

January/February 2015

RESOURCE

engineering and technology for a sustainable world



AE50
outstanding innovations



Celebrating Success



Logo Design
Contest



Boyd-Scott
Graduate
Research
Award



Ag and Bio Engineering
Ethics Essay Contest

PUBLISHED BY AMERICAN SOCIETY OF AGRICULTURAL AND BIOLOGICAL ENGINEERS



Marketing the Value of Ag and Bio Engineering



One of the privileges of serving as President of ASABE is recognizing and celebrating award winners and the many outstanding accomplishments of our members. This issue of *Resource* includes several of such opportunities.

The AE50 Awards program provides a unique forum for the Society to highlight advancements in technology across a variety of fields. Many of the company recipients

reflect the visionary ideas and engineering contributions of our members. The Visual Challenge has become one of my favorite events of the magazine's year, as selected images illustrate the often fascinating and varied facets of the work our members do and the locations they work in. And in addition, this issue lauds the accomplishments of two younger members—an essayist and a graphic design artist—along with three members who also won awards “back then” when they, too, were college or graduate students. Here's to the future of ASABE!

Representing our Society at various events and international forums provides a second privilege—from the 18th CIGR World Congress in Beijing to the Iowa Section meeting in Ames and the Borlaug Dialogues and World Food Prize in Des Moines, among others. At every occasion, our members continually impress me with the impact they are making as

they **engage** in the challenges before them. The ASABE contingent at the CIGR World Congress led in many international standards sessions, and several academic department heads from U.S. universities participated in an exceptional information exchange with their Chinese counterparts. And while in Ames, Darrin Drollinger and I attended the dedication of Elings Hall and Sukup Hall, two new buildings that serve as the home for Iowa State University's Department of Agricultural and Biosystems Engineering. The buildings are showpieces for agricultural and biological engineering, and I left the ceremony with a profound sense of wonder at what will be accomplished by our members—present and future—educated there and at other schools with an ag and bio engineering footprint. At the Borlaug Dialogues, a nearly weeklong program focusing on food security challenges around the globe, ASABE members were **engaged** in discussions about the solutions needed to feed the expected 9+ billion people in the world by 2050. The meeting further examined many of the themes explored at the Annual International Meeting in Montreal last summer.

These events and others continue to challenge me to seek ways to promote the contributions of ASABE members to those outside our profession. I am more convinced than ever that we must continue to **engage** the world.

Terry A. Howell Jr., P.E.
Terry.Howell@mckee.com

events **calendar**

ASABE CONFERENCES AND INTERNATIONAL MEETINGS

To receive more information about ASABE conferences and meetings, call ASABE at (800) 371-2723 or e-mail mtgs@asabe.org.

2015

- Feb. 9-11 **Agricultural Equipment Technology Conference.** Louisville, Kentucky, USA.
- May 3-5 **ASABE 1st Climate Change Symposium — Adaptation and Mitigation.** Chicago, Illinois, USA.
- July 26-29 **ASABE Annual International Meeting.** New Orleans, Louisiana, USA.
- Nov. 10-12 **Irrigation Symposium.** Long Beach, California, USA.

2016

- July 17-20 **ASABE Annual International Meeting.** Orlando, Florida, USA.

ASABE ENDORSED EVENTS

2015

- May 31-June 5 **2015 18th International Soil Conservation Organization (ISCO).** El Paso, Texas, USA.
- July 5-8 **CSBE Conference & Annual General Meeting.** Edmonton, Alberta, Canada.

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RESOURCE

engineering and technology for a sustainable world

January/February 2015



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Here's to the Winners!

*R*esource is pleased to sponsor the AE50 Awards program—celebrating companies for their develop-

ments in agricultural, food, and biological systems. From the many entries submitted each year, an expert panel selects approximately 50 products for recognition. The award-winning products are those ranked highest in innovation, significant engineering advancement, and impact on the market served.

The products featured here represent the diversity of agricultural and biological engineering, as well as the variety of companies—of all sizes and specializations—that continue to bring advanced technology and exciting innovations to the marketplace. This year's AE50 Award recipients join the ranks of many who, for nearly three decades, have been honored for their ingenuity in product development—saving producers time, costs, and labor, while improving user safety as well.

The interest in new technology and innovative applications of existing technology remains constant. Many of the featured products are patented and their names trademarked. Some may become household words. Others may be further improved as technology advances, and perhaps, with time, will win another AE50 Award. But all the winning entrants strive for excellence, and we are pleased to honor their work with the highest honor in the only awards program of its kind.

Bravo!

AE50 
outstanding innovations



12.5 METER 760CG VARIFEED™ GRAIN HEADER

New Holland, New Holland, Pennsylvania, USA
www.newholland.com

The New Holland 12.5 m (41 ft) 760CG Varifeed™ grain header is a major modification to the New Holland stable of combine headers. Its unique cutting width of 12.5 m (41 ft) was developed specifically for operators who are using a controlled-traffic harvesting method to limit ground compaction to specific tracks in the field. This header enables this practice, which increases yields and reduces or eliminates the need for tillage to break up compacted soil. A 12.5 m header is ideal to work in combination with a 36.5 m (120 ft) sprayer, which is compatible with 12.2 or 18.3 m (40 or 60 ft) seeders, ensuring that only three defined paths are needed to plant, care for, and harvest the crop in a 36.5 m swath.



1910 COMMODITY CART

John Deere, Moline, Illinois, USA
www.deere.com

Hydraulically powered conveyance along with a flip-over hopper allows for easy loading and unloading of the 1910 Commodity Cart. Deployment of the conveyance system has been made easier with the addition of hydraulic cylinders to power the positioning of the conveyance. This feature reduces the effort required by the operator to manipulate the system as compared to the previous manually operated system. The control of the motion is further enhanced by the addition of a wireless transmitter. Pushbutton control of all conveyance functions gives the operator greater flexibility in loading. The new flip-over hopper allows for a compact package for transport and storage on the cart while providing the needed span to reach under semi-trailers for unloading. The arm and hopper together give customers a package that provides better performance, less fatigue, and greater reach than the previous model.



2730 COMBINATION RIPPER

John Deere, Moline, Illinois, USA
www.deere.com

The 2730 Combination Ripper has been designed to meet intensive tillage needs by incorporating four operational systems into one machine, with adjustments to optimize residue management and leave a customizable field finish. Maintenance-free bearings and minimized grease points across the machine provide the customer with more uptime. With an industry-leading frame size, the performance and reliability provided by the 2730 is unmet by previous machines. The 2730 delivers improved residue flow by increasing the overall frame length, underframe clearance, and fore-aft spacing of the ripper shanks. An innovative closing system provides uniform performance across a field and in all working conditions, while allowing a user-defined field finish with hydraulic adjustments. The 2730 is available in working widths of 4.30, 5.50, 6.70, and 7.90 m (14, 18, 22, and 26 ft), delivering a 44% increase in productivity over the previous John Deere 2700.



645FD HYDRAFLEX™ DRAPER PLATFORM

John Deere Harvester Works, East Moline, Illinois, USA
www.deere.com

The 645FD HydraFlex™ Draper Platform increases productivity in soybeans and other small grains by providing an additional 1.5 m (5 ft) of width over the 640FD HydraFlex™, by significantly increasing the capacity of the reel and center feed section, and by improving the crop dividers at the platform ends, enabling customers to harvest up to 10% more acres per day. The high-speed, high-capacity center feed section optimizes crop handoff from the draper side belt, providing superior material flow to the combine at high feed rates. A new reel design provides more available drive torque to enhance crop lifting, improved visibility through a sleeker reel finger design, and more durable bat tube bearings. The unique profile and attachment method of the end crop dividers enhance crop dividing, reduce crop losses, improve ground-following capability, and minimize conversion time for transport. When paired with the Platform Tilt Feederhouse, the operator can make fore/aft tilt adjustments from the cab, which ensures proper cutterbar position in challenging conditions.

6120 GRAPE HARVESTER

Oxbo International Corporation
Lynden, Washington, USA
www.oxbocorp.com

The 6120 is Oxbo's first grape harvester with a modular design specifically for ease of manufacturing. The conveyors, frame, operator station, and cleaning systems are built as smaller



subassemblies that are bolted together after painting in order to increase manufacturing throughput. The harvester can be broken down to be driven into a 12 m (40 ft) container for overseas shipping. The four-wheeled drive chassis is highly

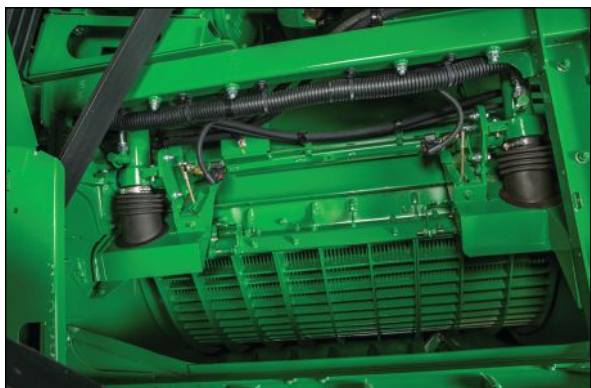
maneuverable to increase uptime, while the operator station is placed directly above the row that is being harvested for optimum visibility. The harvester was designed with a low center of gravity for easy maintenance and stability in hilly terrain; the 6120 has side-slope capability of up to 25% and an optional road speed of 32 kph (20 mph). Integrating feedback from growers before, during, and after the design process, the 6120 was designed from the ground up to meet and surpass customer needs and expectations.



7400A TERRAINCUT™ TRIM AND SURROUNDS MOWER AND 8800A TERRAINCUT™ ROUGH MOWER

John Deere, Moline, Illinois, USA
www.deere.com

The 7400A TerrainCut™ Trim and Surrounds Mower and 8800A TerrainCut™ Rough Mower are equipped with an electronic servo-controlled hydrostatic drive pump combined with large-displacement wheel motors and LoadMatch™ power regulating control system to deliver unparalleled performance for hill climbing and cut quality even in the most adverse conditions. The LoadMatch™ control system senses changing load conditions and automatically regulates the ground speed to maintain cut quality whether climbing a hill or cutting in exceptionally tough turf conditions.



