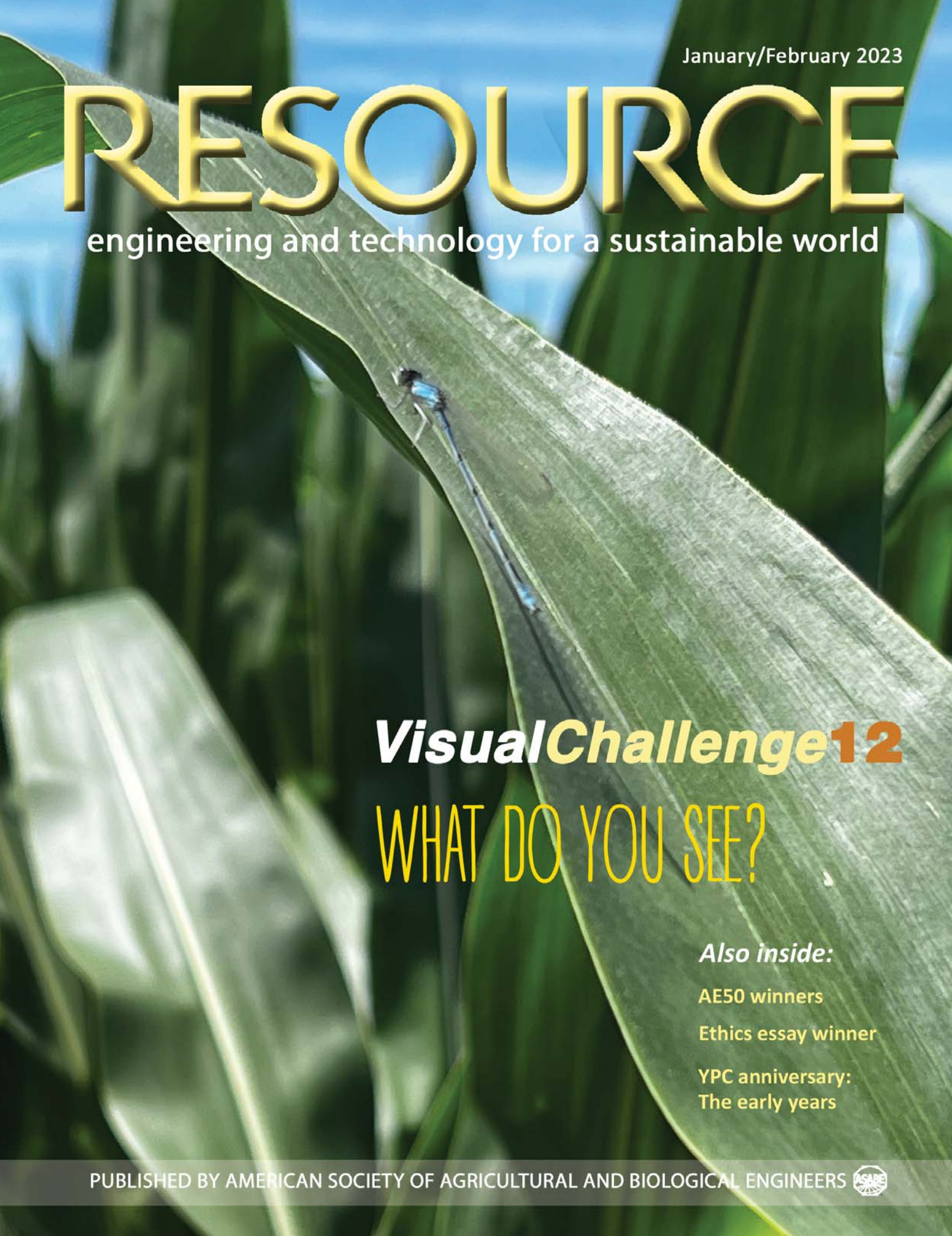
January/February 2023

RESOURCE

engineering and technology for a sustainable world



VisualChallenge12

WHAT DO YOU SEE?

Also inside:

AE50 winners

Ethics essay winner

YPC anniversary: The early years

PUBLISHED BY AMERICAN SOCIETY OF AGRICULTURAL AND BIOLOGICAL ENGINEERS

Looking forward to a busy year

This past fall was a busy season. I met and talked with many friends, students, and colleagues at a variety of events, including the Michigan Section meeting in St. Johns, Michigan, Tri-State Section meeting at NC State in Raleigh, North Carolina, the fall meeting of the ASABE Board of Trustees in Chicago, Illinois, the annual meeting of the Association of Equipment Manufacturers (AEM) in San Francisco, California, the AgEng-Land.Technik 2022 conference in Berlin, Germany (www.eurageng.eu and www.vdi.de/meg), and the Black Gold Farms annual Connect meeting in Grand Forks, North Dakota.

