laboratory scale and large scale experiments.

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Flood Forecasting for Hydropower Reservoirs using Neuro-Fuzzy Technique in North Han River

In South Korea, About 60 to 70 percent of rainfall occurs during the rainy season (June to September) under the influence of monsoon. Due to these climates, there was a high risk of floods in summer and frequent drought damage during the dry season. So Korean government has constructed and operated many hydraulic structures. The North Han River is located in the upper reaches of the Han River, which flows into Seoul, the capital city of South Korea. There are five hydropower reservoirs in the North Han River, four of which have no flood control capacity. These reservoirs aim to maintain constant water level in order to improve power generation efficiency and prevent the overflow of the reservoir. However, in recent years, it has been difficult to achieve these goals due to the torrential rains and the guerrilla rainstorm. Until now, there have been many studies on the forecasting of inflows for the reservoirs operation, but the forecasted inflow time interval was more than 1 hour. This time interval is too long to be used for operation of reservoirs in flood time. Also, the reservoirs water level in North Han River changes drastically even during short periods of time in flood season. In this study, in order to operate the hydropower reservoirs effectively, the inflow was forecasted with 10-minute intervals. The model was constructed considering the characteristics of the watersheds in which the reservoirs are located in series. The neuro-fuzzy method is used in this study and the model is constructed using the rainfall events from 2004 to 2016.

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Effect of Different Sources and Levels of Zinc on some Tissues Mineral Concentration in Laying Hens

This study was conducted to evaluate the efficiency of dietary zinc sources and levels on some tissues mineral content and bone characteristics in laying hens. Twenty-four weeks old, 270 H&N Super Nick laying hens were allocated to 15 experimental groups in a 3 (zinc sources) × 5 (levels) factorial arrangement. Three zinc sources including zinc oxide as inorganic forms, zinc-proteinates as organic form and nano zinc-oxide powder as nano form at different levels (20, 40, 60, 80 and 100 mg/kg diet) were tested.

The results of study indicated that liver Zn content was significantly higher in the nano-Zn group than that in the inorganic-ZnO and organic-Zn groups ($P < 0.05$). Eggshell Mg and P contents were significantly lower in the nano-Zn group compare to and organic-Zn and inorganic-Zn groups ($P < 0.01$; $P < 0.05$). Eggshell Ca content was lower in the nano-Zn group than that in the organic-Zn group. Excreta Zn content increased with the dietary zinc levels. Tibia Zn content, tibia weight, tibia stress and breaking strength were no significantly affected by the dietary Zn sources and levels.

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**Influence of Various Factors on the Iodine Content in Soils
of Western Siberia**

Important biological role of iodine is due to the fact that being a part of the hormones thyroxine and triiodothyronine, it regulates the rate of metabolism in living organisms.

In this paper we present the results of the study of the content and patterns of distribution of iodine in soils of Western Siberia, which are the link in the chain: the atmosphere-soil -water - plants - animals and people.

Soil, due to its accumulative properties, refers to natural objects, concentrating iodine. If we talk about the barriers, where there is concentration of halogen, it is a priority for iodine - biochemical - the accumulation of soil organic matter. Geochemical barrier for iodine exists only in the evaporation conditions.

The study of the content and distribution of iodine in different types of soil showed that the accumulation of these halogen most influence their degree of humus content. On the processes of accumulation and migration of iodine in the soil profile is influenced by other physical and chemical properties of soils: size distribution, the reaction of the soil medium, the content of iron and aluminum oxides, as well as the type of water regime and chemical properties of the trace element. We have studied the content of I in the soils of Western Siberia in the direction from north to south. Soils of tundra and forest tundra (typical cryozems and coarse humus cryozems, cryometamorphic cryoturbic cleyzems, entic podzols. These soils are largely characterised by the low concentration of humus that varies from 0.07% to 3.12%, sometimes the absence of distinct humus horizon (podzols) and the excess of fulvic acids. Soils that have low pH are characterised by low level of iodine retention.

