

American Society of Agricultural and Biological Engineers Annual International Meeting (ASABE 2022)

Houston, Texas, USA
17 – 20 July 2022

Volume 1 of 3

ISBN: 978-1-7138-5794-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2022) by American Society of Agricultural & Biological Engineers
All rights reserved.

Printed with permission by Curran Associates, Inc. (2022)

For permission requests, please contact American Society of Agricultural & Biological Engineers
at the address below.

American Society of Agricultural & Biological Engineers
2950 Niles Road
St. Joseph, MI 49085
USA

Phone: (269) 429-0300
Fax: (269) 429-3852

hq@asabe.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

Mechanized Harvest of Onions in South Texas.....	1
<i>Stephen W Searcy, Subas Malla, Dante L Galeazzi</i>	
Cereal Yield and Yield Components from Cropped Traffic Lanes Compared with Non-Trafficked Crop Beds in Commercial Controlled Traffic Farming Systems.....	19
<i>W. C. Tim Chamen, Diogenes L. Antille</i>	
Detecting Nutrients in Potato Plants Based on Visible/Near Infrared In-Field Spectral Measurements.....	27
<i>Reem Abukmeil, Ahmad Al-Mallahi</i>	
Agronomic Response of Rainfed Taro to Improved Soil and Nutrient Management Practices in Samoa.....	33
<i>Diogenes L. Antille, Aleni Uelese, Angelika Tugaga, Michael J. Webb, Seuseu Tauati, Jennifer Kelly, Uta Stockmann, James R. F. Barringer, Jeda Palmer, Ben C. T. Macdonald</i>	
An Investigation into the Effect of Irrigation with Sodium Bicarbonate-Rich Water on Soil Physico-Chemical Properties of Rugby Fields Under Turfgrass.....	47
<i>Roberto P. Marano, Sebastian Giacosa, Rafael A. Martinez, Diogenes L. Antille</i>	
Advanced Application of Terahertz Time-Domain Spectral Technique for In-Situ Monitoring of Microwave Vacuum Dehydration	58
<i>Yuqiao Ren, Da-Wen Sun</i>	
Design and Experiments of an Integrated Manual-Automatic Navigation Hydraulic Steering System for Crawler Combine Harvesters and Its Control Method.....	63
<i>Zhuohuai Guan, Gang Wang, Senlin Mu, Tao Jiang, Haitong Li, Min Zhang, Chongyou Wu</i>	
The Status of Precision Agricultural Technology Adoption in Missourian Farms.....	74
<i>Shirin Ghatrehsamani</i>	
Adapting Precision Technology on Row Crops Vs. Specialty Crops.....	82
<i>Shirin Ghatrehsamani</i>	
Optimal Sensors Placement in Controlled Environment Agriculture Using a Reinforcement Learning Approach.....	86
<i>Daniel Dooyum Uyeh, Senorpe Hiablie, Tusan Park, Blessing Ito Bassey, Rammohan Mallipeddi, Seungmin Woo, Hoseung Jang, Minjeong Kwon, Yeongsu Kim, Seokho Kang, Hyunggyu Park, Yonggik Kim, Jinho Son, Hyunseo Lim, Jonggeun Hong, Yushin Ha</i>	
Assessing the Potential Impacts of Biosolids Applications on the Presence of PFAS Compounds in Nearby Groundwater Wells: A Citizen Science-Based Study in Pennsylvania.....	91
<i>Md Shahin Alam, Heather E Preisendanz, Jennifer R Fetter, Susan Boser, Bryan R Swistock</i>	
Robust Route Planning for Autonomous Vehicles.....	105
<i>Zhicheng Zhu, Yiannis Ampatzidis, Abhisesh Silwal, Panos Pardalos</i>	
Deep Learning-Based Autonomous Cow Body Detection for Smart Livestock Farming.....	110
<i>Yongliang Qiao, Yangyang Guo, Dongjian He, Lilong Chai</i>	