ACTIVE CONCAVE ISOLATION

John Deere Harvester Works, East Moline, Illinois, USA
www.deere.com

The Active Concave Isolation (ACI) system contains hydraulically supported combine concaves that yield more harvest capacity in tough separating and threshing conditions while maintaining desired loss level. When inclement weather is on the way and crops need to be harvested, the ACI system provides the capability to harvest at a faster rate. The ACI system maintains the threshing clearance to the rotor, which provides smooth material flow, reduces separator distress, and improves in-field harvest time through the elimination of concave shear bolts.



AXIS 50.1 H-EMC-W PRECISION FERTILIZER SPREADER

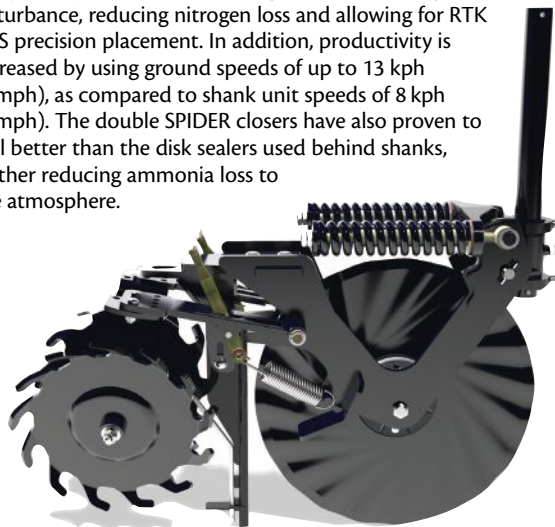
Kuhn North America, Inc., Brodhead, Wisconsin, USA
www.kuhnnorthamerica.com

The Axis 50.1 H-EMC-W precision fertilizer spreader provides the most precise fertilizer spreading in the industry for application rate control and spread pattern. Precise rate control through EMC (electronic mass flow control) technology continually measures hydraulic backpressure and automatically corrects the application rate on each disc with a variance of less than 1% when comparing desired application to actual application. Advanced spreading characteristics provide the ability to spread granular fertilizer up to 50 m (164 ft). ISOBUS compatibility and variable-rate capability are standard. Section control, via a GPS input, allows spreading of up to eight sections, four per side, to reduce overlap. To reduce downtime, two high-capacity weigh cells verify how much material is left before needing to reload.

ANHYDROUS AMMONIA FERTILIZER COULTER

Great Plains Manufacturing Co., Inc., Salina, Kansas, USA
www.greatplainsmfg.com

The Great Plains Anhydrous Ammonia Coulter promises to be a game changer in fertilizer application. In the past, most ammonia was applied with shanks in the fall, leaving the ground rough and then mellowing out over the winter. The new Anhydrous Ammonia Coulter allows the anhydrous ammonia to be applied pre-plant in the spring, with minimum ground disturbance, reducing nitrogen loss and allowing for RTK GPS precision placement. In addition, productivity is increased by using ground speeds of up to 13 kph (8 mph), as compared to shank unit speeds of 8 kph (5 mph). The double SPIDER closers have also proven to seal better than the disk sealers used behind shanks, further reducing ammonia loss to the atmosphere.



CCI COVER CROP INTERSEDER

Hagie Manufacturing Company, Clarion, Iowa, USA
www.hagie.com

The CCI is a new cover crop interseeder that boosts the versatility of Hagie STS sprayers. Many soil and plant health benefits can be attributed to the use of cover crops, such as reduced erosion, increased nutrient sequestration, minimized soil compaction, and increased nitrogen production for future crop use. The CCI incorporates boom hosing and a Gandy dry box for below-canopy broadcast seeding of cover crops. It increases return on investment, protects soil health, maximizes seedling stands, and protects inputs by performing timely and precise seeding applications.

CP20 COTTON PICKER

John Deere Des Moines Works, Ankeny, Iowa, USA
www.deere.com

The CP20 Cotton Picker is a one-row, low-cost mechanical cotton harvesting solution designed for smaller growers and contractors in emerging markets. Capable of harvesting as much cotton in one hour as 250 labor hours with hand picking, the CP20 significantly increases productivity and lowers the cost of harvest for growers pained with the high cost and shrinking availability of labor for hand picking. It's the industry's first semi-integral, tractor-hitched design delivering high maneuverability in small fields and easy attachment with tractors commonly used in the target markets. Integrating current proven cotton picker technology in a minimum-cost, market-appropriate solution, the key features include a John Deere Pro-Series picking unit, a 94 L spindle cleaning solution tank, a high-capacity cotton delivery air system, and a 4.5 m³ basket. A manual lever basket unloading system is standard, with an optional hydraulic basket opener for fast unloading with cab tractors.



CS690 COTTON STRIPPER

John Deere Des Moines Works, Ankeny, Iowa, USA
www.deere.com

The new CS690 Cotton Stripper combines the non-stop harvesting and on-board round module building technology originally made available by the 7760 Cotton Picker with the performance of the John Deere cotton stripper header and field cleaner in a simplified solution that eliminates the need for multiple tractors, boll buggies, and module builders. The CS690 has best-in-class performance (with Anti-Slip Regulation traction control, next-generation ProDrive™ transmission, new CommandCenter™ touchscreen display, and 500 hp from a new Final Tier IV 13.5 L engine) and uptime (with enhanced hydraulic oil service intervals and a dedicated auxiliary fan). In addition, the CS690 is armed with unmatched integration of John Deere technologies and a video observation system with programmable triggers.

CRUMBLES® PRECISION FEEDSTOCKS

Forest Concepts, LLC, Auburn, Washington, USA
www.forestconcepts.com



Understanding the structural biology and mechanics of natural failure within plants (think about why it is easier to split a log than chop a log), Forest Concepts devised a novel method to produce highly uniform precision feedstocks at minimal energy

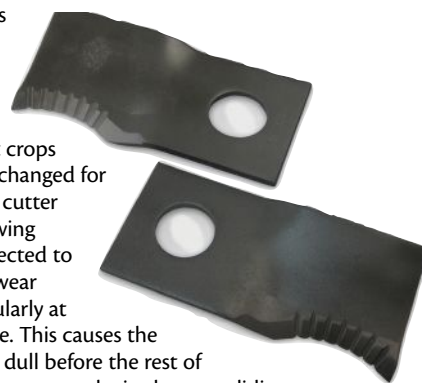
consumption. Supported by the U.S. Department of Energy, Forest Concepts invented a proprietary machine that shears high-moisture feedstocks into Crumbles®, which are uniform particles as small as 1.6 mm (1/16 in.), for conversion to biofuels and biochemicals. The particles are flowable using standard grain handling equipment without the need to pre-dry. The technology has been successfully used on wood chips, corn stover, switchgrass, bamboo, sage, and other important biofuel feedstocks with moisture levels ranging from less than 10% to more than 80%. If drying is necessary, as with pyrolysis or gasification, drying small Crumbles® particles requires significantly less energy than pre-drying chips.

DISC MOWER KNIFE WITH IMPROVED CROP SHARK™ CUTTING EDGE

Kondex Corporation, Lomira, Wisconsin, USA
www.kondex.com

While disc mowers have grown significantly in popularity, the disc mower

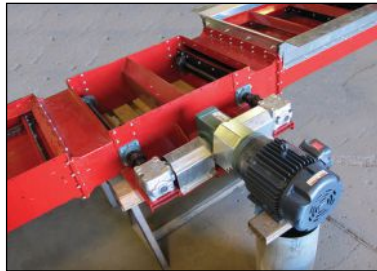
blades used to cut crops have remained unchanged for over 30 years. The cutter blades in disc mowing machines are subjected to extreme abrasive wear conditions, particularly at the tip of the blade. This causes the tip of the blade to dull before the rest of the blade, which in turn results in the crop sliding past the tip instead of being severed. This reduces cutting efficiency and results in a non-clean cut that further harms the re-growth effort of the crop. Kondex is now offering a disc mower knife with an improved Crop Shark™ cutting edge that is designed to grab the crop and hold it while it is being cut. This innovative design uses a concave cutting edge and an aggressive serration pattern instead of the standard straight cutting edge. This new design provides a cleaner, more efficient cut and installs the same as traditional blades. The new blades are made in accordance with ISO 5718.



DUAL HOPPER CHAIN CONVEYOR

Hutchinson/Mayrath, a Division of Global Industries, Inc.
Clay Center, Kansas, USA
www.hutchinson-mayrath.com

The Hutchinson/Mayrath Dual Hopper Chain Conveyor (DHCC) is a stationary, high-efficiency receiving conveyor that allows multi-hopper semi-trucks to discharge an entire load without



repositioning over a receiving pit during operation. The modular design can be configured for site-specific layouts and has a capacity of 10,000 to 20,000 bushels per hour. The DHCC requires as little as 1.1 m (42 in.) of depth, compared to depths of 3.7 m (12 ft) or more for conventional receiving pits, eliminating the risk of groundwater infiltration that often occurs with deep pits. The DHCC has been designed for safety, ease of service, and longevity with features such as OSHA 1910.272 removable grating, spring-loaded chain tensioners, a beltless C-face drive motor, accessible bearings, and commercial-grade gearboxes. The DHCC removes a hazardous confined space by eliminating the need for deep receiving pits, underground conveyors, and associated maintenance activities.



EASYCOLLECT 603 ROW-INDEPENDENT CORN HEAD

Krone North America, Memphis, Tennessee, USA
www.krone-na.com

The new Krone EasyCollect 603 corn head can harvest eight rows of corn at a 20 ft working width and then tri-fold flat for narrow transport. Split into three sections, the EasyCollect 603 header folds quickly and easily into transport position at the touch of a button for a low transport height and a narrow 7 ft. 10 in. transport width that provides an unobstructed view when transporting the machine. The EasyCollect 603 utilizes the well-proven and award-winning Krone Collector. Its modular, endless collector design leads to a substantial reduction in the number of components and drive systems, thus reducing weight and power requirements. The EasyCollect collector feeds the crop to the middle of the machine, and the crop passes smoothly through the header and into the machine without ever changing direction. This system keeps the stalks perpendicular to the chopping assembly, which results in exceptional chop quality.