Contrary results were obtained from soils samples taken in the southern parts of Western Siberian Region. At the sod-podzolic soils, gray forest soils of the iodine content was respectively 1.36 -2.36 and 1,44-2,82mg/kg. These soils are well-drained, low on humus content

and have low pH.. Chernozems (categories zonal soils) are the most iodine-rich soils (min 1.2, max 6.4mg/kg) due to their higher than average level of organic matter. . Albic luvisols и haplic kastanozems soils can be attributed to the middle range based on their iodine concentration. Within the intrazonal group of soils, alkali soils are found to have the highest level of iodine content (min - 5.6, max - 33.2 mg/kg). The solonchak is located in low lying grounds that are often to be found in an iodine-rich environment. The more alkaline (higher pH) a soil is the greater is its iodine concentration. Several smaller halogen found in solonetztes (min-1.8, max-18,7 mg/kg) with a maximum in the illuvial horizon enriched by fine mineral particles, oxides and hydroxides aluminium and iron, volumetric rainfall which ness actively absorb iodine. In stratozemah easily exposed to wind and water erosion, humus content does not exceed 0.5%, which resulted in low levels of iodine 0,12-1,43mg/kg.

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The Dynamic Changes of Grass Yield during the Growing Season in Tibetan Grasslands and the Sustainable Development Strategies

Using actual survey data of grassland yield in Tibet and NDVI data sets, grass yield estimation model in Tibet was established, and then the characteristics of spatial and temporal variation of grassland yield in the grass growing season of Tibet during the period of 1987 to 2010 were analyzed quantitatively. Research showed that: during the period from 1987 to 2010, the growth rate of grassland yield in Naqu was the largest, which was 54%. However, the grassland yield in Lasa showed a decrease of 4%. Spatially, the growth of grass yield showed a trend of increase from northwest to southeast. The areas of increased grassland yield mainly located in the north-central Tibet, while in southern region there were mostly areas of grassland yield reduction. The area of grassland with increased yield accounted for 76.04% of the total grassland area. The area of grassland with reduced yield was only 23.96% of the total grassland area. The area of grassland with increased yield was significantly larger than that of grassland with reduced yield during the period from 1996 to 2006 in Tibet. In order to improve the grassland ecosystem and the grassland yield in Tibet, this article proposed a sustainable development strategy for Tibet grassland resource from the aspects of grassland utilization, spatial pattern, pest control, and ecological compensation for returning farmland to grassland.

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**Interspecific Rootstocks (*Solanum lycopersicum* L. x
Solanum pimpinellifolium) in Tomato Production**

The main factors that affect yield and quality of tomato fruit are root diseases caused by fungi. The aim of this investigation was to identify interspecific crosses of *S. pimpinellifolium* x *S. lycopersicum*, to be used as rootstocks, with resistance to six phytopathogenic fungi that affect tomato roots. The interspecific crosses were generated between a wild line of *S. pimpinellifolium* with 12 lines of *S. lycopersicum* L. which were probed on pathogenicity tests for *Fusarium oxysporum* f.s. *lycopersici* (races 1, 2 and 3) (F1, F2, F3), *Rhizoctonia solani* (Rh), *Verticillium daliae* and *Sclerotium rolfsii*. Thirty days after the seeding the inoculation was carried out using the root-dip technique and transplanted into cup with 300 ml capacity. Plant height, dry matter and severity (visual scale, for 25 days) were evaluated and calculated the area under the disease progression curve (AUDPC) was calculated. Cluster and discriminant multivariate analyses, analysis of variance and comparisons of means were performed. According to the cluster analysis, six tolerance groups were identified. This result was corroborated by discriminant analysis, in which the tolerance to F2 and F3 were associated with the larger variability (74%) of the first discriminant variable (DV); while the tolerance to Rh and F1, were associated to the second DV (15%). The six groups showed differences ($\alpha < 0.05$) in disease resistance, which corresponded with the response of AUDPC. There was not relationship between disease tolerances and the different pathogens, which confirms that different genetic complexes are involved, since the correlations of AUDPCs of the different fungi were low, with the exception of F2 and F3 (0.7, $\alpha < 0.05$). Four genotypes with resistance to the three races of *Fusarium oxysporum* and tolerance to *Rhizoctonia solani* were identified. Of these, three are lines and one is a interspecific hybrid.