Unmanned Aerial Vehicle Based Tree Canopy Characteristics Measurement for Precision Spray Applications.....	116
<i>Md Sultan Mahmud, Long He</i>	
Evaluation of Autonomous Surface Vessel Navigational Performance Under Varying Environmental Conditions.....	131
<i>Jessica Simmerman Wolfe, Gary Daniel Chesser, Jr., John Wesley Lowe, Gray Turnage, Jane Moorhead, Padmanava Dash, Robert Moorhead</i>	
Development of a Life Long Learning Concept for Smart Farming	146
<i>Heinz Bernhardt, Maximilian Treiber, Christina Paulus, Andreas Gronauer, Fabrizio Mazzetto, Andreas Mandler, Anders Henrik Herlin</i>	
Opportunities for Agriculture Through Industrial Internet of Things / Industry 4.0 - A Comparison Between US and Europe.....	151
<i>Heinz Bernhardt, Maximilian Treiber, Paulo Flores, Xin Sun, Leon Schumacher</i>	
Prediction Model of Biogas Production from Co-Digestion of Swine Manure and Waste Kitchen Oil.....	158
<i>Cuong Manh Duong, Teng Teeh Lim</i>	
Effects of an Instructional Treatment on Novice Programmers in an Agricultural Systems Technology Course.....	168
<i>Grant T Hood, Donald M Johnson, Michael L Pate, Christopher M Estepp, George M Wardlow</i>	
Novice Programmer Errors in an Introductory College of Agriculture Course.....	180
<i>Grant T Hood, Donald M Johnson, Michael L Pate, Christopher M Estepp, George M Wardlow</i>	
An Autonomous Ground System for 3D LiDAR-Based Crop Scouting	192
<i>Javier Rodriguez-Sanchez, Changying Li</i>	
Effective Management - A Vital Revamp of Agricultural Systems Management Senior Seminar	202
<i>Dennis R Buckmaster</i>	
Optimization of the Fermentation Parameters to Maximize the Production of Cellulases and Xylanases Using DDGS as the Main Feedstock in Stirred Tank Bioreactors	208
<i>Attia Iram, Deniz Cekmecelioglu, Ali Demirci</i>	
The Effect of Dilution, Aeration, and Agitation on Fungal Cellulase and Xylanase Production by DDGS-Based Fermentation Media in Stirred Tank Bioreactors	222
<i>Attia Iram, Deniz Cekmecelioglu, Ali Demirci</i>	
Simulation of SDI Soil Water Profiles for Alfalfa Using HYDRUS-2D	235
<i>Rocio G. Reyes Esteves, Freddie R. Lamm</i>	
Effects of Different Pretreatments and Drying Temperatures on the Drying Characteristics of Peanut Fruits.....	248
<i>Qingyun Sun, Zongchao Zhang, Menglong Han, Wenliang Ci, Zhenchao Jia, Feng Zhao</i>	
Solar Trigeneration System to Achieve Net-Zero Energy Greenhouse in Mediterranean Regions.....	253
<i>T. M. Abir Ahsan, Md Shamim Ahamed</i>	
Development of Portable Nondestructive Detection Device for Mango Internal Diseases	260
<i>Yang Li, Yankun Peng, Yongyu Li, Decai Lv, Le Liu</i>	

Non-Destructive Determination of Fat and Moisture in Pork Using Near-Infrared Hyperspectral Imaging.....	268
<i>Jiewen Zuo, Yankun Peng, Yongyu Li, Qibin Zhuang, Yang Li, Renhong Zhao</i>	
Linking Water Quality Stressors and Macroinvertebrate Diversity in Central Pennsylvania Using Passive Samplers	278
<i>Francesca M. Ferguson, Kyle R. Elkin, Robert Stout, Tamie L. Veith, John F. Tooker, Heather E Preisendanz</i>	
Projected Rainfall Erosivity Under Climate Change in the Southeastern United States	292
<i>Bijoychandra S Takhellambam, Puneet Srivastava, Jasmeet Lamba, Ryan P McGehee, Hemendra Kumar, Di Tian</i>	
Remote Intelligent Sensing System for Pork Freshness Change During Storage.....	300
<i>Wenlong Zou, Yankun Peng, Deyong Yang, Qinghui Guo</i>	
Surface-Enhanced Raman Spectroscopic Technique for Identification and Classification of Foodborne Pathogens	307
<i>Yahui Chen, Yankun Peng, Qinghui Guo</i>	
Upflow Anaerobic Floating Filter (UAFF) for the Anaerobic Digestion of Fish Farm Waste from Brackish Aquaculture	315
<i>Alessandro Chiumenti, B. Owono Owono, Giulio Fait, Francesco Da Borso</i>	
Thermal Drying of Digestate with Acid Scrubbing of Exhaust Air - A Full Scale Study	320
<i>Alessandro Chiumenti, Francesco Da Borso</i>	
A Heat Transfer Model for an Apple Orchard Equipped with Mobile Heaters During Frost	326
<i>Weiyun Hua, Long He, Paul Heinemann</i>	
Continuous Air Cleaning by Filtration and UV-C Treatment of Airborne Pathogens and Particulate Matter in Indoor Spaces.....	337
<i>Peiyang Li, Jacek A Koziel, Nubia Macedo, Jeffrey J Zimmerman, Danielle Wrzesinski, Erin Sobotka, Mateo Balderas, William B Walz, Reid Vincent Paris, Dongjie Liu</i>	
Ultraviolet Irradiation Modeling: Verification of Near-Field and Far-Field Applications	344
<i>Peiyang Li, Jacek A Koziel, William B Walz</i>	
Improving the Driving Capabilities of a Well-Driver PUP (Purdue Utility Project) to Install Low-Cost Driven Water Wells.....	359
<i>Grace L. Baldwin, Tyler J. McPheron, Robert M. Stwalley III</i>	
Development of a Real Time Internal Temperature Monitoring Device for Sows.....	368
<i>Tyler C Field, Samantha Neeno, Sarah Libring, Javier Flores, Mahira M Morris, Allan P Schinckel, Jay S Johnson, Robert M Stwalley III</i>	
A Comparison of the Academic Performance of Rising Scholars with Other Student Demographic Groupings Before and During the COVID Pandemic	376
<i>Grace L. Baldwin, Virginia Booth Womack, Sarah E. Larose, Carol S. Stwalley, Robert M. Stwalley III</i>	
How Can Fertigation and Chemigation with a Center Pivot Improve Sustainability of Irrigation Corn?.....	384
<i>Jacob L Larue</i>	

