

January/February 2021

# RESOURCE

engineering and technology for a sustainable world

**AE50 Award Winners • Ethics Essay Winner • *VisualChallenge*10**



PUBLISHED BY AMERICAN SOCIETY OF AGRICULTURAL AND BIOLOGICAL ENGINEERS



## 2021: Opportunity



**W**e're starting 2021 off with a bang. In this issue of *Resource*, we're presenting the AE50 award winners, the outstanding contributions to VisualChallenge10, and the award-winning student entries in the Ag and Bio Ethics Essay Competition. I'm always amazed by ASABE members—your ingenuity, your creativity, and your thoughtfulness. The award winners featured here demonstrate how our profession is making a lasting positive impact on food, water, and energy systems.

I'm looking forward to the 2021 ASABE conferences, starting with the Agricultural Equipment Technology Conference (AETC) in February. The AETC planning committee wisely decided that a virtual format was best this year, and they've done an excellent job in pulling it all together! The program incorporates three CPD sessions, seven excellent technical sessions, a student-focused session, and a student poster competition, in addition to numerous ASABE committee meetings. The keynote address will discuss the Modernizing African agriculture initiative. The AE50 award winners will also be recognized with a special showcase session. Check out the full agenda at: [asabe.org/aetc2021](http://asabe.org/aetc2021).

Looking ahead to the 2021 Annual International Meeting (AIM), we've decided to use a virtual and on-demand format, similar to last year's AIM. We've learned a lot about virtual meetings, and while the 2020 AIM wasn't perfect it was a surprising success with just three months to transition formats. We can do it again—and even better this year with a full year of planning. We're looking forward to an event that provides an opportunity to share technical knowledge, recognize members' achievements, collaborate within the technical committees, and network with our peers. Put the 2021 virtual AIM on your calendar: 11-14 July 2021 (#ASABE21) and get the most up-to-date information at [www.asabemeetings.org](http://www.asabemeetings.org).

There is light on the horizon. The accomplishments highlighted in this issue are just a glimpse of the great things happening in our profession. This year's virtual events are an opportunity to engage without the investment typically required to travel to in-person meetings. Use this unique opportunity to #GetInvolved, participate in a virtual meeting, and build your professional network. You, and your Society, will be stronger for it.

Candi

[CandiceEngler@myASABE.org](mailto:CandiceEngler@myASABE.org)

## events calendar

### ASABE CONFERENCES AND INTERNATIONAL MEETINGS

To receive more information about ASABE conferences and meetings, call ASABE at 800-371-2723 or email [mtgs@asabe.org](mailto:mtgs@asabe.org).

#### 2021

Feb. 8-10 **Agricultural Equipment Technology Conference (AETC)**. Virtual.

July 11-14 **ASABE Annual International Meeting**. Virtual.

Dec. 6-10 **6th Decennial National Irrigation Symposium**. San Diego, Calif., USA.

#### 2022

Jan. 9-14 **Soil Erosion Research under a Changing Climate**. Aguadilla, Puerto Rico.

May 16-19 **Sustainable Energy for Sustainable Future**. Escazu, San Jose, Costa Rica.

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**Think Green!** The poly-bag protecting this magazine can be recycled. Just toss it in with your other recycling.

## ON THE COVER:

ASABE member Brian McLaughlin, Safety Psychographics LLC, Notre Dame, Indiana, always has his camera close by. See more stunning shots from *VisualChallenge10* on page 22.

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# CELEBRATING THE WINNERS

**R**esource magazine is pleased to sponsor the AE50 Award program, celebrating companies for their recent developments in agricultural, food, and biological systems. From the many entries submitted in 2020, an expert panel selected the products, showcased on the following pages, for recognition. The award-winning products are those ranked highest in innovation, significant engineering advancement, and impact on the market served.

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

The AE50 Awards had their beginning in June 1984, in a special issue of ASABE's *Agricultural Engineering* (now

*Resource*), in which 25 new techniques, inventions, and innovations were showcased. The featured items were drawn from product information solicited by the Society and screened by a panel of engineers. From this focus on identifying innovative technology, two years later the AE50 Award program was born. As the announcement stated, "Acceptance in the marketplace is the highest accolade any new agricultural product can receive. But for innovative developments in the last 12 months, a singular honor is to be named one of the year's Agricultural Engineering 50 outstanding innovations." Product nominations poured in. An enlisted panel of experts reviewed the entries, and in 1986 the first AE50 Awards were presented.

Interest in new technology and innovative applications of existing technology remains constant. Over the years, many award-winning products were patented and their names trademarked. Some were further improved as technology advanced, and with time, won another AE50. But the most important yearly constant: all winning entrants continually strive for excellence, and we are pleased to honor their work with the highest honor in the only awards program of its kind. Congratulations to the winners!



## 24-ROW AIR PACK SYSTEM FOR CASE IH FERTILIZER APPLICATORS AND AIR CARTS

Case IH Agriculture  
Normal, Illinois, USA  
[www.caseih.com](http://www.caseih.com)

The new 24-Row Air Pack System provides a method to accurately deliver dry fertilizer products from a Case IH Precision Air™ 5-Series cart to a 60-foot 940 Nutri-Placer® or 955 Nutri-Tiller® fertilizer applicator. Featuring a series of unique 3-way splitters, this system can accurately and equally deliver product to 24 individual row units on 30-inch row spacing. This allows growers to make use of a highly productive 60-foot toolbar to cover acres quickly and efficiently. With growing emphasis on environmental impacts, fertilizer run-off can be minimized and plant up-take can be maximized by properly banding fertilizer in the root zone. The Case IH air carts and applicators properly deliver and place dry fertilizer products to lock in crop profit potential.

## 6030 VINEYARD MULTIFUNCTION MACHINE

Oxbo International Corporation  
Lynden, Washington, USA  
[www.oxbocorp.com](http://www.oxbocorp.com)

The Oxbo™ 6030 Multifunction Power Unit is an over-the-row vineyard product that is available with two different grape harvester attachments and a 3- or 4-row sprayer attachment. The 6030 steering system turns the front wheels up to 95 degrees enabling the unit to turn in limited space. It features a simple attachment system for switching between sprayer and harvester. The harvester attachment is available with PremiumSort™ for removing up to 99.5% of material other than grapes. The sprayer



is configured for 3 or 4 rows and uses a Venturi nozzle system with up to 16 nozzles per row. The hydraulic variable speed fan for each row unit ensures precise delivery of product as

well as adequate air flow for complete application of product. The machine utilizes a 4.4L CAT™ ACERT 174-horsepower engine with an integrated Eco-mode to reduce fuel consumption.



### 9350 DYNAFLEX® DRAPER HEADER WITH AUTODOCK™ HEADER DOCKING SYSTEM

**AGCO Corporation**  
Duluth, Georgia, USA  
[www.AGCOCorp.com](http://www.AGCOCorp.com)

The 9350 DynaFlex® Draper Header with AutoDock™ Header Docking System is a 50-foot flexible header with the industry's first automatic system for attaching all mechanical, electrical, and hydraulic connections of the header to the Fendt® IDEAL® Combine. The combine operator pulls up to the header, lifts it from the ground or trailer, and pushes a button in the cab. AutoDock uses guide pins and hydraulic actuators to connect the drives on both sides of the header and connect all systems with a single-point coupler while mechanically latching the header—all in 5 seconds. The 9350 Header with AutoDock improves harvest productivity for a number of crops with its width and ground-hugging flexibility.



### ACCUPULSE® TWINJET (APTJ) FLAT SPRAY TIP

**TeeJet Technologies**  
Wheaton, Illinois, USA  
[www.teejet.com](http://www.teejet.com)

The AccuPulse TwinJet (APTJ) flat spray tip was designed specifically for use on sprayers equipped with pulse width modulation spray tip controls. The unique nozzle design offers ultimate drift control without air induction, a method traditionally used to increase droplet size of a spray. Patent pending pre-orifice and nozzle geometry re-circulates and slows the flow before atomization. The wide angle, twin spray design provides excellent leaf coverage and canopy penetration in broadcast spraying. APTJ is ideal for the application of systemic, post-emerge herbicides in terms of coverage and drift control near sensitive areas like susceptible plants, open water, or residential areas. Every APTJ is individually tested prior to shipment to ensure precise flow rates and excellent distribution quality.



### ACE AIR

**Amber Agriculture**  
Chicago, Illinois, USA  
[www.amber.ag](http://www.amber.ag)

The no-cables way to monitor grain, the Ace Air system is the world's first wireless, solar-powered CO<sub>2</sub> analyzer for grain environments. The product kit includes two new hardware products forming an automation suite for on-farm and commercial grain bins. The headspace CO<sub>2</sub> monitor slaps on to the roof of a storage structure and syncs with a wireless fan controller equipped to the aeration system of the grain environment. Both hardware pieces can be remote controlled from a mobile app. Aeration recommendations from advanced modeling are presented with click button controls to the end user.