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**The Status of Drought in the Winterveldt Area:
A Case of Smallholder Farmers in Tshwane, South Africa**

South Africa is considered a semi - arid country vulnerable to water stress, particularly drought. In the previous 12 months, South Africa has experienced one of the worst drought in history where some provinces were declared disaster areas. During the last decade the frequency of natural disasters in the farming community in Winterveldt area increased significantly and the most common disaster was drought. The aim of the study was to identify sustainable solutions towards drought adaptation in Winterveldt area. The following objectives were identified: (a) To describe socio - economic characteristics of smallholder farmers in Winterveldt area (b) To describe the extend of drought impact on agricultural production in Winterveldt area. A representative sample of 31 productive farms participated in the study and they all fall under City of Tshwane Metropolitan. The purposive sampling method was used to select productive farms and to cover the uniform or homogeneous characteristics of farms. The sample frame was designed to meet the objectives of the study and to adhere to the statistical specifications for accuracy and representation. The questionnaire was administrated to respondents. The study also used observations, current and past rainfall distribution maps as part of data collection. Data was coded, captured, and analysed using SPSS. Descriptive and regressions analyses was conducted. The results showed a bleak picture on drought impact in Winterveldt area where agricultural production has decreased significantly.

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Coffee Value Network Characterization using the Advisory and Consulting Model Chapingo - AGROPEC Star®

Mexico is a major producer of coffee, however, the characteristics of its production systems are not well known. The objective of this work was to characterize the coffee value network using the Chapingo - Agropec Star advisory and consulting model in Puebla and Veracruz. The model was implemented, which includes a digital platform with specialized software and a comprehensive management advising and consulting process, with the participation of 20 advisors who assisted 419 agribusinesses, distributed in 463.13 hectares. The activities carried out were: software installation on the advisors' computers, training and virtual consultation for advisors, follow-up on the management of the platform and compilation of the databases for the monitoring of agribusiness indicators during a period of nine months. The activities carried out by the producers were pruning (73.03%), regulation of shade for the crop (67.13%), as well as weed control (81.46%) and manual harvesting (56.18%). 5.6% of the producers have production records, with an average production of 398.8 kg. The average size of the farms is 0.96 ha. 98% of the producers are indigenous with a high poverty level, use varieties without improvement, old plantations without sanitary control, poor crop management, low yields, inadequate advice and market fluctuation. Shade management, crop pruning, use of live barriers, increased plant density, integrated weed management, pests and diseases through biological control, fertilization rates based on soil and plant analysis, use of improved varieties, the renewal of coffee plantations, the promoting of the transition to organic coffee, technical advice scheme and use of software were suggested. Moreover, the producer was encouraged to improve its organization systems in order to generate economies of scale.

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High Throughput Plant Phenotyping: A New Window to Natural Resources Management and Agricultural Research

High throughput plant phenotyping is increasingly being used to assess morphological and biophysical traits of economically important crops in agriculture, under controlled environment or in the field. In this study, we assess the potential application of this technique in natural resources management, namely the characterization of woody plants regeneration, establishment and growth, under water stress and nutrient manipulations. This is important in our efforts to better understand the impacts of climate variability and change combined with anthropogenic management on forest ecosystems.

Three woody species were selected for this study, *Quercus prinoides*, *Quercus bicolor* and *Betula papyrifera*. Seeds from these species were collected from trees growing at the edge of their natural distribution in Nebraska, Missouri and Iowa, USA. Seeds were germinated in the greenhouse and were transferred to the Lemnatec^{3D} High Throughput Plant Phenotyping Facility at the University of Nebraska-Lincoln. Seedlings subjected to water and nutrient manipulations were imaged using four cameras (Visible, Fluorescence, Infra-Red and Hyperspectral), throughout the growing season. Traditional leaf to plant levels ecophysiological measurements were concurrently acquired to assess the relationship between these two techniques. These include gas exchange (LI 6400 and LI 6800, LICOR Inc., Lincoln NE), chlorophyll content, optical characteristics (Ocean Optics USB200), water and osmotic potentials, leaf area and weight, plant nutrients and carbon isotope ratio.

In this presentation, we highlight results on the potential application of high throughput phenotyping techniques for the three species, characterized with different growth habits and plant architecture, their responses to water and nutrient manipulations, and the relationship between imaging and traditional ecophysiological techniques.