All of these events were firsts since emerging from Covid, and each event had extraordinary energy and excitement. I am delighted that I was greeted with excitement and that ASABE is highly regarded everywhere I traveled. Each one felt like a family reunion, like other events and especially our Annual International Meeting. Discussions were all lively and every meeting resulted in abundant plans for positive action.

Here are some of the strategic actions announced and approved at our fall Board of Trustees (BOT) meeting. First, the BOT approved the creation of a new journal, to be titled *Journal of Natural Resources and Agricultural Ecosystems* (or JNRAE for short). Second, ASABE has undergone evaluation by the Standards Council of Canada, and we are in line to become an accredited standards developer in Canada. Finally, the BOT approved continued support for the development of a Strategy Council. That last point is a big deal.

The Strategy Council is a new concept for ASABE. For decades, ASABE's hierarchical structure has been based upon four pillars: Membership, Standards, Publications, and Meetings. The need for a Strategy Council is a result of our desire to propagate multi-disciplinary innovations with stakeholders inside and outside of ASABE, as well as cut across and include our diverse membership and technical committees.

The main driver of this concept is the Circular Bioeconomy Systems (CBS) initiative (an update on this initiative is included in this issue). The Strategy Council will provide a space for and encourage ASABE members to propose and develop new ideas just as the CBS has developed. Be on the lookout for your opportunity to become further informed and provide feedback regarding the Strategy Council concept with the newly formed BOT task force led by **ASABE Past President Paul Heinemann.**

Speaking of this issue of *Resource,* be sure to check out this year's AE50 award winners, which represent the best recent innovations in our profession and exemplify how we contribute to efficiency, sustainability, and stewardship. Also featured in this issue are the winners of the annual Visual Challenge, which complement the AE50 awards. Together, these two features illustrate the essential work that we do.

That essential work—providing engineering and technology solutions to ensure a healthy environment and a sustainable world with ample food, water, fiber, and energy—brings us together as a family that cares for each other and for communities across the globe. As I recall our recent meetings and events, I'm reminded how grateful I am for your contributions to our Society and to the profession of agricultural and biological engineering. Thank you!

I wish you a happy and productive new year. I look forward to hearing your "I wouldn't be me without ASABE" stories in 2023. #ASABE story

Keith Tinsey
tinsey.keith@gmail.com

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.

2023

Jan. 8-13 **Soil Erosion Research under a Changing Climate.** Aguadilla, Puerto Rico.

Feb. 12-14 **Agricultural Equipment Technology Conference.** Fresno, Calif., USA.

July 9-12 **ASABE Annual International Meeting.** Omaha, Neb., USA.

Oct. 23-27 **The 2nd Global Evapotranspiration Symposium: Advances, Challenges, and Future Needs in Measurements, Modeling, and Applications.** University Park, Pa., USA.

2024

July 28-31 **ASABE Annual International Meeting.** Anaheim, Calif., USA.

2025

July 13-16 **ASABE Annual International Meeting.** Toronto, Ont., Canada.

January/February 2023
Vol. 30 No. 1
www.asabe.org/Resource

Resource: engineering and technology for a sustainable world (ISSN 1076-3333) (USPS 009-560) is published six times per year—January/February, March/April, May/June, July/August, September/October, November/December—by the American Society of Agricultural and Biological Engineers (ASABE), 2950 Niles Road, St. Joseph, MI 49085-9659, USA.

POSTMASTER: Send address changes to *Resource,* 2950 Niles Road, St. Joseph, MI 49085-9659, USA. Periodical postage is paid at St. Joseph, MI, USA, and additional post offices.

ADVERTISING: www.asabe.org/advertise.

SUBSCRIPTIONS: Contact ASABE order department, 269-932-7004.

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

ON THE COVER:
What do you see? Corn plants or a dragonfly? **ASABE member Gayle Baker, P.E.,** snapped this shot in Delaware. Find our other *VisualChallenge*12 entries beginning on page 22.

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RESOURCE

engineering and technology for a sustainable world

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FEATURES

DEPARTMENTS

Celebrating the Winners

Resource magazine has once again sponsored the AE50 Award program, celebrating companies for their recent developments in agricultural, food, and biological systems. From the many entries submitted in 2022, 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!