### AGROVIEW

**Agriculture Intelligence, Inc.**  
Gainesville, Florida, USA  
[www.Agroview.ai](http://www.Agroview.ai)

By leveraging emerging areas of artificial intelligence (AI), machine learning, machine vision, cloud computing, and automation, combined with elegant, user-centric solutions, Agroview provides critical data for growers and other stakeholders based on collected ground and aerial sensory inputs. Agroview's patent pending AI utilizes deep learning algorithms to process, analyze, and visualize data collected from smart ag technologies for precision production management, reducing data collection time and cost. Inputs include sprayers, satellite, and UAV-based imagery. Agroview automates plant counting, plant gap detection, and provides key plant data including plant height, canopy size, and stress detection, while delivering full-field nutrient analysis and developing fertility maps compatible with variable rate technologies.



## ARECA DEHUSKING & PROCESSING MILL

**SGM Technologies**  
Shivamogga, Karnataka, India  
[www.sgmtech.co.in](http://www.sgmtech.co.in)

The areca (or betel) nut is one of the major horticultural crops in the Indian coastal region and has been dubbed the backbone of Indian coastal economy. The Areca Dehusking and Processing Mill is designed to enhance the rate of production and eliminate the risk of injury involved in the traditional manual peeling process currently used. The machine, using an automated gear drive, will be easy to operate and accommodate different sizes of either fresh or dry areca nut. The Areca Dehusking and Processing Mill requires only a single operator per day and functions in the voltage ranges (160-240) available in rural areas where the power supply is unstable.

## AUTONOMOUS PIVOT™

**Autonomous Pivot**  
Tel Aviv, Israel  
[www.autonomouspivot.com](http://www.autonomouspivot.com)

Autonomous Pivot™ turns center-pivot irrigation systems into robotic platforms for autonomous irrigation, fertigation, and crop protection. The platform utilizes: on-pivot ground penetrating radar for continuous noninvasive sensing of soil water content; two cameras, a wide field of view and a narrow field of view; a GPS and a rain gauge. These sensors' data is uploaded to the cloud for analysis by an AI engine, namely the AI-Agronomist. The ground penetrating radar is the first mobile soil moisture sensor that is available for farmers. With deep learning and AI Agronomist technologies, the platform enables fully automatic symptom detection and autonomous treatment actions through Autonomous Pivot's app. Real-time data from the Autonomous Pivot™ platform allow farmers not only to make better use of essential resources to maximize yield, but also to reduce water, gas, and other input costs. In the future, more sensors will be added to the platform, enabling fully autonomous-farming of pivot-irrigated row-crops.



## BIGBALER 340 HIGH DENSITY

**New Holland**  
New Holland, Pennsylvania, USA  
[www.newholland.com](http://www.newholland.com)

The BigBaler 340 High Density produces bales that weigh up to 22% more than conventional large square balers. The patented SmartShift™ two-speed gearbox provides easy driveline startup with full overload protection resulting in less wear on baler and tractor driveline components. Based upon the tractor's torque, the gearbox automatically shifts up to the desired flywheel speed. An integrated oil-cooled brake stops the plunger at the ideal spot to ensure easy baler startup every time. A unique hydraulic axle suspension system yields improved ground following and ensures excellent weight distribution across all four wheels. The elimination of leaf springs allows excellent accessibility underneath the baler. Combined with the high-capacity five-bar pickup and LoopMaster™ knotter, the BigBaler 340 High Density delivers greater producer profitability.



## BIO-YIELD®

**3Bar Biologics**  
Columbus, Ohio, USA  
[www.3barbiologics.com](http://www.3barbiologics.com)

3Bar Biologics' patented LiveMicrobe™ technology is a disposable, on-site fermentation system in which a beneficial microbe inoculum stabilized in dry formulation is released from a cap into a second chamber containing liquid, growth media, and air to grow microbes exponentially to high population prior to use. By pushing the fermentation step on-site with the grower, this allows the freshest, most viable microbes to be consistently delivered to the crop, eliminating issues with microbe loss in the supply chain and leading to less product variability and better overall performance in the field. Powered by the LiveMicrobe™ technology, Bio-YIELD® is a microbial biostimulant for improved corn production, enabling stronger early emergence along with improved plant growth and yield potential. As a platform technology, LiveMicrobe opens the door for many hard-to-stabilize beneficial microbes to be commercialized.





### CASE IH AFS CONNECT™ STEIGER®

Case IH Agriculture  
 Fargo, North Dakota, USA  
 [www.caseih.com](http://www.caseih.com)

The Case IH AFS Connect™ Steiger® provides new operating and connectivity features which build on proven reliability and efficient power. The AFS Pro 1200 display allows for operation of all tractor and implement applications and controls at the operator's finger tips and in one convenient location. Built-in 4G connectivity with remote display viewing, remote service tool support and Firmware Over The Air (FOTA) allows faster and more efficient support of tractors in the field. The redesigned cab interior provides ample storage space and power outlets allowing the operator to stay connected with personal electronic devices. All of these and many other features combine to make the new Case IH AFS Connect™ Steiger® a comfortable and productive high horsepower tractor.



### CASE IH FAST RISER® 6100 FRONT-FOLD PLANTER

Case IH Agriculture  
 Racine, Wisconsin, USA  
 [www.caseih.com](http://www.caseih.com)

The Case IH Fast Riser® 6100 Front-Fold Planter in a 61-row 45-centimeter row spacing configuration offers the most productive corn/soybean/cotton planting in Brazil, at 20 hectares (50 acres) per hour. This planting productivity allows more crop to be planted in the optimal window for increased yield potential, using a patent pending 5-section hydraulic wing down force system that includes in-cab adjustable settings to keep the center section, inner wings, and outer wing agronomic designed Fast Riser row units at target depth, even at planting speeds up to 10 km/h in challenging no-till conditions. Further enhancements to productivity come from ~100X less grease points than the competition (7 vs. 650+) which reduce service times significantly. Large 5,440-liter seed capacity increases autonomy between seed tendering.



### CASE IH MULTICONTROL ARMREST

Case IH Agriculture  
 Burr Ridge, Illinois, USA  
 [www.caseih.com](http://www.caseih.com)

Case IH upgraded the overall armrest ergonomic rating by 58% in customer focus groups by using innovative technologies like human positioning software, Case IH-developed human positioning optimization software, virtual reality simulators, and 3D printing. An iterative design and customer clinic process led to the optimization and delivery of this comfortable armrest to the widest range of customers. Minor changes to the armrest design lead to major customer satisfaction and operator comfort sustainability improvements.



### CATEGORY 3/4N THREE-POINT HITCH QUICK COUPLER

Case IH Agriculture  
 Burr Ridge, Illinois, USA  
 [www.caseih.com](http://www.caseih.com)

The Case IH Agriculture three-point quick coupler carries the load of a two-point or three-point mounted implement while reducing the amount of material required and increasing durability. The design was driven by real-world customer application loading conditions, input through a design volume, then reduced via topology optimization to reveal the most ideal structural path. A two-software process was employed that passed the design from one to the other, developing it from a large volume of design space to a finalized casting that optimizes material usage. The new design improves the strength and life of the quick coupler while at the same time reducing the cost by both reducing weight and implementing a more common material, leading to a more sustainable design.



## CF FOLDING CORN HEAD

**John Deere**

**Bettendorf, Iowa, USA**

[www.deere.com/en/harvesting/corn-heads/](http://www.deere.com/en/harvesting/corn-heads/)

John Deere CF Folding Corn Heads allow customers to harvest up to 7200 bushels per hour and 80,000 bushels per day in high-yielding corn by adding 16- and 18-row folding configurations. When transporting between fields, customers will appreciate improved visibility delivered by the enhanced frame design. Fold and unfold times have been reduced to save time moving between fields throughout the day. For harvesting leaning, down, or flat crop, CF Folding Corn Heads can be equipped ready from the factory with Active End Fenders which pull more stalks into the head as the combine moves through the field. Active End Fenders are compatible with end fender extensions. Factory-installed Stalk Deflectors press corn stalk stubble to the ground to reduce tire and track damage.



## CH950 SUGAR CANE HARVESTER

**John Deere**

**Thibodaux, Louisiana, USA**

[www.deere.com.br/pt/colheitadeiras/colhedora-decana/ch950/](http://www.deere.com.br/pt/colheitadeiras/colhedora-decana/ch950/)

With the new CH950, John Deere presents to the industry a more sustainable sugar cane production system that allows controlled traffic on all the operations from planting to harvesting, reducing compaction by 60% for increased yield and crop longevity while using 30% less fuel. This two-row harvester doubles productivity, decreases losses by 60%, and requires 28% less infield transport equipment and 33% fewer operational actions resulting in 22% less harvesting cost



## CLAAS 6000 SERIES STRAW WALKER COMBINES

**CLAAS of America Inc.**

**Omaha, Nebraska, USA**

[www.claas.com](http://www.claas.com)

The CLAAS LEXION 6000 series is a new line of wide body straw walker combines comprised of four models: 466 horsepower class 8 6900 (wheels), 6900TT (TERRA TRAC), 402 horsepower class 7 6800 (wheels), and 6800TT (TERRA TRAC). The 6000 series processor features the APS SYNFLOW threshing system with an integrated active separation cylinder and interchangeable and adjustable separation grate, and six four-step straw walkers for final separation. The 6000 series is equipped with the high-performance JETSTREAM cleaning system to provide leading crop cleaning and grain handling capacity. A 385-bushel grain tank is standard with an optional 425-bushel grain tank. Unload speeds reach up to 5.1 bushel/ second and offer greater convenience for improved in-field logistics.