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**Sensitive Detection of *Aspergillus Tubingensis* causing
Heart Rot in Pomegranate (*Punica Grantum L.*) and its
Biocontrol by Indigenous Phyto-Extracts**

Pomegranate (*Punica grantum* L.) is an edible fruit of great nutritional, medicinal and economical importance. In a field survey, heart rot disease was observed on Pomegranate in different areas of Pakistan including Islamabad and Murree. Typical heart rot symptoms like dark brown to black spots in the form of wrinkles and lesions were observed in different orchards. Affected fruits were collected for the isolation and identification of disease causing pathogen. This study was also extended to see antifungal effect of selective medicinal plant extracts for the control of this disease. On the basis of mycelium morphology and sequence analysis, *Aspergillus tubingensis* was found to be the disease causing pathogen. Blast analysis revealed 100% similarity with 18S rDNA, partial sequence; ITS-1, 5.8S rDNA, and ITS-4, complete sequence; and 28S rDNA gene, partial sequence (Accession no. HM037959.1). This is the first report of *A. tubingensis* causing heart rot of pomegranate in Pakistan. Extracts of *Syzygium aromaticum* and *Cinnomomum verum* showed maximum mycelial growth inhibition while *Euphorbia granulata* exhibited the least. These results suggest an effective and environment friendly control of *A. tubingensis* on Pomegranate.

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Solar Energy as an Alternative Productive Tool in Agricultural Units in Costa Rica

Around the world, the agroindustrial sector is highly dependent on the fossil fuels for its production process. Therefore, there is an urgent need to find new alternatives of energy resources in order to replace this dependence and make the process more efficient, support the production process of small and medium-sized farmers with clean technologies and achieve the mitigation of the greenhouse gases to contribute to diminish the effect of the climate change from a local initiative. The aim of this research was to evaluate the implementation of a thermal solar system (LP gas hybrid thermosyphonic system) in two agricultural production units for milk pasteurization and manufacture of fresh cheese for the local market. The system was implemented in two milk factories in the Northern Huetar Region of Costa Rica. This area is characterized by its high cloudiness and high volume precipitation, aspects that have limited the use of this alternative technology through the years. The system replaced two wood boilers used to heat water for milk pasteurization to process cheese, sterilization of the milking equipment and other sanitization operations in the agricultural units. The system not only improved the process, but also removed environmental contamination produced by the boilers and the greenhouse gases emitted to the atmosphere. In addition, the system was capable to supply more than 70% of the energy required by the process and reduced the electricity bill of these milk factories, while its economic analysis revealed that the initial

investment can be recovered in around 3 years. In summary, the results show the efficiency of the implemented solar system that can be used as an alternative and clean energy resource for the production units of Costa Rica.

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The Common Bird Composition, Abundance and Distribution in the Developed and Industrialized Provinces of Turkey

Turkey is an industrializing and developing country. 71% of industrial activities occur in twelve cities. These cities; Istanbul, Bursa, Ankara, Izmir, Konya, Gaziantep, Denizli, Kocaeli, Adana, Tekirdag, Kayseri and Mersin. The main aim of this study is to determine the composition, abundance and dominance of common species in the twelve cities which play a significant role in industrialization in Turkey. The observation records of the species between 1946 and 2017 were compiled from KusBank database, personal notes and from published materials (thesis, article, book, report, trip reports and web pages). The most common bird species in twelve cities; *Passer domesticus* (the house sparrow), *Pica pica* (the eurasian magpie), *Corvus cornix* (the hooded crow), *Parus major* (the great tit), *Larus michahellis* (the yellow-legged gull), *Fringilla coelebs* (the common chaffinch), *Turdus merula* (the blackbird), *Fulica atra* (the eurasian coot), *Hirundo rustica* (the barn swallow) and *Corvus monedula* (the western jackdaw). Regional differences have been detected in the composition, abundance and distribution of common species. *Pycnonotus xanthopygos* (the white-spectacled bulbul) in Adana and Mersin; *Streptopelia decaocto* (the eurasian collared dove), *Carduelis carduelis* (the european goldfinch) and *Galerida cristata* (the crested lark) in Adana, Bursa, Denizli, Gaziantep, Izmir, and Mersin; *Phalacrocorax carbo* (the great cormorant) in Istanbul, Izmir and Kocaeli; *Columba livia* (the rock dove) in Kayseri and Ankara are dominant. The species composition of provinces has changed with the years. Especially the distribution area and dominance of *Pica pica* (the eurasian magpie) has increased. In the future, there will be new changes in the composition, distribution and dominance of common species with the continuing increase of industrialization and urbanization.