1tRIPr® II Row Unit

Orthman Manufacturing Inc.
Lexington, Nebraska, USA
orthman.com

The 1tRIPr® II builds on the original design while improving significant aspects of the row unit, including greaseless pin and polymer bushings, redefined machine adjustment, agronomic improvements, and ground-engaging tooling. The patented subsoil point on the shank rolls soil under the ground to eliminate voids that inhibit root growth while preparing a firm, uniform seedbed necessary for the use of high-speed planters. The entire row unit has been created using ductile cast iron, with the end user and ease of adjustment as the primary focus. Handles have been added to all adjustment shanks, vertical adjustments are simplified with one operation to adjust height, and a floating row cleaner keeps residue uniformly out of the strip.

2023 Guardian Front Boom Sprayer with PLM Intelligence

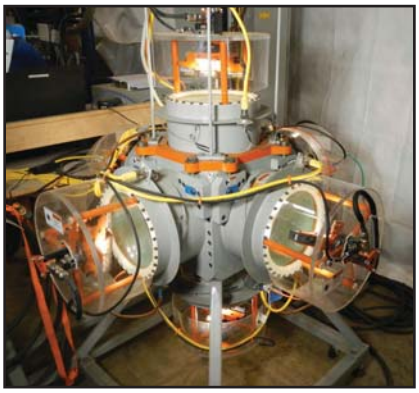
CNH Industrial-New Holland Agriculture
St. Nazianz, Wisconsin, USA
newholland.com

The 2023 Guardian Sprayer features overhauled electronic controls and offboard connectivity. Upgrades include liquid management system controls in the cab and fill station, a specifically featured armrest with multiple sprayer functions, and full integration to the Precision Land Management (PLM) intelligence infrastructure offered by New Holland PLM connect systems and Raven Slingshot offboard interfaces. The liquid management system improvements include a large, easy-to-use display at the fill station with new features including auto-fill, auto-sparge, and a suite of auto-rinsing functions. When paired with the new Intelliview 12 sprayer display and armrest in the cab, the operator has complete control of the sprayer. The PLM intelligence addition remotely provides all of the diagnostics and service information along with agronomic data to phone, tablet, or home office.

360 RAIN Irrigation Machine

360 Yield Center
Morton, Illinois, USA
360yieldcenter.com

The 360 RAIN is a three-wheeled robotic irrigation machine. It can traverse crops with up to 3,000 feet of hose tethered to a liquid source while applying water, nutrients, and manure. Bands of liquid are delivered directly to the bases of the plants, where it can be used quickly and efficiently. With a low flow rate requirement and agile machine positioning, the 360 RAIN excels in fringe water areas and uniquely shaped fields. RTK guidance and cellular communication provide control, coverage, and rate instructions remotely at speeds up to 0.45 mph. More than 2 million gallons of water, nutrients, and manure can be applied each week at rates up to 215 gpm. Strong yield responses, better utilization of manure, and reduced application costs benefit producers with livestock manure.



3-D Biomass Cubical Triaxial Tester

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

Forest Concepts has designed and built a true 3D cubical triaxial tester (CTT) that measures the relationships between applied stress on a bulk biomass sample and the resulting strain displayed. The data generated by the biomass-scale CTT are used to examine the initiation and flow of bulk solid-form biomass as it moves through a hopper, auger, or screw feeder. The CTT identifies the characteristics of the local supply of biomass that are necessary to ensure continuous flowability of bulk biomass and prevent plugging and downtime at a facility.

800R Floater

John Deere
Ankeny, Iowa, USA
deere.com

With a brand-new cab, common hydraulic pumps for faster conversion time, and an expanded application system, the 800R Floater from John Deere is versatile, convenient, and comfortable. The 800R cab update features an improved interior, providing maximized operator comfort. The updates include a massaging and temperature-controlled seat that swivels, easy-to-use common display interfaces, a built-in refrigerator, Bluetooth and Apple CarPlay™, reduced noise level, and footrests. Additional updates include increased on-vehicle storage, common hydraulic implement pumps, updated LED lighting, powered mirrors, rearview camera harnessing, G4 edge spreading technology from New Leader Manufacturing, and the high-performance lime box option from New Leader Manufacturing that enables applying at higher rates with speeds up to 25 mph.