ECOLO-TIGER® 875 DISK RIPPER

Case IH, Goodfield, Illinois, USA
www.caseih.com

The all-new Case IH Ecolo-Tiger® 875 disk ripper features a robust, innovative design to produce ideal seedbed conditions during primary tillage in less time. Growers benefit from better crop emergence in the spring thanks to the industry's smallest clod and valley sizes produced by the tillage pass in the fall, as well as optimum crop residue sizing and mixing for nutrient release in the soil. Productivity improvements include new-generation, high-density Tiger Points that create smoother fields with less draft and are 350% more durable than before, improved clearance for crop residue flow, a unique new scraper assembly to keep the gang flowing free, and the option of a double-edge reel that can be hydraulically set to three positions from the cab. The Ecolo-Tiger 875 is available in four configurations with 7, 9, 11, or 13 shanks.

ECU-S1 AUTOSTEERING CONTROLLER

Novariant, Inc., Fremont, California, USA
www.novariant.com

The ECU-S1 is a revolutionary high-precision autosteering controller that can be interfaced with any certified partner GNSS receiver and display to build a complete autosteering solution for precision agriculture applications. While existing autosteering solutions for agricultural vehicles require specialized displays or



GPS receivers, the ECU-S1 is the first hands-free autosteering system that

functions with virtually any certified GNSS source and/or partner display using standard API messaging. The ECU-S1

features a unique open API protocol using standardized messaging, which makes integration with different displays, GNSS receivers, and vehicle interfaces easy and seamless. The ECU-S1's unique ability to interoperate with multiple GNSS receivers and/or displays provides OEMs with the utmost flexibility to select the best-of-the-breed display, GNSS source, and vehicle interface. The ECU-S1 offers industry-leading performance in terms of line acquisition and steering accuracy, and provides an ideal solution for OEMs and value-added resellers that demand greater flexibility for product configuration and customization.



EGO FLEXSEEDER

Elliott Manufacturing
Binghamton, New York, USA
www.elliottmfg.com,
www.flexseeder.com

For over a decade, Elliott Manufacturing has been providing innovative drive solutions to the agriculture market that eliminate chains, sprockets, and double planting. The EGO FlexSeeder is the next step in innovation from Elliott

Manufacturing, transferring rotary power through gearboxes to sequence seed delivery in one application, replacing chain-and-sprocket drives. The fully sealed flexible shaft requires no servicing and gives machine designers an economical and reliable solution capable of a long service life without replacement. Designed with the option of individual on/off row control for precision farming and maintenance-free operations, EGO FlexSeeder users will realize substantial seed savings and increased yields. The EGO FlexSeeder has been designed to fit a variety of seeder platforms and allows OEMs, aftermarket professionals, and farmers the ability to economically upgrade their planting systems with state-of-the-art drive technology.



EQUALIZER TRACK UNDERCARRIAGE

Unverferth Mfg. Co., Inc., Kalida, Ohio, USA
unverferth.com

The Equalizer tracked undercarriage for grain carts offers a footprint of over 5.6 m² (60 ft²) for added flotation and trunion mounting of the track attachment for more consistent ground contact over uneven terrain. The 1.1 m (42 in.) wide belt with shallow lug design provides a 15% greater footprint than any other agricultural grain cart track yet retains a length of just 3.9 m (148 in.) for easier turning around corners and minimized berming. The shallower tread design provides less rolling resistance for easier grain cart transport. Trunion mounting of the track assembly provides an additional point of oscillation of up to ±8° for more even ground contact while decreasing high bearing loads. Carts equipped with the Equalizer track include a standard auto-greaser for reducing maintenance of the system.



EXACTEMERGE™ ROW UNIT

John Deere, Moline, Illinois, USA
www.deere.com

The ExactEmerge™ row unit is the most highly productive row unit in the industry with an exclusive seed delivery system that plants at speeds up to 16 kph (10 mph). The seed meter and delivery system have a crisp seed handoff and control the seed through the delivery process from the meter to the ground. The seed releases from the delivery cartridge at a rearward speed that matches the forward speed of the planter, resulting in a dead drop of the seed into the trench. The ExactEmerge™ row unit is fully controlled by two electric motors and has a new reflective seed sensor in the delivery cartridge to monitor the system performance. The result is superior seed placement, allowing the seed to get to the bottom of the trench for excellent depth control and seed spacing at higher planting speeds.



FIELDDATAMANAGER™

IntelliFarms, LLC
Archie, Missouri, USA
www.intellifarms.com

IntelliFarms' newest hardware and software solution for the agriculture market is FieldDataManager™, a comprehensive sensor-driven field monitoring system that provides real-time data about the belowground and aboveground soil conditions and atmospheric conditions that impact planting, irrigation, and harvesting decisions. Unlike other field condition monitors on the market,

FieldDataManager™ gathers real-time data from up to 100 soil probe sensors using a self-configuring wireless network. The wireless network is custom-designed for a wide RF range and yet is extremely energy efficient. The result is a battery-powered wireless soil probe operating at the highest legal RF power that can be placed close to the ground, under the crop canopy, so that it does not obstruct spraying equipment. Each device contains a GPS receiver to time-synchronize the entire network, which then follows a strict transmission schedule to eliminate any wasted energy. All data are compiled into one user-friendly interface accessible via any web-enabled device. The interface offers customizable data tables and charts that make data interpretation easy and actionable.



FLIP-UP TALL CORN ATTACHMENT FOR 4400 SERIES CORN HEADS

Case IH, Racine, Wisconsin, USA
www.caseih.com

The Flip-Up Tall Corn Attachment is an all-new option available for Case IH 4400 Series corn heads. The function of this attachment is to prevent the loss of corn ears over the ends of the header when harvesting in tall stands of corn. This attachment is unique in that it is an integral part of the end divider and needs no tools to deploy. It incorporates the CIH CornLouvers™, which ensure that any loose grain makes it into the combine, and it is made from rotationally molded plastic for light weight and superior structure. This option is available from the factory or it can be installed by the dealer on both rigid and folding Case IH 4400 Series corn heads.



GROWSMART® MULTI-CONTROL FOR DRIP AND MICRO IRRIGATION

Lindsay Corporation, Omaha, Nebraska, USA
www.lindsay.com

Growsmart® Multi-Control is an easy-to-use wireless control system for low-volume irrigation systems, such as drip systems (with below-ground or above-ground tubing), emitters, micro sprays, and sprinklers. Growsmart® Multi-Control is an industry breakthrough in ease-of-use because the user interface is based on smartphone and tablet apps or an internet browser, rather than the keypads and LCD screens employed with traditional irrigation controllers. Growsmart® Multi-Control can be controlled from anywhere using the software available in app stores or directly through a secure internet connection using the latest browsers. The expandable wireless controls adapt to latching DC solenoid valves for easy retrofit of existing manually controlled irrigation systems.



HAGIE TRACKS

Hagie Manufacturing Company, Clarion, Iowa, USA
www.hagie.com

A Hagie STS sprayer equipped with the new tracks system is a full-season application solution for a superior combination of traction and comfort with minimal soil disturbance and reduced compaction. The tracks impact the field with a footprint close to that of the human foot, applying less than 0.05 MPa (8.5 psi) to the ground. This technology allows the operator to extend the application window while minimizing the impact to the field.



HsTB HIGH-SPEED TOOLBAR

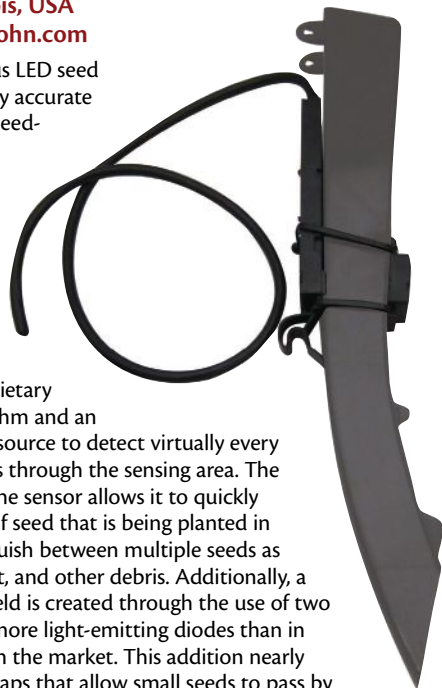
Hagie Manufacturing Company, Clarion, Iowa, USA
www.hagie.com

With narrowing application windows, performing split nitrogen applications on broad acres can present challenges during the application season. Hagie's new High-Speed Toolbar (HsTB) is a low-draft front toolbar that offers a solution for efficiently applying nitrogen at a higher application speed during early growth stages.

HY RATE PLUS LED SEED SENSOR

DICKEY-john Corporation
Auburn, Illinois, USA
www.dickey-john.com

The Hy Rate Plus LED seed sensor is a highly accurate and intelligent seed-tube-mounted sensor for detecting row-crop planting populations at high rates on a wide variety of seeds. The sensor uses an advanced proprietary software algorithm and an improved light source to detect virtually every seed that passes through the sensing area. The intelligence of the sensor allows it to quickly learn the type of seed that is being planted in order to distinguish between multiple seeds as well as dirt, dust, and other debris. Additionally, a uniform light field is created through the use of two to three times more light-emitting diodes than in other sensors on the market. This addition nearly eliminates the gaps that allow small seeds to pass by other sensors undetected.



iCON™ WIRELESS CONTROL SYSTEM

Seed Hawk Inc., Langbank, Saskatchewan, Canada
www.seedhawkseeder.com

The iCon™ Wireless Control System is an innovative product that controls and monitors the new line of Seed Hawk air carts and toolbars. The iCon Control System uses an iPad as the display and features a downloadable



Seed Hawk specific app that allows for wireless communication with the Gateway located on the air cart. The system uses new technology to control individual electric drive meter motors and read individual load cells, enabling iCon to give on-the-go product weights and be used for calibration. The efficient and innovative design of iCon has many unique features, such as Sectional Control® Technology (SCT®), integrated run blockage, field boundary and obstacle creation, on-the-go calibration, Fit to Field™ rate adjustment, and the ability to control up to six products (four granular and two liquid/NH₃), all combined in an intuitive user interface. Full wireless control of a towed seeding implement by Seed Hawk is a first in seeding technology.