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**Estimating Actual Crop Evapotranspiration using FAO
Single and Dual Crop Coefficients approaches under SDI
and SSDI in Arid and Semi-Arid Regions**

Precision estimation of actual crop evapotranspiration (ET_a) as a parameter of irrigation management is critical for efficient use of limited irrigation water resources. The main objective of this study was to identify the proper FAO-56 crop coefficient approach (single-Kc; dual-Kc) to calculate the actual crop evapotranspiration for peanut (*Arachis hypogaea* L.) and sesame (*Sesamum indicum* L.) crops under the climatic condition of the study region and the efficient of surface (SDI) and sub-surface (SSDI) drip irrigation system that improve water use efficiency. Therefore, a field experiment was conducted in sandy soil at the National Research Centre farm, El-Nubaria, Beheira Governorate, Egypt. The results revealed that the maximum seasonal actual crop evapotranspiration (ET_a) was 672.8 mm, 633.7 mm recorded with dual-Kc treatment under SDI for peanut and sesame respectively. Seed yield and water use efficiency were significantly affected by the irrigation system (SDI; SSDI). Maximum yield for both peanut (5.30 ton ha⁻¹) and sesame (1.58 ton ha⁻¹) were obtained by using dual-kc approach under sub-surface drip irrigation system. Optimal water use efficiency for peanut (0.65 Kg m⁻³) and sesame (0.19 Kg m⁻³) were obtained by using dual-kc approach under sub-surface drip irrigation system.

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The Effective Retention and Germination Mechanism of the Suaeda Salsa Seeds under the Effect of Tides in a Chinese Intertidal Salt Marsh

Suaeda salsa is one of the key species in the intertidal salt marsh of Yellow River Delta, China, which create the beautiful landscape of “red carpet”. In the whole life-cycle of the *Suaeda salsa*, it can always get effect from tide. *Suaeda salsa* is a kind of annual herb plants, whose reproduction totally depends on seeds, and the seed of *Suaeda salsa* is both small and light, which is really easy to be taken by tide. However, there are many *Suaeda salsa* plants in the intertidal salt marsh every year. Then field survey and field control experiment has been done to analyze the effective retention and germination mechanism of the *Suaeda salsa* seeds under the effect of tide in the intertidal salt marsh. The results show that there are about four effective retention and germination modes of the *Suaeda salsa* seeds under the effect of tide: intercepted by C-C (concave-convex) microtopography made by crabs, intercepted by C-C microtopography made by plants, remain in plant residues, and directly buried by sediments.

The field survey revealed that the proportions of the four seeds retention and germination modes are different under the natural state, intercepted by C-C microtopography made by crabs, intercepted by C-C microtopography made by plants, remaining in plant residues, and directly buried by sediments respectively accounted for 55.02%, 14.24%, 19.42, 11.31%. The field control experiment further verified the existence of the four modes, and found that the concave-convex microtopography played a great vital role for the retention and germination of *Suaeda salsa* seeds under the effect of tide. The formation and maintenance of the concave-convex microtopography under the natural state mainly based on the burrowing activity of the crabs, which plays the role of the ecosystem engineers. And the artificial C-C microtopography imitating crab burrows can also effectively intercept the *Suaeda salsa* seeds, and it can also attract more crabs coming to burrow, as well as artificially planting *Suaeda salsa*, which can further always maintain the concave-convex microtopography under the effect of tide. This study can have the scientific and effective guidance for the planting and restoration of *Suaeda salsa* in the intertidal salt marsh.

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Selection of Photovoltaic Systems to the Greenhouses

The high level of contamination emanating the production of electricity generated from fossil fuels, has led to the search for new energy alternatives, including photovoltaic systems (PVS).

At work installation of photovoltaic systems based on different environmental and operating parameters are justified and developed a methodology and photovoltaic components selection software to generate electricity demanded by different systems of a greenhouse.

