15th INTERNATIONAL CONGRESS ON AGRICULTURAL MECHANIZATION AND ENERGY IN AGRICULTURE

October 29-November 1, 2023 - Antalya, Türkiye

Abstract Book

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Preface

It is a great pleasure and honor for us to your participation in the 15th International Congress on Agricultural Mechanization and Energy in Agriculture – AnkAgEng'2023" organized between October 29 – November 1, 2023, in Antalya, Türkiye by Ankara University Faculty of Agriculture Department of Agricultural Machinery and Technologies Engineering. We are also honored to hold the 15th of our congress, the first of which was organized by Ankara University in 1980. Since the first International Congress on Agricultural Mechanization and Energy in Agriculture, we have continued our congress on a regular basis every three years. AnkAgEng'2023 Congress was of great importance for us and the Turkish nation as 2023 is the "100th Anniversary of the Republic of Türkiye" and was held like a feast for the scientific world.

AnkAgEng'2023 offered a magnificent international platform for academics, researchers, engineers, industry participants, and students from all over the world to share their research results in the field of agricultural technology engineering. The main subjects of the Congress are; Machinery and Energy Systems, Agriculture Information Technologies, Digital-Smart Agriculture, Ergonomics, Health & Safety, System Engineering, Postharvest Technologies & Process Engineering, Sustainable Agriculture, Natural Resources & Environmental Systems, Plant, Animal & Facility Systems, Agricultural Engineering Education, and Biosystems Engineering. The congress featured keynote speakers, oral and poster presentations, special sessions, and real-time discussions.

A total of 200 researchers from 30 different countries applied to participate in the congress by submitting abstracts. Participants were from the USA, Canada, Italy, England, Ireland, Spain, Portugal, Denmark, Belgium, Greece, China, Japan, Nigeria, Czechia, Pakistan, India, Iran, Russia, Sweden, Brazil, Bulgaria, Oman, Algeria, Poland, Finland, Malaysia, Romania, Sudan, Tanzania, and Turkiye. At the AnkAgEng'23 congress, 5 invited speakers and 8 online keynote speakers made oral presentations. In addition, 57 oral and 12 poster presentations were presented by researchers.

We would especially like to thank our invited/keynote speakers, session chairs, members of the Scientific Committee, authors, and colleagues for making their valuable contributions. We are thankful to Ankara University, Springer Nature, our main sponsor Türk Traktör, gold sponsor Ziraat Bank, European Society for Agricultural Engineers, American Society of Agricultural and Biological Engineers and International Commission of Agricultural and Biosystems Engineering for their kind support that enabled us to hold this congress.

Sincerely yours
On behalf of the Congress Organizing Committee
Prof. Dr. Ahmet ÇOLAK
Congress Chair

Honorary Chairperson

Necdet Ünüvar, Rector of Ankara University

Organising Committee

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Hüseyin Kürşat Çelik	Sefa Altıkat	