INDIRECT ENGINE COOLING SYSTEM FOR CASE IH STEIGER® 620 HD TRACTOR

Case IH, Racine, Wisconsin, USA
www.caseih.com

The Indirect Engine Cooling System in the new Case IH Steiger® 620 HD tractor delivers more effective horsepower for the same operating cost as a 600 hp model while improving the



performance that producers have come to expect from Case IH. Each turbocharger stage of the Case IH FPT engine has its own optimally sized cooling system, giving the operator faster response under dynamic loads. Independent control of the low-temperature coolant flow allows the Case IH FPT engine to manage after-treatment conversion efficiency in low-load and low-temperature environments. Patented SCR technology allows for maximum horsepower without compromising efficiency, resulting in lower operating cost, lower operating temperatures, and greater reliability and durability.



INTEGRATION OF LIN REMOTE-CONTROL ACTUATORS ON NEW HOLLAND CR FLAGSHIP COMBINES

New Holland, Turin, Italy
www.newholland.com

The integration of electrical LIN remote-control actuators as standard equipment on New Holland CR flagship combines enhances the accuracy and reliability of the CR8000 and CR9000 harvesters. In addition to automating the operation and diagnostics of the threshing concave position, sieve opening, unloading tube pivot point position, unloading spout position, straw chopper deflector plate position, etc., smart actuators eliminate 25% of the 4.5 km electronic harness. A single data wire replaces heavy cables, and electronic actuators replace hydraulic distributors, cylinders, and hoses. This technology is standard equipment on all CR flagship combines and will be adapted to even more combine functions in the future.



INTERMEDIATE WING HINGE FOR PRECISION DISK™ 500 DISK DRILL

Case IH, Racine, Wisconsin, USA
www.caseih.com

With the new Intermediate Wing Hinge on the 15.2 and 18.3 m (50 and 60 ft) Case IH Precision Disk™ 500 disk drills, Case IH has optimized transport size, keeping the 50 ft unit under 4.3 m (14 ft) tall and the 60 ft unit under 4.6 m (15 ft) tall. This was accomplished without sacrificing transport width, which is still 38 mm (1.5 in.) narrower than any equivalent drill on the market. No other five-section disk drills can offer this feature. This relatively compact size is important in order to move field equipment safely on narrow roads and bridges and in heavily traveled areas. The patented wing-fold technology lets the outer wings fold in tighter for transport, while the unique center-section frame design means that the front caster wheels are pulled in tighter for turning.



MAGNUM™ ROWTRAC™ TRACTOR

Case IH, Racine, Wisconsin, USA
www.caseih.com

The Case IH Magnum™ ROWTRAC™ tractor is the first high-horsepower tracked row-crop tractor with a steerable front wheel axle designed specifically for use in row-crop applications under a wide range of working conditions. This new tractor combines the low ground pressure of a tracked vehicle with the maneuverability and low soil disturbance of a wheeled tractor. The Magnum™ ROWTRAC™ is available with four track widths (16, 18, 24, and 30 in.), seven tread settings (76, 80, 88, 120, 136, 144, and 152 in.), and two engine-horsepower models (340 and 380 hp) to meet a multitude of applications. The Model 380 has a peak horsepower of 435 hp using Case IH SCR-only Tier 4b Final technology to meet Tier 4b Final emissions requirements. The Case IH Magnum™ ROWTRAC™ includes a new rear-axle system to accommodate either a narrow or optional wide undercarriage system that follows the contour of the ground and road.

L300 SERIES LARGE SQUARE BALER

John Deere, Ottumwa, Iowa, USA
www.deere.com

The new L300 Series Large Square Baler is an important and substantial addition to John Deere's Hay and Forage offering. The L300 Series Large Square Baler offers the John Deere exclusive Double Tie Knotter and Knotter Blower System that leads the industry in performance, fewer missed knots, and highest blower speed. The Double Tie Knotter System enables customers to achieve bales with optimal shape, consistent size, and consistent density, keeping customers in the cab to get



more done when it's time to make hay. The L300 Series also features functional styling with single-row twine boxes and open walk platforms,

hydraulically controlled bale chamber, and true look-ahead baling with electronic knotter flags and an integrated ISOBUS electrical system. These balers complete John Deere's Hay and Forage portfolio for livestock, dairy, and commercial hay and biomass producers.



MAXEMERGE5™ ROW UNIT

John Deere, Moline, Illinois, USA
www.deere.com

The MaxEmerge5™ row unit is designed to be the most user-friendly row unit in the industry. The new seed meter and hopper design allow easy adjustments of the double eliminator with an external dial to achieve 100% seed population. The new row unit structure also provides the most access to the meters for seed changeovers and serviceability. Large seed hoppers have a seed shutoff gate into the meter to hold seed in the hopper, so the hopper no longer needs to be removed to access and open the meter. The row unit structure has also been improved. The ductile cast iron shank is strengthened to handle tough no-till and rocky conditions. The gauge wheel pivot bearings have also been strengthened and have three times the wear life of previous models.



MICHIGAN AGRICULTURAL MAPPING TOOL

Michigan Agri-Business Association, Lansing, Michigan, USA
www.miagbiz.org

This advanced mapping tool provides access to key agricultural and geographical information in order to guide strategic agricultural production decisions. This online tool coalesces fragmented geographical information from various sources into an effective and simple format. Soils, topography, geographical features, weather, climate, infrastructure, land use, crop history, and a plethora of geographically referenced data are brought together into an interactive and easy-to-use tool. Agricultural production systems are dynamic and ever changing in order to meet the demands of consumers, the environment, and the climate. Decision makers can use this tool to seize new opportunities for economic growth, increased efficiency, and smaller environmental footprint.



NFTRAX AIRLESS WHEEL ASSEMBLY

Lindsay Corporation, Omaha, Nebraska, USA
www.lindsay.com, www.zimmatic.com/nftrax-2

The new patent-pending NFTrax is an airless wheel design for center-pivot systems that will never go flat and keeps wheel ruts to a minimum, thereby saving time, labor, and replacement costs. Compared to pneumatic and solid tires, NFTrax helps growers avoid tread damage, punctures, and air pressure checks. In addition, it reduces wheel rut depth, lessens wheel rut runoff, and reduces erosion, allowing trouble-free operation throughout the growing season.



NT8000i NUTRIENT TRACKER RATE CONTROL SYSTEM

Digi-Star, LLC, Fort Atkinson, Wisconsin, USA
digi-star.com

The NT8000i is a closed-loop rate control system for hydraulically driven apron and floor systems on manure, lime, and fertilizer spreaders that provides precision guidance and prescription-based control of the spreading rate. The unique feature of the NT8000i is a weight-based self-calibration and calibration-check system that continuously monitors and readjusts the calibration factor based on the actual weight of the material spread. The NT8000i provides enhanced spreading rate accuracy when working with challenging materials of varying density, such as manure, litter, and compost. When working with lime or fertilizer spreaders, the self-calibration and calibration-check functions of the NT8000i eliminate the possibility of errors caused by mistakes made during manual calibration. The NT8000i can be fitted on any spreader equipped with load cells and a hydraulically driven apron floor chain system.

NUTRIENT SEPARATION SYSTEM

McLanahan Corporation, Hollidaysburg, Pennsylvania, USA
www.mclanahan.com



The comprehensive Nutrient Separation System was developed by McLanahan to improve the social and environmental sustainability of the dairy industry while reducing the cost and liability associated with manure management. In general, nutrients are separated and concentrated from manure, allowing for application where and when they are needed. The system is comprised of four unit processes: pretreatment under anaerobic conditions, ultrafiltration, air stripping and absorption, and reverse osmosis. These unit

processes are combined and operated in a unique way that addresses the challenging consistency and composition of animal manure. The system outputs include concentrated organic nitrogen and phosphorus (slurry), ammonium sulfate (liquid), concentrated potassium (liquid), and clean water. The output water can be applied as irrigation, re-used in the process, or even discharged. Recognizing that all farms are not the same, the McLanahan Nutrient Separation System can be tailored to meet a farm's specific goals and objectives.



PATTERN MASTER

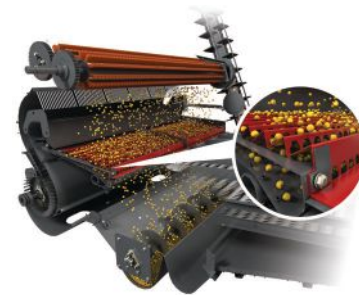
K-B Agritech, LLC, Plainfield, Wisconsin, USA
www.k-bagritechllc.com

The Pattern Master is a simple, common-sense approach to reducing spray drift. Made of laser-cut aluminum and a polyethylene brush designed so that the brush hangs below the boom, the Pattern Master prevents wind shear from destroying a developing spray pattern. The results are more usable product on target, less spray drift, and a better job of spraying. Installing the Pattern Master in front of any nozzle tip will enhance the spray job because it controls ambient wind as well as the wind created by the sprayer ground speed.

PERFORATED CASCADE PAN ON 2015 GLEANER S8 SUPER SERIES COMBINES

AGCO Corporation, Duluth, Georgia, USA
www.agcocorp.com

The 2015 Gleaner combines have increased shoe capacity with a new perforated cascade pan in the front of the cleaning shoe that is slanted at a 6° angle, and an additional 0.64 m² (992 in.²) has been converted to pneumatic cleaning area. This provides additional cleaning capacity and allows high-moisture corn and other high-moisture crops to fall through sooner, after coming through the exclusive accelerator rolls, and reach the sieve and clean grain cross auger faster. This design increases the capacity by approximately 10% in high-moisture conditions. In addition, the air duct has been moved forward 38 mm (1.5 in.) to redirect air to the crop that is falling through this area to the sieve and clean grain cross auger. The entire cleaning shoe area is now pneumatic and provides a 12.8% increase in measurable shoe area to 5.6 m² (8,721 in.²). This also improves hillside operation and capacity with high-moisture crops.