In Mexico, there are different rates for electricity, which annually increased from 4.4 to 27%, these were analyzed for the years 2003-2013. It was proved, that for 10 and 15 years of use of PVS, it is feasible to install them, even in places where there is already the CFE's power grid, for the energy consumption greater than 1.5 and 4.8 kWh per day in greenhouses, as only energy expenses during these years beyond installation costs PVS.

For the selection of the photovoltaic components were developed catalogues for the greenhouse equipment, sites with solar hour's peak in Mexico, PV modules, batteries, controllers, and investors well as algorithms for an economic selection.

The methodology developed was applied in greenhouses with an area of 6,165 m² of the experimental field "Tlapeaxco" of the Universidad Autónoma Chapingo. A photovoltaic system integrated by 16 photovoltaic panels that generate a total power of 3.68 kWp, 2 controllers of 80 A, 12 batteries of 1800 Ah and an inverter / charger of 7 kW, was selected and installed for generate and supply the power to an irrigation system with a flow rate of 1.5 L/s and a pressure of 0.3 MPa composed of 2 pumps of 2.2 kW, well as of a motor of 1.1 kW for the agitator.

The PVS has been monitored and was affirmed the daily energy production of 14.5 kWh in December which ensures the power supply to the irrigation system.

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Cloud-based Animal Health Service Provision

The presentation will describe the technology elements developed to create a platform for animal health monitoring and the subsequent dissemination of the health information of individual animals to increase the efficiency of on-farm operations and inform the supply chain. The technology measures the energy profile and the amount of time a dairy cow has spent eating and ruminating, both crucial metrics to determine individual animal's welfare. The information is presented through a cloud environment to relevant stakeholders across the value chain.

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**Replacing Fresh Water by Seawater in mineral Processing.
Effect of Electrolytes on the Viscoelastic Behaviour of
Flocculated Silica Suspensions in Concentrated Seawater
Salts by Experiments and Molecular Simulations**

The silica-water interface is central to the processing of a large number of mineral systems and the flow properties of particulate suspensions. In particular, these flow properties define the upper limit to tailing processing in the mining industry and, ultimately, the recovery of water. In some regions of the world, the scarcity of fresh water has pushed this industry to use seawater, either as is or partially desalinated. Here we analyze the impact of monovalent alkali metal and divalent alkaline-earth metal chlorides that are typical of seawater on the viscoelastic behavior of flocculated silica sediments at concentrations typical of thickening systems. The sediment samples were subject to creep-recovery tests. All sediments exhibit nonlinear viscoelastic behavior, deduced from the compliance-applied stress relationship. Interestingly, creep recovery was observed to be related to the Hofmeister series, $Cs^+ < K^+ < Na^+ < Li^+$, with Cs^+ producing lower recoveries than Li^+ , and $Ca^{2+} < Mg^{2+}$, with Ca^{2+} producing lower recoveries than Mg^{2+} . For the range of loads below yielding, the apparent compliance follows the inverse Hofmeister series, i.e., the compliance increases according to the series $Cs^+ > K^+ > Na^+ > Li^+$ and $Ca^{2+} > Mg^{2+}$. Sediments in the presence of maker salts are clearly less deformable (lower apparent compliance) than in the presence of breaker salts explaining the higher recoveries in the former salts. The yield stress, critical strain, and critical strain energy of the sediments were observed to be higher in maker salts (Na^+) compared with breaker salts (Cs^+ and K^+), due to stronger bonds in the particle networks.

Comparing the viscoelastic behavior of maker cations it is observed that critical strain and critical strain energy of the sediments unexpectedly follow the order $Li^+ < Na^+$ and $Mg^{2+} < Ca^{2+}$. The explanation rests on the strong hydration of Li and Mg which prevents closer approach of these cations to the silica surfaces. Our model of viscoelastic behavior [Goñi et al., Colloid Surface A 482 (2015) 500] satisfactorily reproduces all experimental strain-time curves. To

unraveled the interactions and mechanisms operating at the quartz-water interface we used molecular simulation. We study the quartz-water interface in the presence of seawater salts, monovalent and divalent, and flocculant via molecular dynamics and a robust force field, particularly we study the adsorption of nine seawater salts on a quartz surface properly deprotonated. The present work provides novel input to decisions about the use of seawater or partially desalinated seawater in minerals processing with direct implications for tailings transportation, handling and water recovery.