## CROSSOVER HARVESTING™ WITH TRIPLECLEAN™ CLEANING SYSTEM

**New Holland Agriculture**

**Zedelgem, Belgium**

[www.newholland.com](http://www.newholland.com)

The New Holland Crossover Harvesting™ system combines conventional drum threshing and Twin Rotor™ separation, with the TripleClean™ cleaning shoe to deliver enhanced capacity for midrange combines. This system significantly increases combine capacity, within the dimensions and engine power range of midrange combines, in classes 4 to 7. This Crossover Harvesting™ system ensures that a midrange combine delivers the capacity of a traditional rotary machine combined with the outstanding straw quality associated with a pure conventional system. The system is compatible with all combinable crops the world over, including, but not limited to soy beans, corn, and rice in Latin-America to cereal crops, rapeseed, and corn in Europe and CIS.







## CX24

**Munters Corporation**  
Lansing, Michigan, USA  
[www.munters.com](http://www.munters.com)

Studies show the use of circulation fans can result in more stable house temperatures and better bird distribution while reducing litter moisture and ammonia. This leads to a reduction of up to 20% in paw lesions and improved feed conversion rates. The advanced design of the CX24 produces a higher centerline velocity, providing more control over the air movement in the barn. This precision creates ideal bird distribution leading to more even litter moisture levels for healthier paws. Munters' unique chevron design is engineered to minimize specific frequencies generated by the fan blades, reducing noise of the fan in order to provide a comfortable environment for the livestock. Acoustic testing was performed in certified, a semi-anechoic chamber to isolate specific frequencies and optimize the design for maximum noise reduction.



## DRI-STACK

**Haber Technologies, Inc.**  
Ames, Iowa, USA  
[www.drycorn.com](http://www.drycorn.com)

Haber Technologies has developed a novel drying and aeration technology that directs airflow to specific locations within bins in a considerably more efficient manner than traditional plenum-based grain drying and aeration systems. The DRI-Stack System consists of a series of



air tube stacks containing valves for directing airflow within the grain mass to specific locations in the bin. This system can be used to dry an entire bin of grain more efficiently and more consistently than either heated air or natural air systems. It can also be used to target specific hot spots within the bin. Tests in grain producers' bins show that entire bins can be dried in less than one week, at a fraction of the price of traditional drying systems.



## DURA-ABV™-B AUTO-BATCH METER

**Dura Products**  
Arcadia, Indiana, USA  
[www.duraproducts.com](http://www.duraproducts.com)

The Dura-ABV™-B Auto-Batch Meter, designed to connect with the BANJO EVX® 100B Electric Valve, is suited to automate a venturi-driven chemical handling system. Simply join the factory-installed electric connectors, plumb the valve to auto-batch, select the volume desired, press start, and the valve automatically opens and closes upon completion. Save up to five calibrations with measurements in gallons, liters, and ounces. Female NPT and manifold flange connections offer plumbing options. Dura-ABV™ and Banjo EVX® Valve remove the need for sophisticated wiring, PLC, or plumbing. Operator error and herbicide exposure is eliminated.



## ELECTRONIC SWING ARM CORNER (ESAC™)

**Reinke Manufacturing Co., Inc.**  
Deshler, Nebraska, USA  
[www.reinke.com](http://www.reinke.com)

ESAC™ increases water uniformity and eliminates under and over watering throughout the corners of a field through a unique and novel patent pending water application method. This increase in uniformity brings the swing arm corner to a higher standard in water use efficiency. ESAC™ provides growers with ways to increase additional acres under an irrigation system without buying additional ground. The innovation is in the application of the sequential zones, GPS positioning, electronic controls, and a patent pending water application method that provides the right amount of water-based system parameters, such as the unique coverage area in the field.



## ENGAGE® SPREADCONTROL

Intelligent Agricultural Solutions  
Fargo, North Dakota, USA  
[www.intelligentag.com](http://www.intelligentag.com)

Engage® SpreadControl is a quarter-boom section control upgrade for dry fertilizer applicators (“floaters”), and increases the swath control resolution from 35 to 17.5 feet per section on a TerraGator® AirMax® Precision (A & B series) applicator. This product reduces the amount of overlap per field by 3% to 5% or more. As stewards of the land, growers are always looking for effective ways to preserve the environment while maintaining a healthy farming operation. Increasing the precision of a floater allows the operator to apply product in the right place at the right rate while also affording them the ability to reduce application costs through saved fertilizer and longer equipment life.

## EXACTRATE™ LIQUID FERTILIZER SYSTEM

John Deere  
Moline, Illinois, USA  
[www.deere.com](http://www.deere.com)

The ExactRate™ Liquid Fertilizer System utilizes existing ExactApply™ Sprayer technology in an innovative way as a planter applied fertilizer solution. The system uses pulse width modulation to enable features such as in-cab rate adjustments, variable rate prescriptions, individual row section control, and curve compensation. As the need for more precise input placement grows, ExactRate™ carries a lot of the features found in electric drive planters and delivers it to the liquid fertilizer side. The system provides an integrated solution for on-planter fertilizer delivery using familiar components and user interfaces, mitigating the need for growers to design and build their own system. The ExactRate™ Liquid Fertilizer System offers new capabilities to practice nutrient stewardship by applying the right source at the right rate during the right time in the right place.



## FENDT 1100 VARIO MT

AGCO Corporation  
Jackson, Minnesota, USA  
[www.agcocorp.com](http://www.agcocorp.com)

The new Fendt 1100 Vario MT Series track tractors combine proven innovations from AGCO’s 30 years of experience in tracked tractors with newly engineered features that elevate operator comfort and in-field performance. The entirely new Fendt iD™ powertrain delivers a high-torque, low-engine speed concept through the use of the VarioDrive™ continuously variable transmission (CVT). All tractor functions, including CVT, PTO, cooling system, and hydraulics, are geared to run at optimum levels with the engine speed in a working range of 1100 to 1500 rpm. These innovations lower fuel consumption, reduce engine and component wear and provide extra-quiet operation.

## FENDT 700 GEN6

AGCO Corporation  
Jackson, Minnesota, USA  
[www.agcocorp.com](http://www.agcocorp.com)

The new Fendt 700 Gen6 Series premium high-horsepower tractors deliver versatility, comfort, and easy operation. AGCO engineers completely redesigned the operator station, and the innovative new FendtONE™ operator interface provides a stream-



lined and highly efficient work environment. It features a 12-inch primary display on the armrest, an optional 12-inch pull-down display recessed into the roof liner, and a 10-inch “digital dashboard” on the steering column.

The 12-inch displays operate in unison, allowing the operator to choose and view up to 12 panels of information across the two screens. Navigation is easy and intuitive, like using a smartphone. The 700 Gen6 Series tractors can be adjusted to narrow and wide row spacings and are available in six models with engine horsepower ranging from 144 to 237.



## FENDT® IDEALDRIVE™ STEERING SYSTEM

**AGCO Corporation**  
 Duluth, Georgia, USA  
[www.AGCOCorp.com](http://www.AGCOCorp.com)

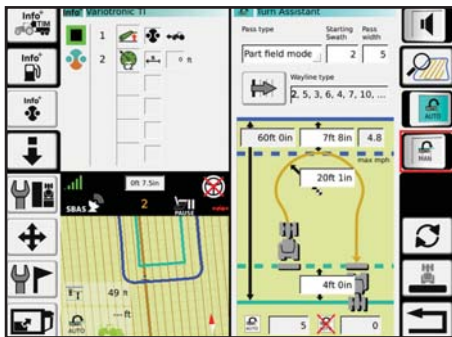
The Fendt® IDEALdrive™ Steering System from AGCO, eliminates the steering wheel and steering column on the Fendt IDEAL® combine, and gives the operator an unobstructed, end-to-end view of the combine header. The intelligent-control joystick located on the left side armrest requires 65% less muscle activity to operate than a steering wheel, reducing operator stress and fatigue during long hours of harvesting. A university ergonomics study comparing different steering technologies showed that joystick steering led to a 6% increase in productivity. Control is easy and precise in the field and on the road. IDEALdrive is an option from the factory on all IDEAL TrakRide™ combines (models 7T, 8T, 9T, and 10T).



## FENDT® MOMENTUM® PLANTER

**AGCO Corporation**  
 Duluth, Georgia, USA  
[www.fendt.com/us/](http://www.fendt.com/us/)

The Fendt® Momentum® Planter is a high-capacity, high-speed planter that addresses planter soil compaction while setting a new standard for seed placement accuracy on contours and in challenging planting conditions. The in-line tandem transport wheels with very-high flexion tires combine with the optional Load Logic™ system to eliminate planter pinch rows. Weight is hydraulically transferred across the planter constantly to maintain either a load balance or controlled traffic mode. Tire inflation pressure is automatically regulated to minimize yield-robbing compaction. Momentum's dual-toolbar SmartFrame™ innovations include a vertical contouring toolbar with row unit travel up to 68 inches to maintain ground contact and uniform planting depth, even over terraces, for even emergence and optimum yields.