Simultaneous Drying and Microbial Inactivation of Industrial Hemp (<i>Cannabis Sativa L.</i>) Using Infrared and Hot Air Heating.....	398
<i>Chang Chen, Ivan Wongso, Ke Wang, Ragab Khir Abd El Gebreil, Daniel H. Putnam, Irwinâ R. R. Donis-Gonzalez, Zhongli Pan</i>	
DeepCottonWeeds (DCW): A Novel Benchmark of YOLO Object Detectors for Weed Detection in Cotton Production Systems	409
<i>Fengying Dang, Dong Chen, Yuzhen Lu, Zhaojian Li, Yu Zheng</i>	
Actual Crop Evapotranspiration and Grass-Reference Crop Coefficients of Cotton Under Different Irrigated and Rainfed Conditions	425
<i>Komlan Koudahe, Jonathan Aguilar, Koffi Djaman, M. B. Kirkham, Farzam Moghbel, Forough Fazel, Aleksey Sheshukov</i>	
Effect of Drying Methods and Parboiling Conditions on Amylose Content and Parboiled Rice Quality.....	435
<i>Khurram Yousaf, Kunjie Chen, Zhenwei Yu</i>	
Influence of Baking Temperature and Time on Quality Parameters of Probiotic Biscuit	444
<i>Divyasree Arepally, Tridib Kumar Goswami</i>	
An Advanced Cartesian Robotic System for Precision Apple Crop Load Management.....	450
<i>Xinyang Mu, Long He</i>	
Automated Cocoa Pod Borer Detection Using an Edge Computing-Based Deep Learning Algorithm	459
<i>Eros Allan Somo Hacinas, Lorenzo Sangco Querol, Liane Acero, Mercedes Arcelo, Divina M Amalin, Dan Jeric Arcega Rustia</i>	
A Real-Time FPGA-Based Image Processing System for On-The-Spot Decisions in Agricultural Field.....	469
<i>Sabiha Shahid Antora, Young Ki Chang, Tri Nguyen-Quang</i>	
Real-Time Counting of Strawberry Using Cost-Effective Embedded GPU and YOLOv4-Tiny	480
<i>Amritha Immaneni, Young Ki Chang</i>	
Development of a Multipurpose Recirculating Dryer for Drying Parboiled and Aromatic Paddy.....	490
<i>Chayan Kumer Saha, Sahabuddin Ahamed, Surajit Sarkar, Md. Monjurul Alam</i>	
Synchronized Paddy Cultivation Using Mechanical Rice Transplanting Technology in Bangladesh	498
<i>Chayan Kumer Saha, Surajit Sarkar, Md. Monjurul Alam</i>	
Establishment of a CA Park to Investigate Long Term Conservation Agriculture Practices to Improve Soil Health for Sustainable Crop Production	505
<i>Md. Ayub Hossain, Muhammad Arshadul Hoque, Md Jahangir Alam, Md. Monjurul Alam, Chayan Kumer Saha</i>	
Evaluation of Novel Ammonia Recovery from the Anaerobic Effluent by Integrating Biogas Stripping and Gypsum Absorption.....	511
<i>Do-Gyun Kim, Liang Yu, Shulin Chen</i>	
Hermetic Storage Technology to Reduce Postharvest Loss of Paddy: Farmers to Commercial Scale.....	519
<i>Md. Monjurul Alam, Md. Rostom Ali, Shibendra Narayan Gope, Md. Abdul Awal, Alex E Winter-Nelson</i>	
Estimation of Injection Site in Turbot Based on Image Segmentation.....	527
<i>Wei Luo, Chen Li, Kang Wu, Jianping Li, Songming Zhu</i>	

AEF's Impact on Ag Digital World	535
<i>David Smart, Johann Witte, Volker Zippel, Slawi Stesny, Norbert Schlingmann</i>	
Analyzing Chicken Activity Level Under Heat Stress Condition Using Deep Convolutional Neural Networks	543
<i>Kai-Rong Chang, Fu-Pang Shih, Ming-Kun Hsieh, Kuang-Wen Hsieh, Yan-Fu Kuo</i>	
Applying Generative Adversarial Networks for Sticky Paper Trap Image Generation and Object Detector Performance Enhancement	548
<i>Dan Jeric Arcega Rustia, Eros Allan Hacinas, Liane Angelo Acero, Lorenzo Sangco Querol, Mercedes Arcelo, Divina M Amalin</i>	
Improvement of Field Phenotyping from Synchronized Multi-Camera Image Collection Based on Multiple UAVs Collaborative Operation Systems	558
<i>Hyeon-Seung Lee, J. Alex Thomasson, Xiongzhe Han</i>	
Droplet Size Classifications for Hollow-Cone Nozzles Manipulated with Two Different PWM Valves.....	563
<i>Ramon Salcedo, Heping Zhu, Hongyoung Jeon, Javier Campos, Carla Roman, Erdal Ozkan, Zhiming Wei, Emilio Gil</i>	
Concept of Adding Ground Truth Data for Economic Evaluation of Silage Quality in Germany	567
<i>Josef Johannes Bauerdick, Hubert Spiekers, Claudia Bodensteiner, Theresa Theunissen, Heinz Bernhardt</i>	