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Technique for the Study of the Internal Morphology of Seeds and Endocarp in Tejocote (*Crataegus* spp.)

Seeds have been used in the characterization of germplasm with alternative approaches, such as taxonomy and analysis of variability in different plant families, due to the conservatism of plants in the size of the seed and the internal parts of the fruit and that shows low phenotypic plasticity. The aim of this paper was to elaborate further the technique for the study of the internal morphology of seeds and endocarp for its use in studies of the genus *Crataegus* L. The technique requires a previous softening of the endocarp of each fruit, halved following the abscission suture with pruning scissors. Digitized images are obtained with a scanner on the sides of the endocarp where the seminal cavity is located. These images are used to perform quantitative measurements of both endocarp and seed through an image analysis program. The data obtained can be subjected to various statistical analyzes. As confirmation of the utility of the technique, a comparative study of the morphology of seeds and endocarp of 37 tejocote genotypes from two different localities was carried out. In general, the characters evaluated had low coefficients of variation. This indicates that the technique allows obtaining stable quantitative morphological data on the seeds and endocarp of *Crataegus* spp. The characteristics that increased the variability were related to size of the endocarp and number of endocarp per fruit. With this two general groups were identified, related to their locality of origin. In the first contrary to the second, the genotypes presented smaller endocarp and greater number of endocarp per fruit. Finally, it is confirmed that the technique facilitates the evaluation of character of seeds and endocarp of tejocote, which show a wide variability related to its morphology.

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Design on Cooling Cycle System in Rural Areas

Rural population is normally not very dense, cold winter and hot summer is a long-term problem for rural residents, and they rarely use the air conditioning system. Based on rich underground sources of cold energy in rural areas, this paper does some research aiming at low carbon emission and energy saving in to the design of the cooling cycle control system in rural areas, with underground cold source driving the semiconductor refrigeration equipment power supply system, combined with the use of ground source heat pump principle. After repeatedly experimenting from different perspectives such as the selection of cold underground sources and environment, the research and development of simple low energy consumption refrigeration equipment, to other simulation systems, by trial and error, we have concluded the following conclusion. In the case of summer temperature above 18, the cooling cycle control system can reduce indoor temperature by 2~ 4. In terms of energy saving, environmental protection, low carbon and so on, it works strikingly well. Therefore, it has a significant economic value in use.

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Assessment of Effects on Vegetation Rehabilitation in Southwest China

The forestry conservation region of Southwest China locating at the upstream of the Yangtze and Pearl River Basins is an important ecological barrier between China and Southeast Asia. It is significant for ecosystem conservation, biodiversity protection; and water and soil conservation. Since 2000, a number of ecological programs have been implemented in this region, especially the Natural Forest Conservation Program (NFCP) and the Grain to Green Program (GTGP).

We used the change of land use and land cover, improvement of vegetation coverage and net primary productivity (NPP), decrease of soil erosion module from 2000 to 2010 to access the effects of the implemented ecological programs. Compared with 2000, the forest area and grassland area of this region was increased 3 884 km² and 2 253 km² in 2010, respectively. Conversely, the farmland area was decreased 12 319 km². The average vegetation coverage and NPP during 2000 and 2010 was 70.71% and 866.26 gC/m²/a, respectively. Since 2000, annual mean vegetation coverage and NPP showed a slightly increasing trend, with an increase of 0.18%/a and 2.96 gC/m²/a. The soil erosion module was decreased 2.76 t/ha/a in this period. The regional warm and wet climate in recent years is helpful for ecosystem recovery. In addition, implementation of ecological projects has contributed significantly to the rehabilitation of the fragile ecosystems in this region. To make these projects more successful and sustainable, long-term management procedures are necessary to maintain and consolidate the improvements.