PLATFORM TILT FEEDERHOUSE

John Deere Harvester Works, East Moline, Illinois, USA
www.deere.com

The model year 2015 S-Series Combines provide an optional Platform Tilt Feederhouse. The Platform Tilt Feederhouse allows the operator to adapt to changing soil and ground conditions and extend the harvesting day in any crop by hydraulically changing the header cutting angle 17° from the cab. This feature also improves feeding the combine in field conditions where the crop could be down or lodged.



PRECISION SEED METER

Seed Hawk Inc., Langbank, Saskatchewan, Canada
www.seedhawkseeder.com

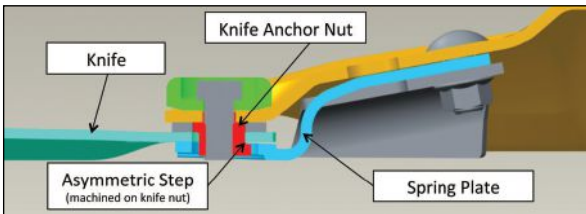
The Seed Hawk Precision Seed Meter is a seed and granular fertilizer metering device that uses a modular design containing multiple electric drives to independently supply granular products to finite sections of the air seeder toolbar. The use of electric drives greatly reduces the reaction time of the meter during sectional control and enables compensation for variable section size. By independently controlling product flow to each section of the toolbar, the metering accuracy is increased and each product's airstream is completely isolated. Additionally, it is now possible to practice variable-rate seeding with different application rates across the toolbar. Due to the modular design, the meter is scalable to match a multitude of toolbar sizes, with each electric drive feeding approximately ten feet of toolbar. Therefore, at a given motor speed, the application rate is constant across all toolbar sizes, and possible application rates do not change depending on toolbar width.



QUICK-CONNECT BACKHOE INSTALLATION SYSTEM

John Deere Commercial Products
Grovetown, Georgia, USA
www.deere.com

This innovation is a quick-connect system for installing a subframe-mounted backhoe on a compact utility tractor. The system significantly reduces the time and skill required for backhoe installation.



QUICKMAX™ DISC CUTTERBAR QUICK-CHANGE KNIFE SYSTEM

New Holland, New Holland, Pennsylvania, USA
www.newholland.com

The optional QuickMax™ quick-change knife system provides a method to quickly and easily flip or replace the cutterbar knives on Durabine™ disc headers and Discbine® 313 and 316 disc mower-conditioners. Knife replacement can be done in about a third of the time required for bolted retention systems. This is an industry exclusive on disc headers for self-propelled windrowers. Like some other quick-change designs, the New Holland system uses spring plates under the knives to hold them on their anchor points. The critical advantage of the New Holland system is a patent-pending knife anchor nut that includes an asymmetric step at the bottom of the knife-bearing surface. During operation, centrifugal force prevents the knife from disengaging from the nut, even if the spring plate is forced downward by a foreign object. To change or flip the knife during service, the knife can be easily pushed toward the center of the arc to disengage the step on the knife anchor.



QUICKDRAW SPRAY TENDER

SureFire Ag Systems
Atwood, Kansas, USA
www.surefireag.com

QuickDraw is the first fully automatic spray tender, filling the sprayer with a completely mixed batch in less than ten minutes. QuickDraw starts with the chemical rates per acre and then

calculates the volume of carrier and each chemical necessary based on field or sprayer tank size and total spray rate. The QuickDraw controller mixes the batch by reading carrier and chemical flowmeters and then controlling independent valves for each material. The chemicals are drawn from their bulk containers by generating suction with a venturi. For 2015, a new Micro-Motion mass flowmeter will accurately measure all liquids regardless of viscosity, conductivity, and other characteristics, removing the need to determine calibration numbers for the large variety of chemicals that sprayer operators use. The QuickDraw controller also calculates the required amounts of small volumes and dry chemicals and instructs the operator when to add them manually in the mix sequence. The QuickDraw iPad app communicates wirelessly with the main controller, allowing easy recipe creation and downloads of batch history.



RDI® 73B40

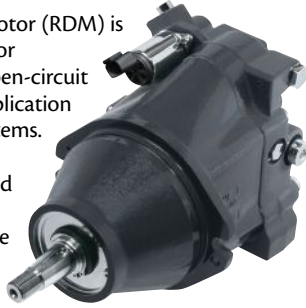
Root Demand Irrigation®, Omaha, Nebraska, USA
www.rootdemandirrigation.com

Root Demand Irrigation® is a unique form of subsurface irrigation interacting with the plants' roots to release water needed to meet the crop's requirements. Water is released from the RDI® tube when naturally occurring chemicals from the roots are released and come in contact with the RDI tube. This is combined with PVC pipe, connections, and monitoring and controls to form a complete system. Root Demand Irrigation goes to the heart of challenges facing other forms of irrigation in that is easy to install in irregularly shaped fields, has minimal filtration requirements for ground or surface water, has low energy requirements, and requires minimal labor during the growing season.

REVERSE DISPLACEMENT MOTOR

Danfoss Power Solutions, Ames, Iowa, USA
www.powersolutions.danfoss.com

The Reverse Displacement Motor (RDM) is a two-position reversing motor designed for use in mobile open-circuit applications. The primary application target is fan drive cooling systems. The RDM offers reverse functionality without the need for a directional control valve anywhere in the system, as the motor swashplate reverses angle to give reversed rotation. The RDM also includes an integrated electric shift valve that uses system pressure for shifting, eliminating the need for an external pressure supply to shift the motor. Eliminating the need for a directional control valve, and the associated fittings and hoses, greatly simplifies reversing circuit system architecture. This saves OEMs valuable time and money in the development of their equipment while providing efficiency improvements over other reversing systems. Additionally, the RDM is available with an integrated anti-cavitation and shock valve for system protection, as well as robust fan drive application options.



SD3000 SHORT DISK

Great Plains Manufacturing Co., Inc., Salina, Kansas, USA
www.greatplainsmfg.com

The Great Plains Short Disk features individual disk mounts, which allows the blades to be angled while the frame remains straight for better ground-engaging and contour-following capabilities. The Short Disk gives producers the best of both worlds: run it shallow to manage residue, or run it up to 179 mm (7 in.) deep as a primary tillage implement in preparation for the next crop. The Short Disk incorporates many field-proven features, including hydraulic weight transfer and maintenance-free tapered disk bearings with 6-lip cassette seals, which provide all of the benefits producers have come to expect from Great Plains.

SPECCONNECT

Spectrum Technologies, Inc., Aurora, Illinois, USA
www.specmeters.com

SpecConnect is a cloud-based data analysis tool that provides growers and researchers the ability to view and analyze real-time crop data instantly on the Internet via a computer or mobile device. More than a website, the SpecConnect system includes DataScout modems to obtain data from remote weather stations or loggers, and the FieldScout Bluetooth accessory and FieldScout mobile app to communicate data from portable devices through a smartphone. Numerous reporting capabilities exist, such as maps, graphs, and tables, in addition to alerts that notify users via text or phone call when user-defined sensor thresholds have been breached. SpecConnect has the ability to tie into other systems to export, view, and run additional calculations on the acquired data using open API protocols. With the functional benefit of providing one central point for multiple users to view various reports on different devices, the system offers a tremendous amount of flexibility for growers and researchers alike.



THE LOAD JUDGE

Leading Edge Industries, Groton, South Dakota, USA
loadjudge.com



The Load Judge from Leading Edge Industries uses patent-pending, high-tech sensors and a user-friendly smartphone or tablet app to load hopper-bottom grain trailers with a high degree of accuracy. This new technology captures and transmits real-time data for consistent, repeatable results regardless of grain type or operating conditions, helping ensure that grain haulers and farmers can achieve optimal loads that maximize the value of every trailer load. Data are adjustable based on different trailer makes and models, and the app displays specific commodity configuration graphics for the exact trailer being loaded. The proximity sensors self-calibrate every second to continuously deliver data in real time. A bushel estimator provides estimated bushel quantities throughout the loading process, while a pile peak adjustment feature accounts for differences in piling wet or dry commodities to allow the user to customize accordingly. Furthermore, desired load levels can be set and saved for every condition, making the process repeatable for every load.

TRI-COLOR TRIANGLE

Safety Psychographics, Notre Dame, Indiana, USA
www.3triangle.wordpress.com

The Tri-Color Triangle is proposed as a major modification of the ASABE Standard SMV emblem. According to the designer, it represents a significant improvement in the practical application of the SMV emblem through greater visibility in both daytime and nighttime conditions. The Tri-Color Triangle SMV emblem may be proposed to the responsible ASABE Standards committees for consideration as a second type of SMV emblem or as a possible replacement for the current SMV emblem. (*Editor's note:* At press time, no formal standards proposal has been submitted for ASABE committee consideration.)



TRIPLE-CLEAN™ CLEANING SHOE TECHNOLOGY FOR CX5000 AND CX6000 ELEVATION COMBINES

New Holland, Turin, Italy
www.newholland.com

The new Triple-Clean™ cleaning shoe is a simple and innovative feature that increases the cleaning capacity by as much as 15% on New Holland CX5000 and CX6000 elevation combines. Through the extra cascade in the center of the grain pan, an additional air blast from the new Triple-Clean™ cleaning fan removes large volumes of chaff and short straw before final cleaning even starts on the main sieves. This means that the grain is almost completely cleaned in the first 50 cm of the cleaning shoe, resulting in excellent grain quality. This triple cascade approach maintains the highest quality of cleaning even when the machine is working at its highest capacity. The Triple-Clean™ cleaning technology is offered as standard equipment on all New Holland CX midrange combines, including models CX5080, CX5090, CX6080, and CX6090.