## FENDT TURN ASSISTANT

**AGCO Corporation**  
 Jackson, Minnesota, USA  
[www.agcocorp.com](http://www.agcocorp.com)

The smart technology of the Fendt Turn Assistant manages all the steps for precise and efficient hands-free turning of a tractor and implement at the field edge. Unlike other systems, it self-adjusts within the parameters set for that field and it includes a field overview map, allowing the operator to see each turn. The system has two modes. Traditional U-Turn mode completes headland turns, and Part Field mode completes turns in areas of the field that require a specific pattern, such as skip rows during a deep tillage operation. Both modes make the operator's job easier, save time, reduce fuel use and result in smoother turns, causing less impact on the soil.

## FLEX MAX LONG-LIFE WIRELESS MONITORING DEVICE

**RealmFive**  
 Lincoln, Nebraska, USA  
[www.realmfive.com](http://www.realmfive.com)

Flex Max was developed to solve the problem of integrating brands and types of in-field and on-farm sensors. Flex Max builds upon RealmFive's original Flex technology to add more inputs as well as an innovative combination of battery technologies that achieves a 5-year battery life, based upon a base data measurement and send frequency. Battery power allows installation in places and in applications where electrical grid power and even solar power are not options. Sensor input types include analog inputs, digital inputs, and serial interfaces. Applications can be as diverse as level sensing, flow meters and soil moisture sensors. Other R5 Core standard features that are available include over-the-air configuration changes, firmware updates, and TrueSync™ technology for reliably connecting to the cloud.





## FURROWFORCE

**Precision Planting**  
Tremont, Illinois, USA  
[www.PrecisionPlanting.com](http://www.PrecisionPlanting.com)

FurrowForce is an automated planter closing with integrated sensing that manages soil density while fully closing the seed furrow. FurrowForce uses two stages: one to aggressively close the furrow and a second to firm the soil so that it maintains moisture for seed germination. Using a weight sensor that measures load on the second stage, FurrowForce automatically adjusts the force applied to the unit to maintain consistent firming force as the row unit encounters varying soil and field conditions.

## HARVEST MONITOR™ WITH SMARTCLEAN™ SYSTEM

**John Deere**  
Thibodaux, Louisiana, USA  
[www.deere.com/en/harvesting/ch570-sugar-cane-harvester/](http://www.deere.com/en/harvesting/ch570-sugar-cane-harvester/)



SmartClean is the controlled cleaning solution for mechanical cane harvesters that reduces operator decision-making through a documentation system while delivering consistent customer-defined product to mill. Agronomists, field managers, or experienced operators set targeted results which are achieved through the sensors and control scheme. Coupled with integrated machine sensors, the control system minimizes cane losses, and manages residue ejection, and leaf trash sent to mill by managing primary cleaning fan speed settings. Agronomic information can be documented and recorded to provide live feedback on the vehicle and sent to the customer via the John Deere data and vehicle management system. The system uses a combination of sensors including accelerometer, stereo cameras, pressure, and speed sensors with an adaptive machine learning development algorithm, to generate correlations between fan speed and cleaning performance.

## HAWKEYE® 2 NOZZLE CONTROL SYSTEM

**Raven**  
Sioux Falls, South Dakota, USA  
[www.ravenprecision.com](http://www.ravenprecision.com)

Hawkeye® 2 Nozzle Control is a pressure-based product control system that allows precise sprayer application by dynamically controlling the rate and pressure in a variety of conditions. The nozzle control valve (NCV) builds upon the previous system: individual nozzle control reduces skips and overlaps; consistent rate and droplet size reduces drift and increases application quality; and turn compensation minimizes over and under application, achieving the ideal application rate across the boom. Each nozzle is controlled by its own pulsing NCV providing a consistent spray pattern across the boom as speed and conditions change, ensuring precise droplet coverage. Hawkeye® 2 can shut off flow by sections or individual nozzles. This technology saves on chemicals, reduces overlap and unnecessary application, and provides the most efficient coverage.



## HDR RIGID CUTTERBAR DRAPER

**John Deere**  
Bettendorf, Iowa, USA  
[www.deere.com/en/harvesting/draper-platforms/](http://www.deere.com/en/harvesting/draper-platforms/)

John Deere HDR Drapers bring innovations that enhance the performance, efficiency, and ease of use of John Deere's grain harvesting solution. A new hinged frame provides nearly two times the vertical wing range compared to competitive machines, while delivering more consistent cut height in uneven and rolling terrain. Integrated cab controls allow the combine operator to quickly change cut height or float pressure on-the-fly from the cab. Grain Saver Draper Belts reduce canola loss up to 25% compared to traditional smooth draper belts. Optional fingered top augers improve feeding performance in bushy crop and help reduce grain loss, while higher feed drum torque and wider center-feed system enable higher throughput. HDR drapers are available in cutting widths from 35 to 50 feet.



### HEMP DRYER MODEL 1

**Forest Concepts, LLC**  
Auburn, Washington, USA  
[www.forestconcepts.com](http://www.forestconcepts.com)

The Forest Concepts Hemp Dryer Model 1 is a continuous incremental zoned dryer optimized for drying industrial hemp prior to storage and extraction. Raw harvested hemp is processed on screen-bottomed trays through the dryer and then either to an extraction facility or for dry storage. A continuous line of bins advances through six drying zones and one cooling zone prior to exiting the dryer system. Semi-independent modules allow optimization along the drying curve and greatly reduce total energy consumption. Each of the seven dryer zones has independent air handling fans, and heated zones have independent propane burners. The mechanical, drying, and cooling system is managed by an integrated PLC-based control system. The dryer is mounted on a highway-legal 48-foot flatbed trailer for mobility.

### INJECTORSENTRY®

**Farmation® LLC**  
Hancock, Minnesota, USA  
[www.farmation.us](http://www.farmation.us)

The InjectorSentry® is a fertigation monitoring solution for use with center pivot and other irrigation systems. The InjectorSentry® is designed to monitor fertilizer injection line flow and pressure, and if a problem is detected, alarm. The first question often encountered when starting a fertigation pump is, "What rate am I actually applying?"

Then, after leaving the site, it becomes, "Is my pump still working as it was when I left it?" From plugged filters, to empty tanks, to mechanical problems, there are many reasons that cause fertigation applications to go amiss. When there is an issue, the next question is, "When did it happen?" The InjectorSentry® answers these questions by showing how much product is being injected, monitoring the application, and alarming if a problem occurs.



### KMC 7406 PEANUT COMBINE

**Kelley Manufacturing Company**  
Tifton, Georgia, USA  
[www.kelleymfg.com](http://www.kelleymfg.com)

The KMC 7406 Peanut Combine, a progressive pull-type peanut harvester, features a 20% higher capacity threshing system, four-tier cleaning system, and custom electronic control system that allows the combine to be adjusted from the tractor seat. The improved threshing system is designed to reduce vine wrapping, increase mass flow rates, and expand the operating parameters of the peanut combine to include less than ideal conditions experienced when crop moisture content is high and/or harvesting has been delayed beyond the ideal window. The four-tier cleaning system has multiple dirt release locations, innovative sizing rollers to remove clods and large debris, and a custom sieve to provide even air flow for the cleanest sample possible. Features include a swing away concave for easy cleaning, abrasion resistance, replaceable steel panels in the air conveyor, and easier access to all maintenance points.



### KONDEX REVOLUTION™ CONCAVES

**Kondex Corporation & John Deere**  
Lomira, Wisconsin, USA  
[www.kondex.com/kondex-revolution-concaves.html](http://www.kondex.com/kondex-revolution-concaves.html)

Kondex Revolution™ concaves are high-performance threshing components that feature a helical, half-width design to deliver greater set-up flexibility and crop condition adaptability than traditional concaves. Continuous rows of angled threshing or separating bars meet the crop head-on to improve threshing, thus reducing whitecaps in wheat and plugging in moist crop conditions. These concaves also reduce rotor power usage, and improve the combine's overall productivity. Assemblies include MaxThresh™—for optimal threshing—and MaxRound™—for ultimate separation. Kondex Revolution™ concaves are available exclusively through John Deere.



## KUHN VB 7100 i-DENSE SYSTEM

**KUHN North America**  
**Brodhead, Wisconsin, USA**  
[www.kuhn.com](http://www.kuhn.com)

Available on the KUHN VB7100 Series, the KUHN i-DENSE System is an intelligent density system, which independently controls the baler's density settings based on crop conditions and moisture levels. This system has the ability to create extremely high-density bales. I-DENSE pairs a twin tensioning arm system with measurements from a moisture sensor to automatically adapt the baling pressure according to different crops and crop conditions, without intervention from the driver. I-DENSE allows the driver to set the core density and the bale's outer layer density independently of each other, and they will individually adapt to the new conditions. This results in the most economical use of the baler without compromising on performance. I-Dense allows a producer to create the best bales for their specific operation and turn the crop into high quality feed.