Scientific Program

Oct. 29, 2023, Sunday	
14.00	Check-in to the Congress Hotel, Sherwood Exclusive Lara Hotel
15.00	Registration
20.00-23.30	100th Anniversary of the Republic of Türkiye Ball (Gala Dinner)
Oct. 30, 2023, Monday	
08.30 -09.15	Opening Ceremony
Invited Speaker Presentations (1-3) – Hall A	
Chair: Jitendra Paliwal – University of Manitoba	
09.30-10.00	ISP-1: Hyperspectral Imaging Technology: A Novel Nondestructive Tool for Detecting and Evaluating Agricultural and Food Products **Da-Wen Sun – University College Dublin**
10.00-10.30	ISP-2: Building a Sustainable Energy Future **Yunus Çengel – University of Nevada**
10.30-11.00	ISP-3: An Exergy-Based Design of An Agricultural and Horticultural Slow-City Compound with Solar, Wind, and Geothermal Energy with Circular Hydrogen **Birol Kılkış – Fellow ASHRAE, Ostim Technical University**
11.00-11.30	Presentation of Türk Traktör, Main Sponsor
11.30-11.45	Coffee Break
SESSION I – Hall A | Oral Presentations (1-4)	
Chair: David Herák – Czech University of Life Sciences	
11.45-12.00	OP-1: Autonomous Ground Vehicle for Weeding Activities: Preliminary Sustainability Assessments **Giuseppe Todde**
12.00-12.15	OP-2: Evaluation of Hydration State around Glycerol as a Humectant using Microwave Dielectric Spectroscopy **Nao Takeuchi**
12.15-12.30	OP-3: Discharge Coefficients for Adjustable Slot Inlets Used to Ventilate Animal Production Buildings **John P. Chastain**
12.30-12.45	OP-4: Combining Digital Image Processing and Machine Learning is Useful for the Early Detection of Salinity and Drought Stresses in Cucumber **Parvin Mohammadi**
12.45-13.30	Lunch Break

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Chair: Poulek Vladislav – Czech University of Life Sciences	
13.30-13.45	OP-5: Enabling Insecticide Spot Application on Boom Sprayer by Developing Machine Vision and Communcation Components **Ahmad Al-Mallahi**
13.45-14.00	OP-6: Optical Techniques for Automated Evaluation of Seed Damage **Mohammad Nadimi**
14.00-14.15	OP-7: Estimation of Vitamin A Concentration in Cattle Blood Based on Fluorescence with/without Blood Cell Separation by Plasma Filter **Mizuki Shibasaki**
14.15-14.30	OP-8: A Network Compaction Strategy to Reduce the Cost of Detection Networks Deployed in Edge-AI Devices: A Case Study for Grading Canola **Chyngyz Erkinbaev**
14.30-14.45	Coffee Break
SESSION II – Hall B | Oral Presentations (9-12)	
Chair: Keyvan Asefpour Vakilian – Gorgan University of Agricultural Sciences and Natural Resources	
13.30-13.45	OP-9: Exploring Transfer Learning for Enhanced Seed Classification: Pre-trained Xception Model **Zeynep Ünal**
13.45-14.00	OP-10: Classification of Pistachio Nut using Convolutional Neural Network **Khaled Idress**
14.00-14.15	OP-11: Deep Learning as a New Technique to Detect Plant Leaf Diseases **Ako Kakarash Omer**
14.15-14.30	OP-12: Definition of Reference Models for Functional Parameters and Price for Mowers and Mowers-Conditioners **Daniele Pinna**
14.30-14.45	Coffee Break
SESSION III – Hall A | Oral Presentations (13-16)	
Chair: Birol Kılkış – Fellow ASHRAE, Ostim Technical University	
14.45-15.00	OP-13: Impact of Building Geometry, Window Types, and Materials on Daylighting Performance of Livestock Buildings **Sheikh Rishad Ahmmad**
15.00-15.15	OP-14: Development of Design of Solar PV Panels within Last 25 Years – Possibilities for Renovation **Martin Libra**