W260 SELF-PROPELLED WINDROWER AND 500R ROTARY PLATFORM

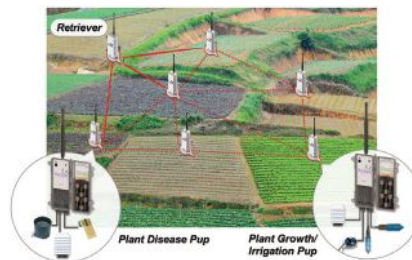
John Deere, Ottumwa, Iowa, USA
www.deere.com

The W260 Self-Propelled Windrower and 500R Rotary Platform are new additions to the John Deere windrower product line. These models bring new features such as Pivot Pro, independent float, an industry-leading 260 rated horsepower with 285 maximum horsepower, increased platform capacity, and improved crop flow performance. The 500R Rotary Platform



delivers uniform windrows, allowing John Deere's single-conditioner system to perform as well as dual-conditioner platforms available today.

Pivot Pro brings the productivity of integrated AutoTrac™, with field operating speeds up to 29 kph (18 mph) and a line acquisition consistency of ± 101 mm (± 4 in.), to customers with center-pivot irrigation. The ability to independently adjust float suspension results in less dirt in the windrow, delivering higher-quality hay and forage. These new products deliver a significant increase in productivity and were developed through close collaboration with a broad base of customers.



WATCHDOG RETRIEVER & PUPS

Spectrum Technologies, Inc., Aurora, Illinois, USA
www.specmeters.com

The WatchDog Retriever & Pups wireless sensor network gives growers the ability to affordably capture real-time, site-specific data in various microclimates. Unlike other data loggers that require growers to retrieve the data manually from each site, Retriever & Pups transmits data via a wireless mesh network to a central location for logging and communication. Each network node (Pup) contains four sensor ports and is compatible with a diverse number of sensors, allowing growers to monitor desired sensor inputs from the locations important to them. All data acquired by the Pups is transmitted wirelessly to the Retriever, which collects the data and communicates the information via numerous options, including cellular modem, WiFi, and USB drive. Growers can monitor their crops on their computer or smartphone and make real-time decisions to improve yield and quality, conserve resources, and increase profits.



WIRELESS RUMEN BOLUS FOR SMART HERD MANAGEMENT

Wandering Shepherd, Ltd.
 Sherwood Park, Alberta, Canada
wandering shepherd.com

The Smart Herd Management System (SHMS) takes real-time measurement of ruminant animals' core body temperature with a device called a wireless rumen bolus. Monitoring of temperature in ruminants can aid in heat stress, monitoring and detection

of mastitis, estrus, metritis, pneumonia/respiratory disease, pregnancy, and overall animal well-being. Each wireless rumen bolus transmits data to a central location through a relay system among the herd. Ranchers can then access up-to-date information on their ruminant animals' temperature, movement, and even location. This allows ranchers to identify early warning signs of sickness and calving. The SHMS reduces labor cost, overall treatment cost, and overall ruminant animal cost. The SHMS is perfect for optimizing dairy cattle milk production as affected by heat stresses. The wireless rumen bolus features extremely long battery life and can communicate with any mobile or desktop device running the SHMS software to remotely change bolus settings, perform temperature monitoring and motion detection, and other features.



ZERO-ENTRY COMMERCIAL SWEEP

Sukup Manufacturing Company, Sheffield, Iowa, USA
www.sukup.com

The Zero-Entry Commercial Sweep is an unloading system that is operated entirely from outside of the bin, thus providing safer operation. Concrete floors in bins of 27 to 47 m (90 to 156 ft) in diameter can vary from level by 51 mm (2 in.) or more, resulting in uneven weight distribution as the sweep circles the bin. Previous drive systems for large bin sweeps have not provided for up-and-down movement, resulting in excessive wear of the flooring, or they included U-joints that permitted up-and-down movement but were difficult and expensive to replace. The Zero-Entry Commercial Sweep provides an innovative solution to these issues. This new sweep uses a unique floating pivot system with direct connection of the drive unit to the sweep auger. This design allows the sweep to move around the grain bin with its weight evenly distributed on the bin floor, thus preventing wear and damage to expensive components.

logo design winner

Spreading the Word to Save Lives



Nick Schrader, winner of the ASABE Agricultural Seatbelt Usage and ROPS Logo Design Contest, took a chance and explored his creativity while enhancing tractor safety—and pocketed \$2,500 for his efforts. In creating his entry for this one-time contest, Schrader's goal was to further tractor safety by developing a graphic image that encourages tractor owners and operators to wear seatbelts, raise foldable ROPS to the upright position, and install ROPS on older tractors. His winning logo is now part of a national ROPS promotion strategy for North America.

Agriculture ranks fourth among U.S. industries for work-related fatalities. Fatalities associated with agricultural

machinery commonly involve farm tractors, and rollover incidents account for up to 76% of all farm tractor-related fatalities. ASABE and agricultural engineers have played a significant role in reducing tractor-related fatalities. Tractor-related deaths declined from nearly 18 per 100,000 workers in 1969 to fewer than 10 per 100,000 workers in 1995. Much of this decline can be directly attributed to improved safety design by ag engineers, including rollover protective structures (ROPS).

ASABE members who have a background in tractor safety standards and design judged the contest entries.



Contest chair John Fisher (left) congratulates Nick Schrader on his winning design.

Reforming Confinement Systems for Food Animal Production



Kristen Perano

Editor's note: Last year, ASABE invited undergraduate and graduate students worldwide to participate in a newly established Ag and Bio Engineering Ethics Essay Competition. Entrants were asked to submit an essay on an ethics topic of their choice that impacts the practice of professions related to ag and bioengineering, systems, or technology. The finalists presented their essays at the 2014 Annual International Meeting in Montreal. Cornell University graduate student Kristen Perano was awarded first place, and her essay is presented here. Second place went to Martha Priester of Auburn University for "Ethical Considerations of Biofuel Feedstock Weed Potential," and third place went to Henry Norrell, also of Auburn University, for "Ethical Concerns in Biological and Agricultural Engineering."



Essay winners (left to right) Henry Norrell, Kristen Perano, Martha Priester with contest organizer Preveen Kolar.

Even as many sectors of the U.S. livestock industry continue to expand to meet increased demand from growing export markets, animal welfare remains one of the most controversial topics in modern U.S. agriculture. Specifically, many consumers are concerned about battery cages for laying hens as well as gestation crates for sows. Polls show that 95% of Americans believe that farm animals should be "well cared for" (HSUS, 2014a). California and Michigan have both banned battery cages for laying hens, with California's Proposition 2, banning battery cages and gestation crates among other practices, passing in 2008 with 63.5% of the vote. Eight states in addition to California have banned gestation crates for sows, and polls show at least 60% support for banning gestation crates (HSUS, 2014a). There have also been voluntary reforms on the part of the livestock industry, with corporations such as Smithfield Foods and many others announcing that they would stop buying pork from producers who use gestation crates. In evaluating the debate about how much space farm animals need, we must consider when

animal confinement is justified and when it is not, what role consumers play in the debate, and how constructive dialog can evaluate and implement reforms.

Many people are disappointed ...

... to learn that the majority of farm animals are not produced on quaint family farms. Advocates for reform often focus on getting the animals more space or eliminating confinement. In some production systems, the animals may be crowded into small spaces without much opportunity to exercise or to practice natural behaviors. To be fair, though, animals in confinement operations are spared from some forms of suffering, such as facing inclement weather or starving in a drought year, that wildlife frequently face. Some degree of confinement may be necessary to protect animals from disease (as in specific pathogen free hog facilities), predation, or inclement weather. For example, chickens often prefer to remain in their coop rather than go outside in sub-freezing weather even when the door is opened. In areas with



Sow nursing her litter of piglets. Courtesy of USDA-ARS.

cold winters, dairy cattle are typically kept indoors while the weather is cold, but the cows are cleaner and more comfortable inside their barns than if they were always outside in the ice, snow, and mud. Thus, some level of confinement may improve animal welfare.

Different systems, different levels of confinement

Even from one segment of the livestock industry to another, different production systems lead to different levels of confinement depending on the ability of the animals to fend for themselves. Beef cattle are typically raised in large fields and rarely if ever put in a barn. Beef cattle also raise their own

calves until the calves are 6 to 8 months old. Dairy cattle, by contrast, may be kept indoors year-round in some operations. They are less able to take care of themselves, often even lacking the instinct to raise a calf. Dairy calves are usually raised separately from their mothers, although most are raised in a calf hutch that is bigger than a veal crate. Lactating dairy cattle need to be milked and fed a carefully balanced diet at least twice a day. Dairy cattle are also more vulnerable to heat and cold stress than beef cattle and are often kept in barns to protect them from the worst of the hot or cold weather. Thus, dairy cattle are raised more intensively and are much more likely to be confined but are also better fed and more protected from inclement weather than are beef cattle.

Hierarchies and bonds

Larger farming operations also present a challenge in that animals live in larger than natural social groups. Animals naturally form somewhat small groups where all of the individuals know each other and have established a dominance hierarchy, which eliminates constant fighting and allows the animals to form bonds with one another. Larger social groups are especially a problem for chickens, where “cage-free” egg-laying systems may mean hundreds of chickens are raised together in a barn instead of a handful of chickens living in a cage together. While the connotations of “cage-free” sound much better, mortality rates are actually much higher in cage-free systems due in part to the disruption of the normal social hierarchy and increased fighting. Laying hens also tend to have brittle bones, and if a hen breaks her leg in a large barn, she could die from being unable to reach feed and water.



Dairy cows feeding in a barn. © Branex | Dreamstime.com

There is also a higher incidence of many diseases due to so many animals living together (Mench, 2008). Thus, it is not a clear-cut advantage for chickens being raised in “cage-free” barns rather than in battery cages. Although in the future there may be somewhat of a return to locally grown, small-scale farming, it is hard to scale up laying hen production and maintain the same quality of life for the hens as the classic “barnyard flock” on a family farm.