## LB436 HD LARGE SQUARE BALER

**Case IH Agriculture**  
**Racine, Wisconsin, USA**  
[www.caseih.com](http://www.caseih.com)

The LB436 HD delivers all-out efficiency by producing bales that weigh up to 22% more than with standard large square balers. The exclusive two speed gearbox provides easy driveline startup with full overload protection resulting in less wear on both baler and tractor driveline components. Based upon the tractor's torque, the gearbox automatically shifts up to the desired flywheel speed. An integrated oil-cooled brake stops the plunger at the ideal spot to ensure easy baler startup every time. A unique hydraulic axle suspension system yields improved ground following and ensures excellent weight distribution across all four wheels. The elimination of leaf springs allows excellent accessibility underneath the baler. Combined with the high-capacity five-bar pickup and TwinePro™ knotter, the LB436 HD delivers greater productivity to the producer.

## LEAFSPEC

**LeafSpec LLC**  
**West Lafayette, Indiana, USA**  
[www.sites.google.com/view/leafspecllc](http://www.sites.google.com/view/leafspecllc)

LeafSpec is an accurate, affordable, and portable hyperspectral leaf imager. Within 5 seconds, LeafSpec scans a leaf non-destructively and provides measurements of a plant's physiological features such as leaf moisture, chlorophyll content, nutrients level, diseases, and so on. Innovated by the Plant Phenotyping Sensor Lab at Purdue University, the small handheld LeafSpec integrated advanced hardware and software technologies from existing hyperspectral imaging stations but provides even higher imaging quality. LeafSpec can be easily deployed at any location and generates hyperspectral leaf images with 0.5-mm resolution. The cube image is immediately processed with an onboard microprocessor, and the measured plant features can be viewed in real-time with a smartphone app. Each measurement is geo-referenced and automatically viewable through the service of a digital ag cyberinfrastructure.



## MULTIAXIS-STEER™

**Danfoss Power Solutions**  
**Nordborg, Denmark**  
[www.danfoss.com](http://www.danfoss.com)

The new Danfoss MultiAxis-Steer™ electrohydraulic steering solution provides independent control of secondary steered axles on machines with multiple steerable axles to optimize safety, performance, and operator comfort. Intelligent electronic control improves productivity by providing operators unparalleled maneuverability with minimal effort. MultiAxis-Steer™ allows safe and seamless changes between steering modes—including all-wheel steering and crab steering—during operation. It can also improve implement tracking and be applied to a theoretically unlimited number of axles. In addition, MultiAxis-Steer™ complies with the latest functional safety requirements. Control is accomplished by a new algorithm incorporated into the SIL2 TÜV certified failsafe PVED-CLS steering and safety controller integrated in the EHi steering valve. This results in less time required for OEMs to obtain functional safety certification for their machines.





## NETBOW™

**Netafim**  
Tel Aviv, Israel  
[www.netafim.com](http://www.netafim.com)

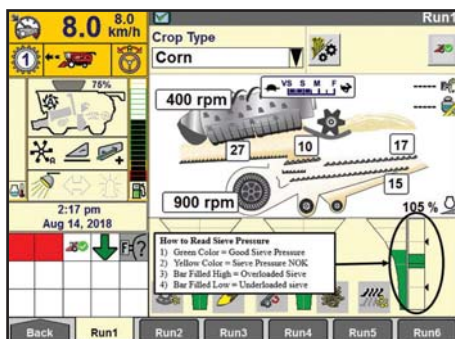
NetBow™ is an innovative, user-friendly container irrigation multi-outlet dripper arc with high clogging resistance and superb water distribution. Placed on the substrate surface, NetBow™ ensures 100% uniform coverage of the substrate from top to bottom with no “blind spots,” and can minimize drainage. With NetBow™, roots develop in every square inch of the container including the top layer, where root development is critical, ensuring that crops reach their full growth potential. NetBow™ features eight of Netafim’s high clogging-resistant drippers to ensure uniform water distribution with a lower risk of clogging. NetBow™ is quick and easy to install and collect with little room for human errors, saving labor and time. NetBow™ helps growers maximize nutrification efficiency in containers.



## SCHLOT LIVE MkI CANE LOSS MONITOR

**SCHLOT Pty Ltd**  
Cambridge, Tasmania, Australia  
[www.schlot.com.au](http://www.schlot.com.au)

SCHLOT Live is a data-driven console that provides real-time and quantifiable cane loss data to harvester operators, enabling fine tuning and maximization of harvesting performance. Incorporating SCHLOT Live into a harvesting program reduces cane losses by between 40% and 60% across normal operating conditions. SCHLOT Live addresses the considerable ‘invisible’ losses made up of cane reduced to non-recognizable matter by the extractor systems. This is achieved using proprietary algorithms that process 25 years of field research trial data against live harvesting data collected by an array of monitors installed at key locations on the harvester. SCHLOT Live brings immediate financial benefit to the sugar supply chain, with return on investment achieved in as little as 100 hours.



## SIEVE PRESSURE VISUALIZATION

**Case IH Agriculture**  
Racine, Wisconsin, USA  
[www.caseih.com/northamerica/en-us](http://www.caseih.com/northamerica/en-us)

Case IH provides instant cleaning system performance profile information via sieve pressure visualization for the Axial-Flow® 250 Series Combine. Throughout the history of harvesting, there has always been a risk of “making the wrong adjustment.” This is because, although loss is sensed, there is no way to understand what type of loss it is. Making any correction to the cleaning system without doing a kill stall has been more or less a guess. When properly equipped with sieve pressure visualization, Case IH Axial-Flow® 250 series customers will have the ability to define how the cleaning system needs to be adjusted thereby saving grain with the right adjustment.

## TRIDENT PULSATION™

**LR Gehm, LLC**  
Lisle, New York, USA  
[www.TridentPulsation.com](http://www.TridentPulsation.com)

Using an integrated controller card, this pulsator enables consistent liner attach, gentle detach, and continuous real-time pulsator monitoring. Cows milk at average peak flows of 20 lbs/min with many cows achieving 25 to 35 lbs/min, resulting in average milking durations of 3.6 minutes. Reduced milking time reduces labor, permits more cows to be milked, and enables cows to spend less time in the milking process. Several technologies incorporated into this pulsation product include the ability to hold a liner fully open during the attach and detach process to ensure full liner engagement and gentle



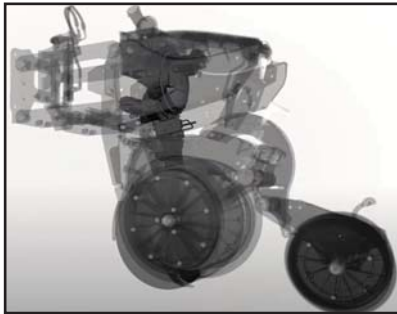
removal. A positive pressure fresh air system ensures consistent liner action. An integrated sensor continuously monitors and verifies specified operation of the pulsator. A long-life feature is included.



## TRUESPEED, SURESPEED

**Kinze Manufacturing Inc. and Ag Leader**  
Williamsburg, Iowa, and Ames, Iowa, USA  
[www.Kinze.com](http://www.Kinze.com) and [www.agleader.com](http://www.agleader.com)

TrueSpeed by Kinze Manufacturing Inc., and SureSpeed by Ag Leader, is a high-speed, high-accuracy planting system developed to provide growers a planting solution that increases productivity and accuracy while providing efficient operation and low-cost ownership. This product was a collaborative development between Kinze Manufacturing for OEM application and Ag Leader for aftermarket application. The system uses 24-volt brushless DC motors to power a new-design high-speed, high-efficiency vacuum seed meter and a mechanical seed transfer system, providing high accuracy seed placement at speeds from 3 to 12 mph. Developed primarily for row crop growers, the system uses a unique 2-stage brush type transfer system to accurately transfer seeds from the seed disk to a seed delivery mechanism that places the seeds in the seed furrow without the effects of gravity, hillsides, or forward travel speed.



## VSN® VISUAL GUIDANCE

**Raven**  
Sioux Falls, South Dakota, USA  
[www.ravenprecision.com](http://www.ravenprecision.com)

VSN® Visual Guidance system in full canopy utilizes a stereo vision camera and non-contact radar sensors to navigate the machine through emerged crops. VSN allows the operator to focus on other aspects of effective application control while eliminating crop damage and covering more acres in a day. This provides easier machine operation, leading to a quick return on investment to maximize yield profitability. The operator covers 20% more acres due to increased speed and ease of use, and drastically reduces crop damage and misapplication in the field. This non-contact, multi-sensor approach maintains sub-inch accuracy through varying crop conditions at speeds up to 20 mph. VSN Visual Guidance works with a variety of Raven products, including the field computers Viper® 4+, RS1™, and SC1™; and Slingshot® telematics.