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Spatial Heterogeneity in the Food Web of a Large Shallow Eutrophic Lake (Lake Taihu, China): Implications for Eutrophication Process and Management

Understanding food web spatial heterogeneity is important for ecologists and lake managers to understand ecosystem complexity and lake management. Lake Taihu, a large shallow eutrophic lake in China, has two distinct zones: algae- and macrophyte-dominated zones. In this study, we assessed the spatial heterogeneity of food webs in the two lake zones through stable isotope analysis and mixing isotope model. Overall, more $\delta^{13}\text{C}$ -depleted and $\delta^{15}\text{N}$ -enriched ratios were found in the algae- than the macrophyte-dominated zone for basal sources and consumers. The basal sources and consumers showed significant differences for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ratios between the two lake zones, except for the filter-feeding fishes. These spatial differences may have resulted from catchment anthropogenic impacts and ecological interactions within the system. Spatial trophic heterogeneity may be considered for protection and restoration of the shallow eutrophic lake.

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Perception to Climate Change and Impact on Agricultural Productivity: An Assessment of Smallholder Farmers in Amathole District Municipality, Eastern Cape Province, South Africa

The already declining contribution of agriculture to South Africa's national economy from more than 6% in the 1970s to 1.9% in 2013 is faced with an increased likelihood of further reduction as a result of climate change. Particularly, its former homeland agricultural production characterized by indigent smallholder farmers. As sustainability is crucial to the continuous survival of this exclusive population, this study assesses their perception to climate change and its impacts on their agricultural productivity. A multistage sampling procedure was used to select a total of 303 crop, livestock and poultry smallholder farmers from 18 villages in Amathole District. Data were collected using semi-structured questionnaires soliciting information on the socio-economic characteristics and perceptions towards changes in temperature, rainfall, the severity of climate change induced hazards and the extent of its perceived impacts on agricultural productivity. Multiple regression analysis was carried out to determine factors influencing smallholder farmers' perceived impacts of climate change on agricultural productivity.

Findings revealed increase in temperature level, drastic decline in rainfall, harsh and aggressive climatic conditions, with attendant problems of drought, heat waves, veld fire and excessive wind blowing. There is increased difficulty in production activities as a result of water scarcity, drying up of velds and dams, poor soil conditions, pest infestations and disease infections, livestock weight loss and deaths, and destruction of shelters (both human and livestock). There is a growing threat of unsustainable agricultural production, which may in due course, increase poverty level of the resident smallholder farmers. In order to sustain production activities, immediate government interventions are required to appropriate functional extension service delivery systems particularly in carrying out climate change coping and adaptation response outreaches and implementations.

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Aquaporins and Oxygen Transport in Plants: Consequences for Waterlogging Tolerance and Crop Productivity

Aquaporins are proteins involved in the transport of water and other small molecules across cell membranes. In addition to their well-described role in regulating plant hydraulic properties, reports of their contribution to the transmembrane gas transport point to their likely importance in gas exchange processes in plants. A recent study (Zwiazek et al. 2017) demonstrated that some of the plant and human aquaporins facilitate oxygen transport when heterologously expressed in yeast. In hypoxia-tolerant tobacco (*Nicotiana tabacum*) plants, root oxygen deficiency conditions induced a sharp, more than a hundred-fold, increase in the transcript levels of the oxygen-transporting aquaporin *NtPIP1;3*, that was accompanied by an increase in root and leaf levels of ATP. The effect of ethylene on root hypoxia tolerance was also studied in aspen (*Populus tremuloides*) seedlings to explain the processes leading to improved water transport, photosynthesis, and growth in ethylene-treated hypoxic plants. Ethylene treatment of hypoxic roots resulted in several-fold increases in net photosynthesis and light saturation levels for photosynthesis in hypoxic aspen. These increases were attributed mainly to the increased stomatal conductance that was possible due to improved root hydraulic properties under oxygen-deficiency conditions. The improved hypoxia-tolerance was associated with an increase in the internal oxygen concentration levels in the roots of the ethylene-treated hypoxic plants in the absence of changes in root porosity. These responses were also associated with an increase in the transcript abundance of several root aquaporins suggesting a link to oxygen transport. The discovery of oxygen transport through aquaporins opens the possibility of controlling the rates of transmembrane oxygen transport and enhancing oxygen delivery to the roots of plants subjected to waterlogging and to other conditions that generate root hypoxia. This may have important consequences to the efforts aimed at improving waterlogging tolerance of plants and increasing crop productivity.

Zwiazek J.J., Tan X., Xu H., Navarro-Ródenas A., Morte A. 2016.
Functional significance of oxygen transport through aquaporins.
Scientific Reports - Nature 17: 40411.