A right and a responsibility, reforms and dollars

Consumers do have a right to know how their food is produced, but they also have a responsibility to be informed about the issue and not attack farmers based on sensationalized cases or unrealistic demands. In many cases, consumers should also be prepared to pay more than current prices for animal products if reforms are implemented. While some reforms may be economically beneficial (an Iowa State University study concluded that group housing for gestating sows could save money in the long run) (HSUS, 2014a), many times reforms will lead to higher facility costs and thus higher production costs. Thin profit margins in the livestock industry may not be able to absorb even low-cost increases, and especially in the short term, farmers will incur significant costs upgrading facilities. Consumers also often over-report their own willingness to pay more for reforms, as evidenced by less than 10% of Californians buying cage-free or organic eggs but more than 60% supporting a ban on battery cages. Some of this discrepancy may come from uninformed consumers who were unaware of the issue of battery cages when buying eggs, but much of it likely comes from the consumer



Pullets in group housing. © Ginasanders | Dreamstime.com

willingness to pay for improved practices being lower than current price differences. However, some of this may be alleviated by current over-priced niche markets becoming more mainstream. For example, the estimated increase in production costs is \$0.35 more per dozen for cage-free eggs, yet the average store charges \$1.65 more for cage-free eggs (Norwood, 2011). However, if more cage-free eggs are produced, either due to consumer demand or government regulations, the mark-up will likely fall to better reflect the true increase in cost of production.

Welfare evaluation

What criteria, then, should be used to evaluate food animal welfare? The first criterion should be whether the confinement is necessary and therefore justified. For example, farrowing crates, which confine the sow while she has young piglets, have been shown to save piglets from being crushed or eaten by their mother. These have been generally accepted as a necessary practice, while gestation crates, which confine the sow during her whole pregnancy, have been banned in many states. A second criterion is whether the proposed improvement is really an improvement. As in the case of raising laying hens in large barns instead of small cages, in some ways the new practice may compromise welfare, such as the chances of starving to death because of a broken leg. Finally, the proposed reform must be feasible, reasonably practical, and implemented in a fair way. Reforms must be something that does not increase labor too much (making it possible for farmers to use) as well as something economical enough that consumers will be willing to pay for any extra costs that

result. Farmers must also be given adequate time to phase out or phase in changes.

Overall, constructive dialog on animal welfare between welfare advocates and the livestock industry must involve some negotiation of what is reasonable and feasible. With increasingly large populations of city dwellers at home and abroad, there will continue to be a need for large-scale production. Some issues, such as how to build large-scale laying hen facilities, are not clear-cut. However, a proposed compromise is enriched cages, adopted in many European countries, which offer more space and a more interesting environment for laying hens but maintain the advantages of raising hens in smaller social groups. In a positive development for working across the aisle, the Humane Society of the United States and the United Egg Producers (the egg industry's trade association) worked together to draft a federal bill, H.R. 3798, to phase out battery cages in favor of enriched cages (HSUS, 2014b). Such a bill is an example of what can be accomplished when agricultural lobbyists and animal rights activists seek common ground and workable solutions. A growing national movement to eliminate gestation crates also focuses on a feasible reform that is being supported by an increasing number of corporations in the industry. However, many other welfare issues remain. These should be addressed in a similar manner, by evaluating sensible improvements and working across the aisle to make reforms.

ASABE member Kristen Perano, graduate student, Department of Biological and Environmental Engineering, Cornell University, Ithaca, New York, USA; kmp263@cornell.edu.

Author's Note: The bill to phase out battery cages, H.R. 3798, has expired and has not been reintroduced. The United Egg Producers are no longer working with HSUS, a setback from the perspective of compromising on animal welfare issues.

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Visual Challenge 4

Visual images are always a part of producing *Resource* magazine. They complement the written word by engaging reader interest and enhance a feature with further information. And this year's **Agricultural and Biological Engineering Visual Challenge** brought in a visual feast. We received photos from across North America and around the globe.

Our fourth annual call for "statements without words" has proven once again that ag and bio engineers are often as proficient in photography and the graphic arts as they are in science and technology.

The finalists' photos presented here show scenes from work life—at everyday, close-to-home locations and far-flung assignments as well—all with an eye for color and composition. Some entrants by sheer happenstance captured a curious or inspired moment with a mobile phone. As one entrant pointed out, "A good camera is the one at hand."

Most important, the beauty and meaning of the ABE profession and its many accomplishments come to life in these images, showing those outside the field: "This is what we do—on the job and off." Of course, as good as they are, they are only a glimpse of the wide variety of activities—and occasional surprises—that can be found in agricultural and biological engineering.

Thank you for your entries and for the work that you do. We eagerly invite all readers to contribute to next year's competition. And congratulations to all our participants featured on these pages!



CATCHING SOME RAYS

Small business collaborator Phil Sadler, of Sadler Machine Co., adjusts the Himarwari, a Fresnel-lens tracking solar collector/concentrator, which directs light for plant growth via fiber optic cables into The University of Arizona Lunar Greenhouse.

Gene A. Giacomelli, Professor, Department of Agricultural and Biosystems Engineering, and Director, Controlled Environment Agriculture Center, The University of Arizona, Tucson, USA



"What are YOU looking at?"

Improving animal welfare: a free-range chicken farm in The Netherlands.

A. J. Both, Associate Extension Specialist, Department of Environmental Sciences, Rutgers, New Brunswick, New Jersey, USA



DINNER IS SERVED, Boyd County, Nebraska

"Agricultural engineers continue to play an instrumental role in farm automation. This fence line feed bunker shows one of numerous innovations that reduced the labor input tied to food production. One worker can serve an evening meal to thousands of steers from the climate-controlled comfort of his tractor cab."

Paul Funk, Agricultural engineer, USDA-ARS Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico, USA



NORTHERN INDIANA IRRIGATION

"Advanced irrigation systems in crop-growing areas have virtually guaranteed a commodity to sell at harvest, compared to 'the good old days' of working at the mercy of the elements. This drought-fighting strategy works in areas of dependable water sources and reasonable equipment and utility costs. The groundwater resource of northern Indiana is good to excellent: well yields of 200 to 2,000 gpm or 0.3 to 2.8 million gallons per day (mgd) can be expected in the St. Joseph, Elkhart, Pigeon, Fawn, Eel, and Tippecanoe River valleys. These sources are capable of large groundwater production. Wells with capacities greater than 400 gpm, or 0.6 mgd, are quite common."

BIRD'S-EYE VIEW: Veteran Oliver and International Tractors in Berrien County, Michigan

"Agricultural engineering has a rich history, and sometimes it reads like a novel. However, these two brands could never have been stable mates because James Oliver '... flatly refused to join the "plow trust" that became International Harvester.' For more on Oliver tractors (which were produced in St. Joseph County, Indiana, where this picture was taken) and some fascinating history on the company's pioneering chilled plow, visit the Indiana Historical Society's web page: www.indianahistory.org/our-collections/reference/notable-hoosiers/james-oliver."

Brian McLaughlin, Visual Researcher and Innovator, Safety Psychographics, Notre Dame, Indiana, USA





ALL HANDS ON DECK

"In Oyo State, Nigeria, at a grain market, the hands of a grain trader, a farmer, and a U.S. extension engineer together examine the quality of threshed grain. I love this image—it shows the various stakeholders in agriculture that are needed to ensure global food security."

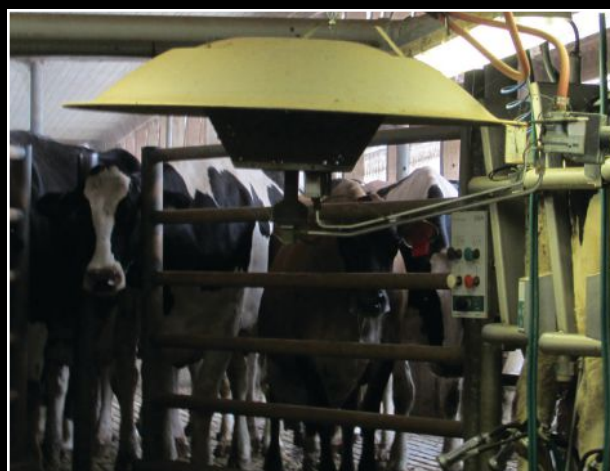
Klein Ileleji, Associate Professor, Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, Indiana, USA



MAIZE MARKET FAVORITE

A farmer's young daughter bags freshly harvested corn while specialists, evaluating Good Agricultural Practices, look on.

Robert "Bobby" Grisso Jr., P.E., Professor, Department of Biological Systems Engineering, Virginia Tech, and Associate Director, ANR Extension Programs, Virginia Cooperative Extension, Blacksburg, USA



IS IT HOT IN HERE, OR IS IT JUST ME?

Finding the optimal temperature to maximize milk production.

"Conducting an on-farm energy assessment as part of the USDA-NRCS cost-share program, special emphasis is placed on ventilation and heating. The 'umbrella' is a propane-fueled, pancake-style radiant heater. The machinery on the right is the milking equipment that feeds the plate collector for precooling."

Andrew J. Courts Jr., Certified Energy Manager, North Carolina Energy Partners, Greensboro, USA



PALM FRUIT HARVESTING DISCUSSION

Sam Suzana Abd Aziz, head of the Department of Ag and Bio Engineering, University Putra Malaysia (on right) and an engineering technician (center) explain to Manoj Karkee how fruit for palm oil is harvested in Malaysia, where there is great need for mechanized and automated harvesting systems.

Photo by a University Putra Malaysia student, submitted by **Manoj Karkee**, Assistant Professor, Department of Biological Systems Engineering, Center for Precision and Automated Agricultural Systems, Washington State University, Prosser, USA



SOMEWHERE OVER THE RAINBOW

"Outside of Yuba City, California, due to rain, the rice harvest was halted, so I made inspections on the customer's machine to bide time. As I walked back to my truck, colors burst forth."

Zachary Winkel, Field Test Technician, CLAAS, Omaha, Nebraska, USA



ASSESSING AIRFLOW

Intern Michael Albertson reads the velocity pressure of a pneumatic conveying system during an energy audit at the USDA-ARS Southwestern Cotton Ginning Research Laboratory in Mesilla Park, New Mexico.