## WATCHDOG® 3000 SERIES WIRELESS STATION

**Spectrum Technologies, Inc.**  
Aurora, Illinois, USA  
[www.specmeters.com](http://www.specmeters.com)

The WatchDog® 3000 Series Wireless Station measures, records, and communicates weather and environmental information. Its flexible configuration options for radio and sensors enable it to precisely meet the needs of any grower. With an LTE CAT-M1/NB-IoT cellular radio, the 3000 Series can monitor the widely dispersed fields of modern large farms. After an overnight rainfall, a farmer can see which fields can be worked without risking soil compaction and adjust field activities accordingly. With a mesh network radio, the varied microclimates of a vineyard, orchard or golf course are capably tracked, with localized disease pressure or frost warnings available. The all-in-one design with smartphone setup makes installation quick and easy for someone whose real job is not setting up weather stations.



## X9 COMBINE

**John Deere**  
East Moline, Illinois, USA  
[www.deere.com](http://www.deere.com)

The X9 combine brings together new levels of capacity, efficiency, and technology. The industry's widest body allows substantial increases in functional capacity that delivers more capacity throughout the harvest day and extends the hours of the harvest day. The X9 1100 can harvest up to 7200 bushels per hour in high-yielding corn and up to 30 acres per hour in wheat. The entire drive architecture has been updated, and a new propulsion system is in place to further improve efficiency. These changes, combined with the new 13.6L engine from John Deere Power Systems, provide significantly more capacity with a minimal increase in engine power in the X9 1000 and X9 1100 models, leading to an improvement in fuel economy.



## INDEX OF WINNERS BY COMPANY

### 3Bar Biologics

Bio-YIELD®

### AGCO Corporation

9350 DynaFlex® Draper Header with AutoDock™ Header Docking System

Fendt 1100 Vario MT

Fendt 700 Gen 6

Fendt® IDEALdrive™ Steering System

Fendt® Momentum® Planter

Fendt Turn Assistant

### Agriculture Intelligence, Inc.

Agroview

### Amber Agriculture

Ace Air

### Autonomous Pivot

Autonomous Pivot™

### Case IH Agriculture

24-Row Air Pack System for Case IH Fertilizer Applicators and Air Carts

Case IH AFS Connect™ Steiger®

Case IH Fast® Riser 6100 Front-Fold Planter

Case IH MultiControl Armrest

Category 3/4n Three-Point Hitch Quick Coupler

Sieve Pressure Visualization

LB436 HD Large Square Baler

### CLAAS of America Inc.

CLAAS 6000 Series Straw Walker Combines

### Danfoss Power Solutions

MultiAxis-Steer™

### Dura Products

Dura-ABV™-B Auto-Batch Meter

### Farmation® LLC

InjectorSentry®

### Forest Concepts, LLC

Hemp Dryer Model 1

### Haber Technologies, Inc.

DRI-Stack

### Intelligent Agricultural Solutions

Engage SpreadControl

### John Deere

CF Folding Corn Head

CH950 Sugar Cane Harvester

ExactRate™ Liquid Fertilizer System

Harvest Monitor™ with

SmartClean™ System

HDR Rigid Cutterbar Draper

X9 Combine

### Kelley Manufacturing Company

KMC 7406 Peanut Combine

### Kinze Manufacturing Inc. & Ag Leader

TrueSpeed, SureSpeed

### Kondex Corporation & John Deere

Kondex Revolution™ Concaves

### KUHN North America

KUHN VB 7100 i-DENSE System

### LeafSpec LLC

LeafSpec

### LR Gehm, LLC

TridentPulsation™

### Munters Corporation

CX24

### Netafim

NetBow™

### New Holland Agriculture

Crossover Harvesting™ with TripleClean™ Cleaning System

### New Holland

BigBaler 340 High Density

### Oxbo International Corporation

6030 Vineyard Multifunction Machine

### Precision Planting

FurrowForce

### Raven

VSN® Visual Guidance

Hawkeye® 2 Nozzle Control System

### RealmFive

Flex Max Long-Life Wireless Monitoring Device

### Reinke Manufacturing Co., Inc.

Electronic Swing Arm Corner (ESAC™)

### SGM Technologies

Areca Dehusking & Processing Mill

### SCHLOT Pty Ltd

SCHLOT Live MkI Cane Loss Monitor

### Spectrum Technologies, Inc.

WatchDog® 3000 Series Wireless Station

### TeetJet Technologies

AccuPulse® TwinJet (APTJ) Flat Spray Tip



## Will your company introduce a new product in 2021?

If you have a new product, we might be celebrating you here next year!

If your company will bring a new product to market for 2021, consider nominating it for an AE50 award. ASABE is proud to sponsor AE50, the only awards program of its kind, celebrating product innovations in the areas of agricultural, food, and biological systems. Our online nomination process begins in August, check our website ([www.asabe.org/AE50](http://www.asabe.org/AE50)).

## Innovation Worth Smiling About



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[kondex.com](http://kondex.com)



# Educating the Public on Transgenic Crops: An Ethical Obligation

Sydney Williford

Symptoms of the papaya ringspot virus on papaya leaves.

**Editor's note:** ASABE member Sydney Williford, a student at Auburn University, took first place in the 2020 Ag and Bio Ethics Essay Competition by submitting "an original work of up to 1,500 words on an ethics topic impacting the practice of professions related to agricultural and biological engineering, systems, or technology." Open to undergraduate and graduate student members of ASABE and IBE, second place went to **ASABE member Vivek Patil** of Auburn University for "Cure Worse Than the Disease? A Deep Look into the Ethics of Bioplastics" and third place was awarded to **ASABE member Viet Le** of Louisiana State University for "The Ethical Implications of Groundwater Use." Congratulations to our 2020 finalists, who presented their essays at the 2020 virtual Annual International Meeting. These winning essays can be found at [asabe.org/Awards-and-Competitions/Student-Awards-Competitions-Scholarships/Ethics-Essay-Competition](https://asabe.org/Awards-and-Competitions/Student-Awards-Competitions-Scholarships/Ethics-Essay-Competition).



In the modern-day 21st century, it is nearly impossible to go to the grocery store and not see products proudly labeled "GMO-Free." Many misconceptions surround the controversial topic of genetically modified crops. The stigma that surrounds the phrase "genetically modified organism" is impeding the potential for global impacts of transgenic crops on nutrition and food supply. The transgenic papaya that saved Hawaii's papaya industry and rice fortified with provitamin A are two biotechnologies that had global potential that was restrained by anti-GMO groups. As agricultural scientists and engineers, it is our ethical obligation to educate the public on the effects and benefits of transgenic crops in the wake of impending food shortages that we will face in the future.

In the 1990s, the papaya ringspot virus infected Puna, Hawaii, the city that produced over 95 percent of Hawaii's papayas. With over 30 years of research, Dennis

Gonsalves, a Hawaii native, developed a method of cross-protection. Cross protection, or the infection of a plant with a weak virus strain, prevents a strong virus strain such as the papaya ringspot virus from harming the plant. Gonsalves and scientist Richard Manshardt developed transgenic cultivars that were tested and eventually deregulated by the USDA and are widely used throughout Hawaii (Gonsalves, 2013). However, countries receiving exports of transgenic papaya must also deregulate the plant before selling it commercially. Many countries are wary of deregulating the transgenic papaya, such as Thailand, where protestors temporarily halted the field trials of transgenic crops in 2004. Protestors destroyed trials of transgenic papayas while dressed in extensive personal protection gear, conveying their extensive distrust for genetically modified organisms despite their local papaya crop being infected by the papaya ringspot virus. Following a leak of transgenic papaya seeds, many farmers, knowingly or unknowingly, planted transgenic papaya in Thailand. These farmers were villainized and socially exiled and were told that they would develop infertility if they ate the crop, driving some farmers out of business. Despite the radical acts against them, in a survey conducted in 2006, only 30 percent of farmers surveyed had any idea what genetic engineering was. When explained, nearly 90 percent of surveyed farmers said they approved of the practice (Davidson, 2008).

Another genetically modified organism, “golden rice,” or rice fortified with provitamin A was invented with hopes of benefitting the health of people in third world countries. Deficiency of vitamin A in the diets of many children and adults in Southeast Asia causes varying degrees of blindness, gastrointestinal problems, and respiratory diseases (Ye et al., 2000). The inventors of golden rice, Peter Beyer and Ingo Potrykus, proposed an introduction of vitamin A through diet rather than supplement by introducing the biosynthetic pathway into the rice endosperm. Through the access of this technology, the 124 million children that experience vitamin A deficiency throughout the world could live healthier lives with less risk for blindness, disease, and death. Despite the potential to increase the standard of living for many people in third world countries, anti-GMO organizations such as Greenpeace rallied against the technology, similar to the transgenic papaya in Thailand. The radical actions against GMOs by these organizations eventually prompted the Swiss Federal Institute of Technology to take an extreme preventative measure of mak-

ing their greenhouses grenade-proof to ensure the experimental trials for golden rice would not be destroyed. The involvement of the chemical company Syngenta in the production of the rice caused an additional reason for distrust in the technology. The Greenpeace organization claimed that golden rice would not supply enough vitamin A to affect consumers. Potrykus claimed that the rice, not necessarily intended to supply all of a person’s daily vitamin A, was a feat that proved that genetic technology could be used for the benefit of poor consumers in third world countries. In 2015, the invention received the Patents for Humanity award from the United States Patent and Trademark Office (2015 Award Recipients, 2019). Despite this recognition of potential, research and production of golden rice are forced to a halt because of public opinion. Further advancement of golden rice is now taking place in other countries that have more potential for the use of the crop. Potrykus claims that the regulation of genetically modified crops is also to blame for the lack of progress (Enserink, 2008).