Scientific Program

Oct. 30, 2023, Monday	
15.15-15.30	OP-15: Estimating Tall Fescue and Alfalfa Forage Biomass Using an Unmanned Ground Vehicle **Ali Bülent Koç**
15.30-15.45	OP-16: Tracking Hydraulic Performance of Photovoltaic Pumping System using Solar Radiation Data: An Empirical Model **Assia Harkani**
15.45-16.00	Coffee Break
SESSION III – Hall B | Oral Presentations (17-20)	
Chair: Daniele Pinna – University of Padova	
14.45-15.00	OP-17: Evaluation of Air Conditioning Parameters in Semi-closed Greenhouses According to Turkey's Climate **Mohammed Hassan**
15.00-15.15	OP-18: Effect of Different OLR and Mixture Ratios on Biogas Production using Goat Dung and Maize Silage **Aslı Ayhan Arslan**
15.15-15.30	OP-19: Mapping Biomass Energy Potential from Agricultural Residues in Tanzania **Geofrey Prudence Baitu**
15.30-15.45	OP-20: The Effect of Different Tillage Methods on Plant Emergence Parameters for Wheat **Serkan Özdemir**
15.45-16.00	Coffee Break
ONLINE SESSION I – Hall A | Online Keynote Presentations (1-4)	
Chairs: John P. Chastain – Clemson University	
16.00-16.30	OKP-1: Robotics for Crop-Load Management in Tree Fruit Crops **Manoj Karkee – Washington State University**
16.30-17.00	OKP-2: Precision Agricultural Technology Transition in Fruit/Berry Crops Production Management **Lav Khot – Washington State University**
17.00-17.30	OKP-3: A Greenhouse Plants Heating System Based on Low Temperature Long Wave Radiation Emission **George Papadakis – Agricultural University of Athens**
17.30-18.00	OKP-4: Development of Thermoset Epoxy Resin Film from Soybean Oil **Kasiviswanathan Muthukumarappan – South Dakota State University**

Scientific Program

Oct. 31, 2023, Tuesday	
Invited Speaker Presentations (4-5) – Hall A	
Chair: Martin Libra – Czech University of Life Sciences	
08.45-09.15	ISP-4: Robotics and Perception in Agriculture, Challenges to a Fully Automated Process **Fernando Auat Cheein – Heriot-Watt University**
09.15-09.45	ISP-5: Smart Agriculture and its Connection to the Digital Twin's Ideas **David Herák – Czech University of Life Sciences**
09.45-10.00	Coffee Break
ONLINE SESSION II – Hall A | Online Keynote Presentations (5-8)	
Chairs: Hong Liu – Oregon State University, Serap Görücü – University of Florida	
10.00-10.30	OKP-5: Flying Lora-Drone Gateway for IoT Monitoring in Oil Palm Plantation **Samsuzana Abd Aziz – Universiti Putra**
10.30-11.00	OKP-6: Key Technologies for Fully Intelligent Production of Kiwifruit **Longsheng Fu – Northwest A&F University**
11.00-11.30	OKP-7: Detecting the Basal Stem Rot (BSR) Disease using Vegetation Index, Thermal Imaging, and Machine Learning **Siti Khairunniza Bejo – Universiti Putra**
11.30-12.00	OKP-8: Exploring the Impact of Dust on Photovoltaic Performance: An Overview of Historical Trends, Current Findings, and Future Prospects **Hussein A Kazem – Sohar University**
12.00–13.30	Lunch Break
SESSION IV – Hall B | Oral Presentations (21-27)	
Chair: Yeşim Benal Öztekin – Ondokuz Mayıs University	
10.00-10.15	OP-21: Design and Implementation of a Real-Time Wireless PTO Torque Measurement System for Agricultural Applications **T.Göktürk Seyhan**
10.15-10.30	OP-22: Recent Developments in Agricultural Machinery and Technologies **M. Metin Özgüven**
10.30-10.45	OP-23: Developing Test Method for Automatic Steering Systems **M. Barış Eminoğlu**
10.45-11.00	OP-24: Estimation of Some Soil Loss Characteristics using Machine Learning Algorithms **Sema Kaplan**
11.00-11.15	OP-25: Effect of Different Drying Temperatures on CO2 Emissions in Acorn Drying **Mahmut Kaplan**