VOLUME 2

Dynamic Irrigation Water Distribution Network Modeling Based on Hydraulic-Hydrological Performance Analysis Using SWMM with Modulated Control.....	575
<i>Won-Ho Nam, Ji-Hyeon Shin, Eun-Mi Hong</i>	
Ergonomic Risk Assessments for Selected Nursery Operations	581
<i>Julian Williamson, Serap Gorucu</i>	
Innovations in Engine Design and Cab Structures of Agricultural Equipment Considerations for Noise Exposure.....	587
<i>Brian J Ahlstrom, Jayce Zilles, Michael L Pate</i>	
Round Modules: Handling Logistics and Cover Damage, 3rd Year	590
<i>Md Zafar Iqbal, Robert G. Hardin, Iv, Jason K. Ward, John D. Wanjura</i>	
Physicochemical Characterization of Biochar Derived from the Pyrolysis of Cotton Gin Waste and Walnut Shells	594
<i>Marlene Carla Ndoun, Clinton F. Williams, Allan Knopf, Herschel A. Elliott, Michael L. Mashtare, Natasha Vozenilek, Stephanie B. Velegol, Tamie L. Veith, Heather E. Preisendanz</i>	
Case Study of a Course that Prepares Future Engineering Educators: A 25-Year Reflection.....	606
<i>Ann D. Christy, Robert J. Gustafson</i>	
Comparison of Pine and Miscanthus Biochar Physicochemical Properties and Impact on Escherichia Coli Populations in Broiler Litter.....	616
<i>Maryam K Mohammadi-Aragh, John E Linhoss, Christopher A Marty, Jeffrey D Evans, Joseph L Purswell, Bernardo Chaves-Cordoba, J Wesley Lowe, G Daniel Chesser, Jr.</i>	

Evaluations of Manure Additive Prototypes on Their Mitigation of H ₂ S, NH ₃ , CO ₂ , and CH ₄ Emitted from Stored Swine Manure	624
<i>Baitong Chen, Jacek A Koziel, Samuel C O'Brien, William B Walz</i>	
Effects of Biochar-Based Control Release Nitrogen Fertilizers on Corn Growth in Greenhouse Trials.....	630
<i>Sikander Ameer, Lin Wei, Yajun Wu, Robiul Rubel</i>	
Video Recording System to Assess Animal Welfare Impact of Environmental Changes in Barns.....	646
<i>Daniel W Hofstetter, John Boney</i>	
An Arduino Based All-In-One Data Acquisition and Control System for Poultry Health Research.....	651
<i>Daniel W Hofstetter, Gino Lorenzoni, Eileen E Fabian</i>	
Development of Automatic Recognition and Gripping System of Beekeeping Auxiliary Device Using Stereo Camera and Object Detection Algorithm.....	655
<i>Pingan Wang, Kuswidiyanto Lukas Wiku, Hanif Adhitya Saiful, Changyeon Mo, Subae Kim, Xiongzhe Han</i>	
3D Deep Learning-Based Segmentation to Reveal the Spatial Distribution of Cotton Bolls.....	661
<i>Lizhi Jiang, Changying Li, Longsheng Fu</i>	
A Mobile System for Swine Depopulation, Pathogen Inactivation, Carcass Disposal, and Cleanup.....	671
<i>Myeongseong Lee, Jacek A Koziel, Brett C Ramirez, Baitong Chen, Yuzhi Li</i>	
Evaluation of Particulate Matter and Airborne Pathogen Mitigation with Filtration and UV-A Photocatalysis.....	682
<i>Myeongseong Lee, Jacek Koziel, Nubia R Macedo, Peiyang Li, Baitong Chen, William Jenks, Jeffrey Zimmerman, Vincent Paris</i>	
Deep Learning Based Grape Mildew Disease Severity Classification	690
<i>Yongliang Qiao, Zhao Zhang, Yangyang Guo, Dongjian He</i>	
Integration of Multiple Sensors for Beehive Health Status Monitoring and Assessment.....	695
<i>I-Chen Ho, Yen-Jen Lai, Po-Neng Chiang, Young-Fa Chen, Ta-Te Lin</i>	
Developing Cucumber Foliar Disease Complex Identification Using One-Hot and Multi-Hot Labeling Methods.....	706
<i>Meng-Chien Hsueh, Yu-Lun Dai, Chu-Ping Ling, Jin-Hsing Huang, Yan-Fu Kuo, Shih-Fang Chen</i>	
Automated Phenotyping of Single Seeds Using a Novel Volume Sculpting Framework	712
<i>Kai Zhao, Venkat Markapuri, Mitchell Neilsen</i>	
Visual Measurements of Fluttering Leaf to Quantify Internal Water Stress	729
<i>Jisoo Yuk, Joseph Lee, Caroline Graves, Sunghwan Jung</i>	
Estimating Ammonia Emitted from Manure During Storage on a Dairy Farm.....	735
<i>Rana A. Genedy, Jactone Ogejo</i>	
Automatic Pest Detection Utilizing Machine Vision and Artificial Intelligence	746
<i>Vitor Andrade Gontijo Da Cunha, Lucas Costa, Yiannis Ampatzidis, Dylan Pullock, Christopher Weldon, Kerstin Kruger, Aruna Manrakhian</i>	
Effect of Bromoform and Linseed Oil on Greenhouse Gas Emissions from Stored Beef Manure	753
<i>Andrew S Ortiz Balsero, Mara Zelt, Amy Millmier Schmidt, Miguel Fudolig, Daniel N Miller</i>	