Paul Funk, agricultural engineer, USDA-ARS Southwestern Cotton Ginning Research Laboratory, Mesilla Park, New Mexico, USA

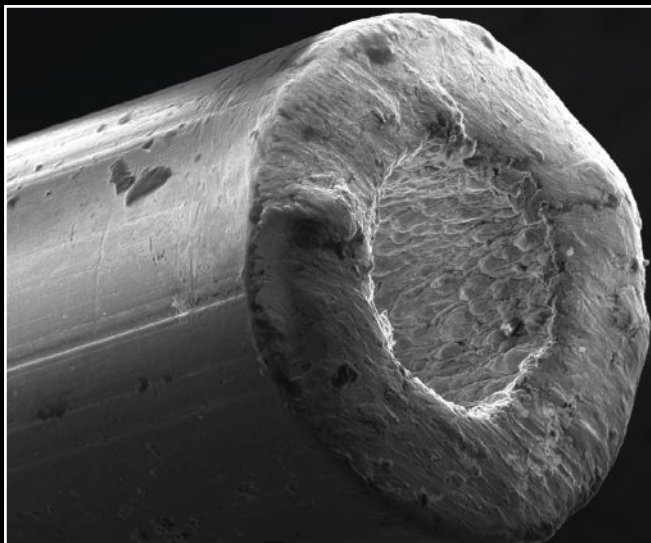


POSE WITH ORANGE

Visible to near-infrared hyperspectral camera, Center for Precision and Automated Agricultural Systems, Washington State University.

"This setup was used to acquire hyperspectral images to detect the development of chilling injury in honeycrisp apples. An orange was used in a related test. The fruit target is placed in front of a black background with a white standard board to enable image processing and calibration. The complete setup includes lighting to illuminate the fruit target during image acquisition in a dark room."

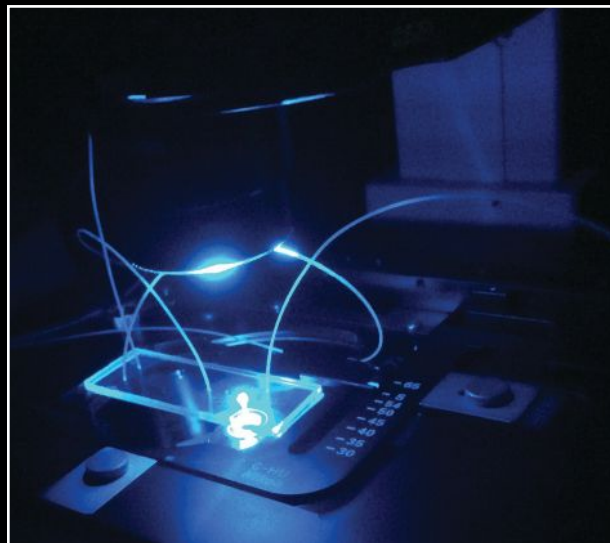
Peter Ako Larbi, Assistant Professor of Agricultural Systems Technology, College of Agriculture and Technology, Arkansas State University, Jonesboro, USA



INSIDE, OUTSIDE, AND THE TRANSITION

Scanning electron microscope image of syringe needle tip.

Evan Wright, BioNano Laboratory, University of Guelph, and **Suresh Neethirajan**, Assistant Professor, School of Engineering, University of Guelph, Ontario, Canada



NORTHERN LIGHTS

Fluorescence microscopy: experimental setup for the study of bacterial chemotaxis—the movement of an organism in response to a chemical stimulus.

Lee Preiss, BioNano Laboratory, and **Suresh Neethirajan**, Assistant Professor, School of Engineering, University of Guelph, Ontario, Canada



NERVE CENTER

Technology-driven agriculture: the command and control center of Greenwood Resources Boardman Tree Farm, the world's largest irrigated fiber farm and contiguous drip-irrigated farm, with one of the nation's most sophisticated control systems.

"These operator interface terminals operate the Irrigation Supervisory Control and Data Acquisition (I-SCADA) system, providing high-efficiency irrigation on 10,440 ha (25,800 ac) of drip and 2,225 ha (5,500 ac) of pivot ground. The I-SCADA system incorporates 153 remote terminal units—mini field computers—along with more than 1,400 sensors and 1,800 controls. This is computer-controlled agriculture at its best, remotely irrigating trees for solid wood/vener or wood chips for paper, bio-energy, biofuels, and biochemical production, in addition to producing high-value crops like potatoes, onions, mint, alfalfa, and sweet corn."

Nabil Mohamed, Water and Energy Resource Engineer, Boardman Tree Farm, Hermiston, Oregon, USA

Focus on the Foundation

© Johan63 | Dreamstime.com

Welcome to *Focus on the Foundation!* With these pages, we begin a new column dedicated to ASABE Foundation news. In upcoming *Resource* issues, we will continue to highlight the work that the Foundation does to support the Society.

Happy Anniversary

This year marks the tenth anniversary of the Boyd-Scott Graduate Research Award, one of many awards that support young professionals in ASABE. Created by Landis Boyd and Norman Scott, the award honors excellence in conducting and presenting research that builds the knowledge base needed to design the equipment, facilities, and processes for the sustainable operation of a biological system. The award also recognizes the unique, important relationship between a graduate student and his or her advisor.

Boyd, a graduate student recruiter for Cornell University in the late 1950s, enticed Scott—a Washington State

University, ink-not-yet-dry grad in agricultural engineering—to pursue further studies at Cornell. Boyd then served as Scott’s graduate advisor and mentor, and a lifelong friendship began.

Marking a decade of the Boyd-Scott Award, as the new year begins we take a look at where the 2004 winners are today, ten years later.

Catching up

The Boyd-Scott Award has two categories: MS and PhD. The three winners profiled here were the MS finalists for 2004 and remain active in the Society today.

Angela Green, the first-place recipient, is an assistant professor at the University of Illinois at Urbana-Champaign and director of the Animal Welfare and Environmental Systems Laboratory.

Green received the Boyd-Scott Award at the end of her MS work at the University of Kentucky. Her master’s degree focused on implementing technology to answer questions

about the impacts of environmental management on physiological responses in horses during transport in hot weather.

“Being recognized for excellence in this research at a critical juncture in my graduate studies helped to solidify my confidence in an academic career. The Boyd-Scott Award certainly helped in my navigation of career options,” says Green.

The Society’s PAFS-413 Animal Care and Welfare committee has grown in membership and participation because of Green’s enthusiasm, energy, and effort.



“My role as an engineer is one that makes me unique in the field of animal welfare, and it affords me a different perspective on systems-thinking assessments and solution-driven problem solving.”

Runner-up in 2004, **Michelle Soupir** is an associate professor of Land and Water Resources Engineering in the Department of Agricultural and Biosystems Engineering at Iowa State University. She holds an appointment in research, teaching, and service. Her career goal is to work toward improved water quality—in Iowa, the United States, and around the world.

Soupir agrees that the Boyd-Scott Award offers a timely early-career boost. “This award gave me confidence that the research I was doing was important,” she says. “I have always been very proud of this achievement, and the plaque is still hanging in my office.”

In addition to conducting research, Michelle has taught several courses and directed independent study projects focused on water quality and professional development. Recently, she completed work integrating water-related topics into several courses, raising awareness of environmental stewardship among students majoring in agricultural or biological systems engineering within the ISU ABE department.

Hongyoung Jeon, 2004 third-place finisher, says the competition was a valuable experience. Now a senior application engineer at Dow AgroSciences LLC, he says that the very act of competing against his peers made him a better researcher, requiring him to explain and justify the value and impact of his work. Jeon says the experience offered new opportunities and ultimately changed his career path.



Michelle Soupir

“My life changed in many ways: I continued pursuing a graduate degree, and I worked as a post-doc research agricultural engineer at the USDA-ARS before joining Dow AgroSciences.”



Hongyoung Jeon

Hongyoung is currently an active member of the ASABE MS-23/6 Application Systems committee. He encourages professionals and students alike to become involved in technical committees to strengthen their knowledge as well as contribute to continued advancement of the profession.

Be inspired!

ASABE awards, funded by gifts through the ASABE Foundation, change lives and enrich Society membership. For more information, visit www.asabe.org/foundation.

ASABE member and Foundation Development Committee Chair **Sylvia Schonauer**, P.E., Principal Engineer, Advanced Innovation, W. K. Kellogg Institute, Battle Creek, Michigan, USA; sylvia.schonauer@kellogg.com.

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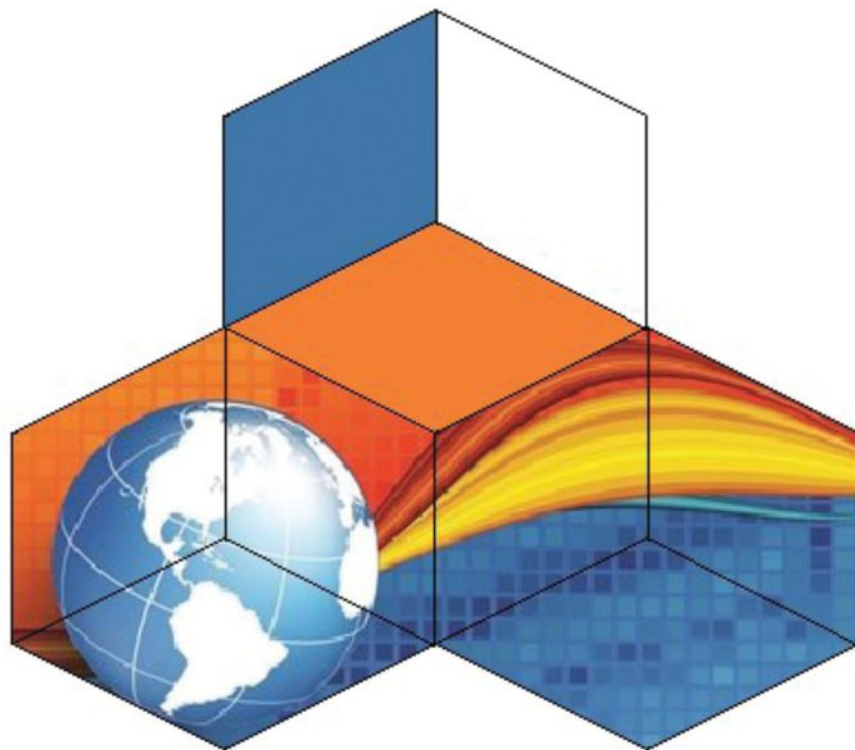
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