Scientific Program

Oct. 31, 2023, Tuesday	
11.15-11.30	OP-26: Microwave Assisted Convective Drying Effect on Drying Time, Energy, Quality and Bioactive Compounds of the Cantaloupe **Mohammad Kaveh**
11.30.11.45	OP-27: Prediction of the Kinetics of Drying Rheum ribes L. by an Infrared-Convective Dryer using Artificial Neural Network and ANFIS **Mohammad Kaveh**
12.00–13.30	Lunch Break
SESSION V – Hall A | Oral Presentations (28-32)	
Chair: Aaron Turner – Clemson University	
13.30-13.45	OP-28: Farm Vehicle and Farm Labor Transportation Crashes in Florida: 2013-2021 **Serap Görücü**
13.45-14.00	OP-29: Implementation and Assessment of an Autonomous Ground Vehicle (AGV) for On-Field Agricultural Operations **Gabriele Sara**
14.00-14.15	OP-30: Criteria of Ecological Pressure on Agricultural Systems **Valentin B. Sapunov**
14.15-14.30	OP-31: Rural Development Policy for Water Management Sustainability in Italy: Opportunities to Achieve Water Framework Directive Objectives **Myriam Ruberto**
14.30-14.45	OP-32: Hazard Identification and Risk Assessment for Cattle Stunning: Case Study **Serap Görücü**
14.45-15.00	Coffee Break
SESSION V – Hall B | Oral Presentations (33-37)	
Chair: Chyngyz Erkinbaev – University of Manitoba	
13.30-13.45	OP-33: Developing a Data-Driven Model for Predicting Water Stress in Pistachio Trees **Azar Alizadeh**
13.45-14.00	OP-34: Water Distribution Uniformity of Nozzles for a Hose Reel Irrigation Machine **Selçuk Arslan**
14.00-14.15	OP-35: Economic Analysis of Subsurface Drainage Systems in North Central Iowa **Kapil Arora**
14.15-14.30	OP-36: Determination of Suitable Shearing Conditions for Effective Pruning of Tree Branches **Saeid Minaei**
14.30-14.45	OP-37: Development of Variable Rate Irrigation System for Linear Moving Irrigation Machine **Bahattin Akdemir**
14.45-15.00	Coffee Break

Scientific Program

Oct. 31, 2023, Tuesday	
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Chair: Saeid Minaei – Tarbiat Modares University	
15.00-15.15	OP-38: Using Composted Cow Manure to Improve Nutrient Content, Aeration Porosity, and Water Retention of Pine Bark-Based Potting Media **Tom O. Owino**
15.15-15.30	OP-39: Coefficient of Dynamic Wall Friction for Wood Fuel Pellets **Aaron P. Turner**
15.30-15.45	OP-40: Emerging Smart Biosensors for the Specific and Ultrasensitive Detection of Plant Abiotic Stresses **Keyvan Asefpour Vakilian**
15.45-16.00	OP-41: Sexing of Chicken Egg in the Early Incubation Based on the Analysis of Transmission Image **Maho Chihara**
16.00-16.15	OP-42: EASY4DIGIT – European Agriculture System for Digital-Based Technologies **Yeşim Benal Öztekin**
16.15-16.30	Coffee Break
SESSION VI – Hall B | Oral Presentations (43-47)	
Chair: Kapil Arora – Iowa State University	
15.00-15.15	OP-43: Determination of the Effect of Technical Parameters which Affect on the Tractor Energy Efficiency **İbrahim Ergül**
15.15-15.30	OP-44: Determination of PTO Performance Test Method for Electric Tractors **S. Oğuz Yıldız**
15.30-15.45	OP-45: Development of Fertigation System for Hose Reel Irrigation Machine **Turgay Polat**
15.45-16.00	OP-46: Determining the Possibility of Use of the DSSAT Model to Estimate Maize Yield and Water Consumption under Different Irrigation Levels **Sener Özçelik**
16.00-16.15	OP-47: Enhancing System Understanding, Gathering and Structuring Knowledge to Manage Uncertainty in WEF Systems in Gediz Basin **Sinan Aras**
16.15-16.30	Coffee Break