Use of Self-Organizing Maps to Estimate Furrow Sediment Loss in Western U.S.....	761
<i>Bradley A. King, David L. Bjorneberg</i>	
Considering Micro-Aeration Strategy for Enhancing Methane Production in Anaerobic Digestion of Agricultural Wastes.....	776
<i>Yuanhang Zhan, Yiting Xiao, Leland C. Schrader, Ndeddy Aka Robinson Jr., S. Wu, Jun Zhu</i>	
The Use of Ultraviolet Radiation to Reduce Airborne Escherichia Coli.....	784
<i>Xuan Dung Nguyen, Yang Zhao, Jeffrey D Evans, Jun Lin, Brynn Voy, Joseph L Purswell</i>	
Design of a Versatile Wireless Multi-Sensor Interface for the Intelligent Environmental and Pest Monitoring System.....	790
<i>Yi-Tse Wu, Ya-Fang Wu, Sheng-Kuan Chen, Jui-Yung Chung, Ta-Te Lin</i>	
Hiring Culture.....	799
<i>Nicole E Anderson</i>	
Active-Laser Scanning and Intelligent Picking for Automated Loading of Agricultural Commodities to Processing Machines.....	811
<i>Mohamed Amr Ali, Benjamin Wu, Caleb Wheeler, Dongyi Wang, Yang Tao</i>	
In-Field Pine Seedling Counting Using End-To-End Deep Learning for Inventory Management.....	820
<i>Rafael Bidese Puhl, Yin Bao, Nina Payne, Thomas Stokes, Ryan Nadel, Scott Enebak</i>	
Moving Towards Digital Twin Based Smart Drying Systems for Agricultural Products	829
<i>Sharvari Raut, Jorg Schemminger, Gardis J. E. Von Gersdorff, Jochen Mellmann, Barbara Sturm</i>	
Regional Opportunities to Mitigate Greenhouse Gas Emissions in the Capital Region Berlin- Brandenburg, Germany	835
<i>Barbara Amon, Barbara Sturm, Federico Dragoni, Anja Hansen, Cornelia Weltzien, Thomas Amon, Annette Prochnow</i>	
Effect of Surfactant and Sonication Time on Improving the Bio-Accessibility of Lycopene Synthesized in Poly-Lactic Co-Glycolic Acid Nanoparticles.....	842
<i>Mohammad Anwar Ul Alam, A. Kassu, Lamin Kassama</i>	
Antimicrobial and Antioxidative Activity of Ethanolic Extract from Two Hemp (Cannabis Sativa L) Cultivars Grown in Northern Alabama.....	860
<i>Aaron L Dudley, Lamin M Kassama, Armitra Jackson-Davis, Xianyan Kuang, Ernest Cebert</i>	
A Field Survey of Electrical Grounding Systems of Commercial Broiler Houses in Mississippi and Alabama	875
<i>Matthew R Rowland, Gary D Chessser, Jr., John E Linhoss, Jeremiah D Davis, Jesse C Campbell, Joseph L Purswell</i>	
Application of Principal Component Analysis to Hyperspectral Data for Potassium Concentration Classification on Peach Leaves	885
<i>Megan Io Ariadne S. Abenina, Joe Mari Maja, Matthew Cutulle, Juan Carlos Melgar, Haibo Liu</i>	
The Mitigation of Gaseous Emissions from Swine Manure: A Review of Biochar Application for Environmental Management.....	899
<i>Baitong Chen, Jacek A Koziel, Samuel C O'Brien, Andrzej Bialowiec</i>	
Estimation of Evapotranspiration in a Zone with Residual Water Irrigation Using Metric.....	911
<i>Jorge Flores-Velazquez, Monserrat Ramirez</i>	

Vision Transformer with Masked Autoencoder Pretraining for Quantification of Grape Downy Mildew	918
<i>Ertai Liu, Kaitlin M Gold, David Combs, Lance Cadle-Davidson, Yu Jiang</i>	
Optimization of Electrospinning Parameters and Evaluation of the Physical Properties of the Electrospun Chitosan Antimicrobial Fibers	928
<i>Edwin O Ochieng, Lamin S Kassama, Joongmin Shin</i>	
Can Soil Smell Tell Us Something About Soil Practices?	935
<i>Darcy Bonds, Jacek A Koziel, Baitong Chen, Christian Haffner, Hailee Christensen, Teresa E Middleton, Marshall D McDaniel, Amy Kaleita, Adina Howe</i>	
An Automated Thermal Imaging System Based on Deep Learning for Dairy Cow Eye Temperature Measurement	947
<i>Wen-An Chen, Jih-Tay Hsu, Ta-Te Lin</i>	
The Development of a National-Level Energy Assessment Tool for the Dairy Industry	959
<i>Philip Shine, John Upton, Michael D. Murphy</i>	
Developing a Self-Guided Field Robot for Greenhouse Asparagus Monitoring	969
<i>Shih-Yu Lee, Jen-Cheng Wang, Ming-Chi Guo, Joe-Air Jiang, Ming-Hsien Hsieh, Jui-Chu Peng, Shih-Fang Chen</i>	
Sentinel Image to Estimating Water Use by Type of Source in La Laguna" Mexico"	976
<i>Jorge Flores-Velazquez, Eduardo Gutierrez</i>	
Corn Emergence Uniformity at Different Planting Depths and Yield Estimation Using UAV Imagery	983
<i>Chin Nee Vong, Lance S. Conway, Jianfeng Zhou, Newell R. Kitchen, Kenneth A. Sudduth</i>	
Speed and Whole Body Vibration in a Sample of Grapple Skidders from the US South	995
<i>Mathew F Smidt, Stephanie Lynch, Mark Schall, Richard Seseke</i>	
Smart Tree Crop Sprayer Sensing System Utilizing Sensor Fusion and Artificial Intelligence	1004
<i>Lucas Costa, Yiannis Ampatzidis</i>	
Anomaly Detection on the Cutter Bar of a Combine Harvester	1013
<i>Jorre Goossens, Bart Lenaerts, Steven Devos, Konstantinos Gryllias, Bart De Ketelaere, Wouter Saeys</i>	
Classification of Soybean Response to Off-Target Dicamba Exposure Using UAV-Based Imagery and Machine Learning Methods	1025
<i>Shagor Sarkar, Caio Canella Viera, Fengkai Tian, Jing Zhou, Jianfeng Zhou, Pengyin Chen</i>	
An Automated Delivery System for Therapeutic Materials Using Needle-Based Trunk Injection to Treat HLB Affected Citrus	1033
<i>Israel Ojo, Vinay Vijayakumar, Yiannis Ampatzidis, Ozgur Batuman, Sanju Kunwar, Ute Albrecht, Leigh Archer, Fernando Alferez, Haimanote Bayabil, John K. Schueller</i>	
Electrochemical Sensor Based on Magnetic Molecularly Imprinted Polymers and Cu ²⁺ for the Detection of Amoxicillin Residuals in Milk	1040
<i>Maosai Zhang, Xinhua Zhu, Wenchuan Guo</i>	
Evaluation of Drift Reduction Adjuvants Via Biological Injury on Soybeans from Simulated Dicamba Drift in a Low-Speed Wind Tunnel	1050
<i>Aszhia K. Albrecht, Elizabeth R. Alonzi, Anderson Weber, Joshua J. Skelton, Steven A. Fredericks</i>	