**Agricultural scientists and engineers are needed to establish trust with the public and educate them about the research, experimentation, regulation, and effects of genetically modified crops.**

There is an obvious fear of genetically modified crops that inspires protest and violence and hinders scientific research and experimentation. Agricultural scientists and engineers are needed to establish trust with the public and educate them about the research, experimentation, regulation, and effects of genetically modified crops. Professionals, especially those that are not employed or associated with chemical corporations, should educate themselves about transgenic crops and form an unbiased opinion based on scientific research in order to establish credibility with the anti-GMO community that already distrusts chemical companies like Monsanto and Syngenta. A grassroots approach to dissipating fear of transgenic crops can be enacted by creating a relationship with family members, colleagues, and communi-

ties to create a platform for sharing factual information about GMOs. The same relationships need to be formed with organizations against GMOs, such as Greenpeace, not just in the United States, but across the world. As the world population rises, this biotechnology could be the most consequential technology of the 21 century, yet many transgenic crops are not being utilized. As scientists and engineers concerned with potential future food shortages, it is our ethical obligation to be a mediator for these technologies to the public. If agricultural engineers and scientists fail to create a relationship with people in their communities and those that protest the use of transgenic crops, one of the most important tools of our future could be rendered useless.

**ASABE member Sydney Williford**, Department of Biosystems Engineering, Auburn University, Auburn, Alabama, USA, [sjw0047@auburn.edu](mailto:sjw0047@auburn.edu).

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## Get Involved with Standards

This past October, the YPC took over ASABE's social media accounts to highlight the process of developing standards related to agricultural, food, and biological systems. We also shared interesting facts about ASABE standards work. If you haven't already, follow ASABE on Facebook and our other social media platforms.

In case you missed it, some of the most impressive facts are that ASABE has nine Technical Communities, comprising over 200 committees supported by over 2,000 professionals!

These committees develop a wide variety of standards, from Agricultural Field Equipment Braking (ASABE Standard S648.2) to Method of Determining and Expressing Fineness of Feed Materials by Sieving (ASABE Standard S319.4). They also represent the U.S. in dozens of technical committees for the International Organization for Standardization (ISO).

So how can you get involved in shaping the future of ASABE and your field of expertise? Here are three ways:

- **Find an ASABE Technical Community that matches your interests.** With nine to choose from, there is sure to be a Technical Community (or two or three) that's involved with topics related to your area of expertise.
- **Attend a committee meeting!** All meetings are open to interested ASABE members. Most committees meet during the Annual International Meeting, and many Machinery Systems committees meet during the Agricultural Equipment Technology Conference (Feb. 8–10 this year). If you can't attend a meeting, e-mail ASABE staff or the committee's chair to let them know you want to be involved. Much of the committee work happens during the year, such as reviewing and affirming standards.
- **Become an observing member.** Being an observing member is a low-pressure way to become involved and stay informed on standards activities. Observing members have full access to committee business, without the responsibilities of voting members. To become an observing member of a committee, contact ASABE staff at [standards@asabe.org](mailto:standards@asabe.org).

For more information, including a list of all the technical committees, visit the ASABE Standards Development webpage: <https://asabe.org/Publications-Standards/Standards-Development>.

**ASABE member Wyatt Hall**, Systems and Applications Engineer, Danfoss Power Solutions, Ames, Iowa, USA; [whall@danfoss.com](mailto:whall@danfoss.com).



## Honoring the Newly Elected

**E**leven new ASABE Fellows were recognized at the virtual Annual International Meeting in July. *Resource* is proud to highlight these recent honorees. In this issue we recognize **Suat Irmak, P.E.**, and **Amy Kaleita, P.E.**

Fellows must have a minimum of 20 years of active practice in, or related to, the profession of engineering, the teaching of engineering, or the teaching of an engineering-related curriculum. The designation Fellow has honorary status, to which members may be elected but may not apply.



**Suat Irmak, P.E.**, Harold W. Eberhard Distinguished Professor, biological systems engineering, University of Nebraska-Lincoln, is honored for his global impact in advancing irrigation engineering and understanding crop engineering interactions.

Irmak is a renowned scientist, researcher, educator, and a servant leader who is internationally recognized for his exceptional contributions to the advancement of science, education, and engineering. Irmak has made contributions to the measurement and modeling of surface energy and water vapor fluxes, which play a critical role in understanding the response of agro-ecosystems to changes in environmental and atmospheric parameters to better model water losses for more accurate water balance analyses. Irmak is an international leader in irrigation engineering and evapotranspiration and related topics. He operates numerous large-scale research projects that are designed to advance scientific understanding of various processes related to soil and water resources engineering, evapotranspiration, agriculture, climate, and the interactions among these categories. Irmak's programs have been instrumental in educating citizens and enhancing the scientific literacy of producers, crop consultants, state and federal agency personnel, and next-generation scientists and researchers (including post-docs, graduate and undergraduate students), and have contributed to enhancing the efficiency of irrigation and crop production systems.

*Pictured above:* Suat and his family.

As the ASABE Constitution states, Fellows are “of unusual professional distinction, with outstanding and extraordinary qualifications and experience in, or related to, the field of agricultural, food, or biological engineering.” Election to Fellow is one of the highest distinctions an ASABE member can achieve, and *Resource* looks forward to acquainting you with more of ASABE's best and brightest.



**Amy Kaleita, P.E.**, professor and associate chair for teaching, agricultural and biosystems engineering, Iowa State University (ISU), Ames, Iowa, is honored for sustained excellence in education, research, and service.

Throughout her career, Kaleita has been devoted to providing high quality education to young engineers and to creating a robust research program. Kaleita teaches courses in soil and water conservation management and engineering and analytical techniques for data and modeling. Kaleita also conducts research on information technology for precision conservation, remote sensing, hydrologic modeling, precision farming, and advanced analytical methods for understanding the influence of spatiotemporally variable soil and hydrologic properties. Kaleita leads a collaborative research program with more than \$7 million in external support and has received over \$4 million in external support for educational programs. Kaleita has also participated in a variety of outreach activities, including serving as chair of the ISU College of Engineering Honors Program committee. While chair of this committee, she led an initiative to overhaul the Engineering Honors plan of study. Kaleita was a member and leader of the departmental engineering curriculum committee and led ABET self-studies and accreditation site visits.

*Pictured above:* Amy and her family.

## VisualChallenge10

# CLEAR VIEW

## IMAGES OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

Each year, *Resource* asks ASABE members and their colleagues to communicate with images—statements without words—to celebrate the visual aspects of agricultural and biological engineering. After the call went out for submissions for *VisualChallenge10*, we were excited about what we would see. Beginning 2021 with a clear view, we are excited to showcase a smattering of the entries that we received for our tenth year.

We thank our many contributors who focused in on the profession—finding beauty and meaning. Their work comes to life in these images, showing those outside the field: “This is what we do.”

While the selection process was inevitably subjective, we hope these photos provide a glimpse into the variety of activities, workplaces, and surprises that an ABE career can offer. As your view clears in 2021, remember to pull out your camera or phone and take a shot for next year’s visual challenge!



ASABE member **Gayle Baker, P.E.**, *Agricultural Services Engineer, Maurer-Stutz, Peoria, Illinois, USA.*

### JOB WELL DONE

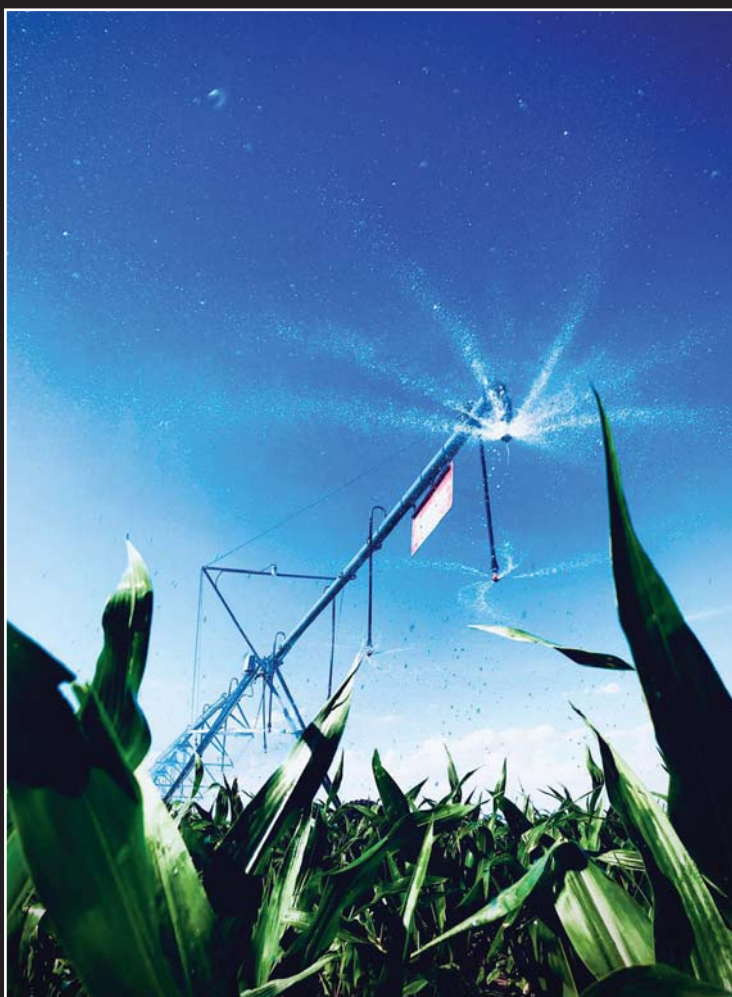
*These 40-year-old clay tile pieces have been retired after being removed from the system and replaced with corrugated plastic tubing (CPT).*