Scientific Program

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SESSION VII – Hall A | Oral Presentations (48-52)	
Chair: Giuseppe Todde – University of Sassari	
16.30-16.45	OP-48: Determination of Operating Parameters in Milking Robots with Milk First Cow Traffic **Hasan Kuraloğlu**
16.45-17.00	OP-49: Shear Tests of Grapevine (*Vitis vinifera* L.) Canes **Abdullah Sessiz**
17.00-17.15	OP-50: Comparison and Evaluation of Vegetation Indices for Image Sensing Systems in Precision Agriculture **Ömer Barış Özlüoymak**
17.15-17.30	OP-51: Development of An Autonomous Mobile Robot Prototype for Agricultural Tasks in Greenhouses **Erdem Yıldız**
17.30-17.45	OP-52: Investigation of the Compliance of the Milking Routine and Pulsator's Working Characteristics to the Milking Technique in Some Dairy Cattle Farms in Isparta Province **Mwiinga Micheal Milimo**
SESSION VII – Hall B | Oral Presentations (53-56)	
Chair: Selçuk Arslan – Uludağ University	
16.30-16.45	OP-53: Design Approaches of One-Pass Strip-Till Machines **Serkan Özdemir**
16.45-17.00	OP-54: Examination of the Farm Machinery Tests Based on the Testing Institutes and Machinery Producers in Türkiye **Zeynep Demirel Atasoy**
17.00-17.15	OP-55: Fine-Tuning Growth Conditions: Leaf-Level Vapor Pressure Deficit Control for Optimized Photosynthesis **T. Göktürk Seyhan**
17.15-17.30	OP-56: The Relationship between CO2 Emissions and Soil Moisture Content Under Different Tillage Methods in Cotton Farming **Şener Özçelik**
17.30-17.45	OP-57: Chopper System for In-Line Small Square Balers **Sedat Kahraman**
POSTER SESSION – 17.45-18.30	
18.30	Closing Ceremony
19.00-20.30	Closing Cocktail

Scientific Program

Nov. 01, 2023, Wednesday	
08.30-14.00	Half day tour in Antalya

POSTER SESSION – 17.45-18.30
PP-1: A method for Multispectral Images Alignment at Different Heights on the Crop **Sabina Laveglia, Giuseppe Altieri**
PP-2: Novel SERS Framework for Sulphur Quality Analysis of Pulse Protein **Catherine RJ Findlay, Mohammad Nadimi, Alex C-T Ko, Pankaj Bhowmik, Jitendra Paliwal**
PP-3: Convective Drying of Black Chokeberries (*A. Melanocarpa*) by Different Pretreatments **İsmail Boyar, Hasmet Emre Akman, Nesibe Ebru Yasa Kafkas, Betül Yesil, Sadiye Gözlekçi Kuzu, Can Ertekin**
PP-4: Studying the Effect of Surface and Geometry Manipulation on Dew Condensation and Rain Collection in Boreal Field Conditions **Soroush Moradi Zavie Kord, Juuso Tuure, Matti Räsanen, Laura Alakukku, Szabol Galambosi**
PP-5: Analysis of Factors affecting Farmers' Intention to Use Autonomous Ground Vehicles **Jonny Waked, Gabriele Sara, Giuseppe Todde, Daniele Pinna, Georges Hassoun, Maria Caria**
PP-6: Uncertain Future Menemen Plain Integrated Management of Agriculture and Nature Based Solutions for Sustainable Soil Management **Vural Karagül, Alican Eren, Tuncay Topdemir, Zübeyde Albayram Doğan, Sinan Aras, Nuri Candan, Murat Çağatay Keçeci, Gülay Yılmaz, Gözen Yüceerim, Şener Özçelik**
PP-7: Investigation of the Performance of a Pneumatic Hazelnut Harvester with Husker Unit Used in Türkiye **Taner Yıldız**
PP-8: Transmission Raman Spectroscopy for Inner Layers Chemical Analysis of Fresh Produce **Rani Arielly**
PP-9: Hyperbaric Inactivation – a New Pressure-Based Method to Inactivate *Bacillus subtilis* Endospores at Room Temperature? **Jorge A. Saraiva, Carlos A. Pinto**
PP-10: Hyperbaric Storage as a New Food Preservation Methodology to Control the Germination and Development of *Clostridium perfringens* Spores **Carlos A. Pinto, Jorge A. Saraiva, Alireza Mousakhani**
PP-11: Applying Nature-Inspired Optimization and Machine Learning for Strawberry Leaf Scorch Detection and Classification **Mohammad Javidan, Ahmad Banakar, Keyvan Asefpor, Ioannis Ampatzidis, Kamran Rahnama**
PP-12: The influence of combustion temperature on the emission of pollutants in a low-power wood biomass boiler **Maciej Joński, Adam Ekielski, WULS, Adam Świętochowski, Jan Joński**