Determining Moisture Content in Equine Arena Footing On-Farm	1061
<i>Staci E McGill, Morgan Hayes, Kiley Power, Michael Peterson, Robert Coleman</i>	
Effects of One-Pass Microwave Drying on Rice Utilization in the Brewing Process	1064
<i>Christopher Stuckey, Kaushik Luthra, Griffiths G Atungulu</i>	
Surface Area Measurement Techniques, and Scope of Nutrient Removal from Greenhouse Wastewater by Improved Activated Carbon from Tomato Plant Biomass	1071
<i>Abu-Taher Jamal-Uddin, Shakirudeen A. Salaudeen, Animesh Dutta, Richard G Zytner</i>	
Impacts of Swine Lagoon Sludge Inclusion Rate on the Composting Process and Compost Quality	1081
<i>Piyush S Patil, Mahmoud A. Sharara</i>	
Detecting Peanut Flowers in Images Collected from a Field with the New High-Performance Detector YOLOX	1098
<i>Peyman - Nematzadeh, Ning - Wang, Rebecca S. Bennett</i>	
Development of a Public Database for Lone Agricultural Worker Incident Reporting.....	1112
<i>Aaron J Etienne, William Field</i>	
Towards Aerial Robotic Pollination for Controlled Crosses in Pinus Taeda.....	1129
<i>Piyush Pandey, Juan J. Acosta, Kitt G. Payn, Sierra N. Young</i>	
Rainwater Harvesting System for Water Supply	1138
<i>R Caleb Bruhn, Michael J Stablein, Luis F Rodriguez</i>	

VOLUME 3

Modeling a Grain Bin for Safe Entry Anchor Point Retrofit.....	1147
<i>Serap Gorucu, Michael Dyer, Randall Bock, Roderick Thomas, Linda Fetzer, Stephen Brown</i>	
Alternative Wastewater Pond Design for Land Applying the Effluent	1155
<i>Clifford B. Fedler, Luis Carlos Soares Da Silva Junior, Kushal Adhikari</i>	
Revenue Increase for German Dairy Farmers Throughcross-Value Chain Energy Management	1163
<i>Theresa Chiara Theunissen, Heinz Bernhardt</i>	
Application of Digital Twin in Evaluating Quality Changes in Tomato Value-Chain in Nigeria.....	1172
<i>Charles Chioma Nwaizu, Taofiq Olayinka Olanrewaju, Christiana Iluno</i>	
Design and Experimental Study of Automatic Vaccine Injection Device for Spindle-Shaped Fish	1191
<i>Chen Li, Junyang Chen, Songming Zhu, Jianping Li</i>	
A Profiling Device for Sugarcane Basecutters	1199
<i>Peng Huo, Shaochun Ma, Weiqing Li, Jun Qian, Lingfeng Li, Chenyang Su</i>	
Experimental Study on the Damage Regulation of Sugarcane Stubble Based on 4GZQ-180 Sugarcane Harvester	1204
<i>Jun Qian, Shaochun Ma, Weiyi Li, Maofeng Li, Songhao Kang, Peng Huo</i>	
Path Planning of a Robotic Manipulator for Pruning Apple Trees Based on RRT-Connect Algorithm	1218
<i>Yechen Li, Shaochun Ma, Zhengliang Ding, Lingfeng Li, Yujian Xin, Chenyang Su</i>	