**ASABE member Shane Williams,**  
*Design Engineer, Kuhn North America,  
Madison, Wisconsin, USA.*

### WATCHFUL EYES

*It is said that the customer is always right.  
On a dairy farm, sometimes that 'right' is  
behind you.*



**Meetpal Kukal,**  
*Post-Doctoral Research Associate,  
Biological Systems Engineering Department,  
University of Nebraska,  
Lincoln, USA.*

### ENGINEERING RAIN

*This semi-arid corn field in Paxton, Nebraska, sums  
up how the innovations of engineers, soil scientists,  
and plant physiologists have resulted in the most  
widespread irrigation innovation in the U.S.  
The center-pivot technology is rain, but better.*



**Ehsan Bagheri**, *Ph.D. Student and Research Assistant,  
Dr. Mohamed Youssef's Water Management Research Group,  
Department of Biological and Agricultural Engineering,  
North Carolina State University, Raleigh, USA.*

### CAUGHT IN THE CORN

*The in-field monitoring unit of the real-time water management system measures field water table depth and precipitation. It transmits data to the control unit of the system that automatically manages drainage and subirrigation at the field edge.*







**ASABE Member Paula Steiner,**  
*Engineer, USDA-NRCS,  
Mason, Michigan, USA.*

**SWEET!**

*Last fall ASABE's Michigan Section  
participated in a socially distanced event at a  
sugar beet harvest near Bay City, Michigan.*



**ASABE member Paul Funk**, *Agricultural Engineer, Southwest Cotton Ginning Research Lab, USDA, Mesilla Park, New Mexico, USA.*

### **KNIT ONE, PURL TWO**

*This research knitting machine at Cotton Incorporated, in Cary, North Carolina, serves the textile industry as well as the educational and research needs of NC State students and faculty.*

**ASABE member  
Gerald Rehkgler, P.E.,**  
*Professor Emeritus, Cornell University,  
Cortland, New York, USA.*

### **TIME TAKES ITS TOLL**

*I grew up on this farm, which is located on Pre-emption Road in Wayne County, New York. The farm was in my family from 1854 to 1974. As a boy, 75 years ago, I fed and milked cows in this barn. My great-grandfather built the barn, and my dad and I put the aluminum roof on. The roof seems to be the only thing that lasted.*





**ASABE member John Lumkes, P.E.,**  
*Professor, Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, Indiana, USA.*

### AGTOURISM

*Corn mazes have become popular agricultural tourism mainstays, and this year, Exploration Acres near Purdue chose a timely message of "United We Stand" (the maze commemorates Iwo Jima 75 years ago, but the general message of "United We Stand" is very relevant today).*

**ASABE member John Lumkes, P.E.,**  
*Professor, Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, Indiana, USA.*

### READY FOR TAKE OFF

*This airplane is going to spray the fields. The low pressure zone created by the spinning propeller produces swirling vapor trails (sudden temperature drop brings the air temperature below the dewpoint).*



**ASABE member A.J. Both,** *Professor, Rutgers University, Department of Environmental Sciences, New Brunswick, New Jersey, USA.*

### BLUEBERRY HILL

*Blueberries are considered a superfood because they are low in calories and high in antioxidants and several key nutrients. They are grown across the Eastern U.S. and Southern Canada and in California.*

## SUNRISE

*Icicles on a center pivot irrigation system on a turf farm near Constantine, Michigan. There had been a freeze the previous night, and the center pivot had been running, whether on purpose or by oversight is unknown. Turf farming is an intensive method of agriculture that produces sod for commercial and residential use. Turf plays a vital role in erosion control.*



**ASABE member  
Brian McLaughlin,**  
*2015 AE50 Winner,  
Safety Psychographics LLC,  
Notre Dame, Indiana, USA.*

## SUNSET

*The Andersons White Pigeon Facility, near White Pigeon, Michigan, provides farmers in southwest Michigan and northern Indiana with an outlet to the booming export markets in Europe and the former Soviet Union. Today, the focus is primarily the domestic feed market, shipping corn and soybeans to processors throughout the eastern U.S. The total storage capacity is more than two million bushels.*





Photo credit **Moyosore Ogunsina**.

Submitted by **ASABE member Babatunde Ogunsina**, Head, Agricultural and Environmental Engineering Department, Obafemi Awolowo University, Ile Ife, Nigeria

## GREENHOUSE FARMING IN AFRICA

Preparations for greenhouse-grown tomatoes at the peak of the rainy season (October 2020) at the Obafemi Awolowo University Teaching and Research Farm in Ile Ife, Nigeria. Greenhouse agriculture is just trending in most African suburbs, occasioned by climate change adaptation. Greenhouse cultivation of tomatoes ensures year-round harvest. Here, tomato seedlings are almost ready for transplanting.

**ASABE member A.J. Both**,  
Professor, Rutgers University,  
Department of Environmental Sciences,  
New Brunswick, New Jersey, USA.

## BRIGHT IDEA

More and more LED lighting systems are being installed by greenhouse growers. Because plants respond well to blue and red light, the resulting magenta color is a common characteristic.



**ASABE member Paul Funk**, Agricultural Engineer, Southwest Cotton Ginning Research Lab, USDA, Mesilla Park, New Mexico, USA.

## PILES OF COTTON

USDA-ARS Supervisor Tye Lightfoot explains the cotton ginning process to an agriculture class from New Mexico State University at the Southwestern Cotton Ginning Research Laboratory.



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# Seek Diversity of Experience

Arthur Johnson, P.E.

**F**or problem-solving, the diversity that matters most is experiential, because diversity of experience leads to diversity of thought. Too often, when diversity in academic programs is discussed, what's mentioned most is diversity of skin color, because skin color and experiential diversity are often strongly correlated. However, for some of the most selective academic institutions, the skin color and experiential backgrounds of student applicants are not strongly correlated.

For example, applicants to the University of Maryland, no matter what their skin color, all have supportive families, computer expertise, e-mail addresses, and similarly outstanding high school records. If their skin color were not known, there would be little to distinguish one applicant from another.

As a result, when these highly qualified students attend classes, they don't bring the desired experiential diversity to enrich the class discussions and design projects. Real experiential diversity can lead design groups to consider ideas different from those that have been tried before. This happened in my classes when I teamed up students from dissimilar backgrounds.

Studies have shown that diversity promotes hard work, creativity, and consideration of more alternatives than would be the case in a more homogeneous environment. Diversity exposes students to viewpoints that they otherwise would not encounter. True diversity in the classroom, when accepted without bias, promotes an atmosphere of openness, where anyone can ask any question or contribute any idea, no matter how weird it might seem to those with other experiences.

My cohort of graduate students typically included students that nobody else in the department would accept. That was a conscious decision on my part. I wanted wanderers, people with new ideas and different ways of looking at things. We already had plenty of goal-oriented grad students to keep us all on track. The added diversity of my cohort paid off in increased productivity for everyone.

There's an old story about a problem that arose soon after a new skyscraper opened in New York City. The people who worked on the upper floors were unhappy because the elevator capacity was not enough to handle the surge of passengers at quitting time. The people on the upper floors had to wait while the elevators shuttled back and forth to the ground floor. What could be done? There was no way to make the elevators go faster, nor was it possible to add more elevators at this stage of the building's development.

The solution was to install mirrors in the corridors where people waited for the elevators, so they could check their appearance when they left for the evening. With the distraction of the mirrors, the people on the upper floors didn't mind waiting for the elevators. Problem solved, and at minimal cost! This simple solution happened because someone looked at the problem in a completely new and unexpected way.

**ASABE Fellow Arthur Johnson, P.E.**, Professor Emeritus, Fischell Department of Bioengineering, University of Maryland, College Park, artjohns@umd.edu.

This essay has been distilled from <https://pulse.embs.org/september-2015/it-is-diversity-of-experience-that-counts/>

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