Invited Keynote Presentations

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ISP-02. Building a Sustainable Future in Energy
Yunus A. Çengel 3

ISP-03. Exergy-Based Slow-City/Agriculture Mechanization With Circular Hydrogen And Renewable Energy Systems
Birol Kılkış 4

ISP-04. Robotics and Perception in Agriculture, Challenges to a Fully Automated Process
Fernando Auat Cheein 5

ISP-05. Smart Agriculture and its Connection to the Digital Twin's Ideas
David Herák 6

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Manoj Karkee 9

OKP-02. Precision Agricultural Technology Transition in Fruit/Berry Crops Production Management
Lav Khot 10

OKP-03. A Greenhouse Plants' Heating System Based on Low Temperature Long Wave Radiation Emission
George Papadakis 11

OKP-04. Development of Thermoset Epoxy Resin Film from Soybean Oil
Kasiviswanathan Muthukumarappan 12

OKP-05. Flying Lora-Drone Gateway for IoT Monitoring in Oil Plam Plantation
Samsuzana Abd Aziz, Nurul Adilah Abdul Latiff, Idrus Salimi Ismail, Fakhrul Zaman Rokhani 13

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Longsheng Fu, Rui Li 14

OKP-07. Detecting the Basal Stem Rot (BSR) disease using vegetation index, thermal imaging, and machine learning
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Mohammad Nadimi, Jitendra Paliwal 23

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Mizuki Shibasaki,Tetsuhito Suzuki, Nanding Li, Moriyuki Fukushima,Tateshi Fujiura, Takahiko Ohmae, Norio Nishiki, Yuichi Ogawa, Naoshi Kondo 24

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OP-27. Prediction of the Kinetics of Drying *Rheum ribes* L. by an Infrared-Convective Dryer Using Artificial Neural Network and ANFIS

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In this research, nonlinear models including artificial neural network (ANN) and adaptive-network-based fuzzy inference system (ANFIS) were employed to evaluate the moisture ratio and drying rate of the *Rheum ribes* L. dried by infrared/convective dryer. The drying process was carried out in three temperatures (50, 60 and 70 °C), infrared powers (250, 500 and 750 W), the distances between the product and the infrared source (10, 15 and 20 cm), and thicknesses (3, 5 and 7 mm). These four parameters along with the drying time (0-1000 min) were considered as the network input in the ANN and ANFIS to assess the moisture ratio and drying rate. The best nonlinear model was selected based on the determination coefficient (R^2), mean square error (MSE), and mean absolute error (MAE). The rise in the temperature and IR power and a decline in the thickness and the distance between the product and the infrared source can shorten the drying time. The R^2 value of ANN and ANFIS models was 0.9988 and 0.9996, and MSE values was 0.0037 and 0.0021, respectively. Based on the considered statistical criteria (R^2, MSE, and MAE), the best model for the prediction of melon moisture content was the ANFIS model. These results indicated the high performance of the ANFIS model in the evaluation of the moisture content compared to ANN methods.

Keywords: *Rheum ribes* L., Infrared-convective dryer, ANN, ANFIS, drying rate