Design of Reed Binding Device	1229
<i>Yang Bai, Yanjun Li, Zhenming Yang, Mingsheng Wang</i>	
AIoT-Based System for Indoor Plant Growth Monitoring and Early Nutrient Deficiency Detection.....	1235
<i>Eros Allan Hacinas, William Mitchell Dimaculangan, Simon Justin Que, Ma. Isabel Moncayo Tendido, Armando Salvador Matienzo Bambao, Lea Tesoro, Ma. Bonita C Raz, Alyssa Jane Cabtalan, Jeremias A Gonzaga, Dan Jeric Arcega Rustia</i>	
Resource Utilization in Heterotrophic Vs Autotrophic Marine Shrimp Production.....	1245
<i>David E Brune</i>	
Phenotyping Agronomic Traits of Peanuts Using UAV-Based Hyperspectral Imaging and Deep Learning	1253
<i>Kamand Bagherian, Rafael Bidese Puhl, Yin Bao, Qiong Zhang, Alvaro Sanz-Saez, Charles Chen, Phat Dang</i>	
Effect of High-Power Microwave Drying on Moisture Removal, Fissuring and Milling Yield of Rough Rice	1265
<i>Sreenivasula Reddy Boreddy, Kaushik Luthra, Griffiths G Atungulu</i>	
Effect of High-Power Short-Time Microwave Heating on Inactivation of Microbes on Rough Rice.....	1269
<i>F. Achieng, Kaushik Luthra, Sreenivasulu Boreddy, Abass Oduola, Griffiths G Atungulu</i>	
The Virginia Stormwater Runoff Calculator - A Geospatial Web Application.....	1278
<i>John L Coles, Raj Cibin</i>	
A Summary of South Carolina's Agricultural Incident Rates Used to Improve an Agricultural Safety Program	1291
<i>Maryann M. Lovern, Hunter F. Massey, Catherine A. Dibenedetto</i>	
A Comparison of Instructional Formats Used to Teach an Undergraduate Agricultural Safety Course.....	1301
<i>Mariah Beth Swygert, Hunter F Massey, Catherine A Dibenedetto, Jacob Paul Koch</i>	
A Review on Agricultural Academic Safety and Biosecurity Curriculum Standards	1310
<i>Glen Morris III, Shawn Ehlers, Roger Tormohlen, Bill Field, Melissa Rudolph</i>	
Experimental and CFD Simulation Studies of Infrared Explosion Puffing Dryer.....	1321
<i>Xianlong Yu, Zongchao Zhang, Qingyun Sun, Feng Zhao</i>	
Developing Energy Use and Savings Indices for Michigan Greenhouses.....	1327
<i>Grace A Dempsey, Aluel S Go</i>	
Impact of Microwave Rice Cooking in Steam-Vented Package on Gelatinization and Color	1335
<i>E. Ameyaw Owusu, K. Luthra, G. Atungulu</i>	
Evaluating a Dual Chamber Magnesium Electrolytic Process for Struvite Precipitation from Synthetic Wastewater	1347
<i>Robinson Ndeddy Aka, Dinithi Mohotti, Alia Nasir, Linan Zhu, Yuanhang Zhan, Jun Zhu, Sarah X Wu</i>	
Nonthermal Milk Pasteurization by Continuous-Flow Liquid Phase Plasma Discharge.....	1358
<i>Yuan Yuan, Shaobo Deng, Robinson Ndeddy Aka, Linan Zhu, Dinithi Mohotti, Sarah X Wu</i>	
Co-Production of Biogas and Hydrochar from the Mixture of Sawdust and Brewer's Spent Grain.....	1364
<i>Kalyani Ananthakrishnan, Md Shahadat Hossain, Klaus Doelle, Siddharth Chatterjee, Deepak Kumar</i>	

Optimization of a Green Plasma Process for Nitrogen Fixation in Water	1377
<i>Sarah X Wu, Bishal Thapa, Yuan Yuan, Robinson Ndeddy Aka, Alia Nasir</i>	
Optimization of Airflow Velocity of Pneumatic Pollination for Hybrid Rice Breeding	1386
<i>Te Xi, Fuqiang Yao, Yongwei Wang, Dongfang Li, Fake Shan, Lunqing Sun, Jun Wang</i>	
Research on the Influence Law of Rheological Properties and Rheological Behavior in Liquid-Phase Paddy Field	1396
<i>Lunqing Sun, Yuxuan Pan, Yongwei Wang, Jun Wang, Yiyang Zhao, Yangxuan Liao</i>	
Eff-PlantNet: An Annotation-Efficient 3D Deep Learning Network for Plant Shoot Segmentation Using Point Clouds.....	1406
<i>Liyi Luo, Shangpeng Sun</i>	
Impact of Urbanization and Drainage Disconnectivity in the Groundwater Recharge Potential - A Case Study.....	1415
<i>S. R. Thiruchelva, S. Chandran, Kumar Veluswamy</i>	
Variation of Litter Quality in Cage-Free Houses During Pullet Production.....	1424
<i>Xiao Yang, Lilong Chai, Ramesh Bahadur Bist, Sachin Subedi, Yangyang Guo</i>	
Non-Destructive Classification and Quality Evaluation of Proso Millet Cultivars Using NIR Hyperspectral Imaging with Machine Learning	1431
<i>Lauren E. Doyle, Julia R. Loeb, Nader Ekramirad, Dipak Santra, Akinbode A. Adedeji</i>	
Automated Pruning Decisions in Dormant Canopies Using Instance Segmentation.....	1440
<i>Daniel Borrenpohl, Manoj Karkee</i>	
Temperature and Humidity Distribution of a Wide-Tunnel Dairy Barn in the Winter.....	1454
<i>Mario R. Mondaca, Michael Wolf, Matthew Brady, Niloofar Moradian</i>	
Bias Towards Female Instructors of Agricultural Technology Courses.....	1462
<i>S. Kjersti Clawson, Michael L Pate, Don Edgar, Tyson Sorensen</i>	
Simulation of an In-Field Phenotyping Robot: System Design, Vision-Based Navigation and Field Mapping	1466
<i>Zhengkun Li, Rui Xu, Changying Li, Longsheng Fu</i>	
The Climate Change Effect on the River Discharge Southwest of Iran	1481
<i>Zohreh Khorsandi, Farhad Mokhtari, Farzaneh Khorsandi</i>	
Field Calibration of a Time Domain Reflectometry Sensor with an Extension Pipe for Soil Water Content Measurement.....	1483
<i>Rehnuma Mobin Maisha, Dean D. Steele</i>	
Financial Feasibility Study of GREENBOX Technology for Crop Production in an Urban Setting	1497
<i>Ankit Kumar Singh, Boris Bravo-Ureta, Xiusheng Yang</i>	
The Bushland Maize for Grain Datasets: A Machine-Readable Resource	1513
<i>Steven R. Evett, Karen S. Copeland, Brice B. Ruthardt, Gary W. Marek, Paul D. Colaizzi, David K. Brauer, Terry A. Howell, Sr.</i>	
Pest-Infested Soybean Leaf Image Classification with Deep Learning Techniques for Integrated Pest Management (IPM).....	1522
<i>Chetan Badgujar, Hasib Mansur, Daniel Flippo</i>	

Risk Assessment Methods for Automated Agricultural Machines: Current Practice and Future Needs.....	1530
<i>John M Shutske, Kelly J Sandner, Zachary Jamieson</i>	
Estimation of Alfalfa Hay Crop Yield in Northern Nevada Using Two Different Regression Methods.....	1558
<i>Diego Quintero, Uriel Cholula, Manuel A Andrade, Juan Solomon</i>	
Effects of Deficit Irrigation on Yield and Water Productivity of Alfalfa in Northern Nevada	1567
<i>Uriel Cholula, Diego Quintero, Manuel A. Andrade, Juan Solomon</i>	
UAV Multispectral Imagery for Site-Specific Management of Iron Deficiency Chlorosis (IDC) in Soybean	1577
<i>Katelin S. Waldrep, Mary Love M. Tagert, Justin McCoy, Mark Harrison, Andy Taylor</i>	
Quality Assessment and Grading of Sweet Potato Using VNIR Hyperspectral Imaging.....	1585
<i>Mohammed Kamruzzaman, Arthur Villordon</i>	
3D Characterization of Tree Architecture for Apple Crop Load Estimation.....	1590
<i>Tian Qiu, Lailiang Cheng, Yu Jiang</i>	
Economically Sustainable Shade for Feedlot Cattle in Brazil	1600
<i>Alex Sandro Campos Maia, Gustavo Andre Bernado Moura, Msc, Rodrigo Pacheco, Hugo Maia Milan, Marcos Chiquitelli-Neto, Vina-cius De Franca Carvalho Fonseca, Kifle Gebremedhin</i>	
Discrete Element Modeling of Wedge Hopper Discharge of Milled Loblolly Pine	1609
<i>Qiushi Chen, Feiyang Chen, Yidong Xia</i>	
Deep Learning-Based Disease Identification and Severity Estimation Tool for Tar Spot in Corn	1615
<i>Aanis Ahmad, Varun Aggarwal, Dharmendra Saraswat, Aly El Gamal, Guri Johal</i>	
Â Estimation of Equine Stride Length and Stance Duration Using Stereo 3D Videography and Deep Learning	1634
<i>Nariman Niknejad, Jessica Caro, Rafael Bidese Puhl, Yin Bao, Elizabeth Ann Staiger</i>	
Development an Edge-Computing Sensing Unit for Continuous Measurement of Canopy Cover Percentage of Dry Edible Beans.....	1649
<i>Wei-Zhen Liang, Joseph Oboamah, Xin Qiao, Yufeng Ge, Bob Harveson, Daran R Rudnick, Jun Wang, Haishun Yang, Angie Gradiz</i>	
Assessment of Groundwater for a Municipality Environment - An Urgent Need for Rural Development	1667
<i>Satheesh Kumar P, Chandran S, Dhanasekarapandian M, Kumar Veluswamy, Sivasankari S</i>	
Visualizing Supply Chain Data to Bolster Resilience for Puerto Rican Food, Energy, and Water Infrastructure	1677
<i>Daniela M. Markazi, Luis F. Rodriguez, Richard R. Rushforth, Sean M. Ryan, Michael J. Stablein</i>	
Performance Analysis of AquaCrop Model for Simulating Forage Sorghum Yield in Western Kansas Under Different Irrigation Conditions	1681
<i>Farzam Moghbel, Forough Fazel, Jonathan Aguilar, Hossein Ansari</i>	
Exploring Deficit Irrigation Strategies Effects on Cotton Yield and Yield Components Under Linear Move Irrigation System in Western Kansas.....	1690
<i>Forough Fazel, Farzam Moghbel, Jonathan Aguilar, Komlan Koudahe, Hossein Ansari</i>	

Evaluating the Potential Impacts of Solar Farms on Hydrological Responses 1698
Adira Ajith Nair, Rohith A N, Cibir Raj, Lauren E McPhillips

Development of a New Foam Vaccination Method for Poultry in the Hatchery..... 1706
Hong Li, Brittney Andersen

Author Index