AP-6010 Pit Level Monitor for Swine Facilities

AGCO Grain & Protein
Duluth, Georgia, USA
automatedproduction.com

The AP-6010 Pit Level Monitor uses electronic pressure transducers to measure the depth of effluent in the manure pits below swine confinement facilities. This innovation gives facility operators more accurate information for manure pit management, such as early warnings of water leakage and remaining storage capacity. The monitor uses a hollow tube extending down to the bottom of the pit and senses the pressure at the end of the tube that is produced by the weight of the effluent. The hollow tube extends above the pit at the floor where animals may be present. To prevent damage from the animals, the section of the tube above the floor is protected in a 3-inch square steel enclosure that is 4 feet tall. The control unit displays the effluent depth in inches, feet, or centimeters.

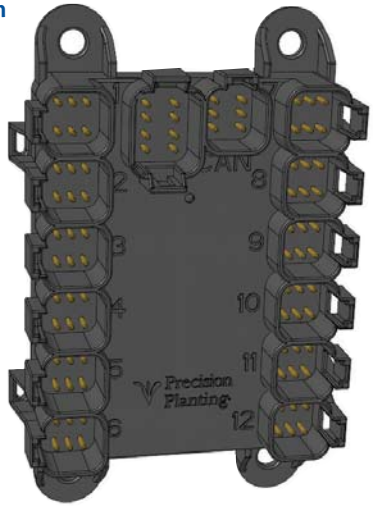
AST62D Eight Wheel Steering Combine Head Hauler® Trailer

Duo Lift Manufacturing Company, Inc.
Columbus, Nebraska, USA
duolift.com

The AST62D Eight Wheel Steering Combine Head Hauler® Trailer is the only four-axle, fully steerable combine head trailer in North America for carrying 60-foot flex draper combine heads or 24-row, 30-inch row spacing combine cornhead. Eight-wheel steering allows this 68-foot long trailer to be very maneuverable. Duo Lift Manufacturing launched six-wheel steering combine head trailers in 2019 and eight-wheel steering combine header trailers in 2022. The AST62D uses the proven components of the six-wheel steering system with an additional steerable axle for a total of four steerable axles and eight tires to carry heavyweight combine heads.

Blockage Expansion Module

Precision Planting
Tremont, Illinois, USA
precisionplanting.com



The Blockage Expansion Module (BXM) is a new blockage monitoring component for non-singulated crop seeding implements that combines multiple blockage sensors at a single connection point to communicate via a CANBUS network with Precision Planting's 20|20 seed monitoring systems. The BXM simplifies the electronic components on the implement and enables the 20|20 seed monitoring system to present the application data in a more understandable and actionable format. High-speed processing of the application data provides row-by-row distribution metrics that improve the grower's ability to diagnose problems that can occur in the delivery of product from the commodity tank to the application point.

CanTILLeaf™ Spring

McFarlane Ag Manufacturing
Suak City, Wisconsin, USA
mcfarlaneag.com

The CanTILLeaf™ spring is a new design for independently mounting disk blades on a tillage tool. It provides consistent downforce that protects against disk breakage and allows clearance in rocky and sticky soils. Inspired by cantilever and leaf spring concepts, the CanTILLeaf™ design leads to a smooth, level seedbed, ready for the planter. The CanTILLeaf™ spring is new on the Incite®-i 5200 Universal Tillage tool. The original Incite® 5100 Series had a front and rear set of disk gangs, which underperformed in rocky or sticky soils. The 5200 Series has independently mounted disks, which outperform units with gang assemblies in rough conditions.

Case IH 620 Hp Rear Three-Point Hitch

CNH Industrial
Burr Ridge, Illinois, USA
caseih.com

Rated for 620 hp, the Case IH rear three-point hitch on AFS Connect™ Steiger® Series tractors provides full engine power to the hitch, increases the lift capacity by 12.8% over the previous design, and increases the maximum lift height by 3.5%. The lower links are designed to withstand the heaviest side loads from today's implements. A new wear block adjustment has been added to allow the operator to adjust the lateral sway of the hitch. Precise adjustment provides accurate tractor/implement control with high accuracy auto-guidance systems. CAT 3 compatible, the hitch includes a robust one-piece cast CAT 4N quick hitch, which adds strength for the largest implements.

Case IH Early Riser® 2150S Front-Fold Split-Row Planter

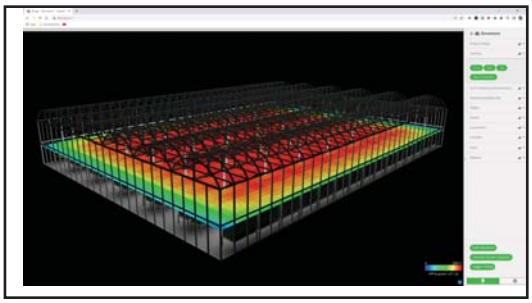
Case IH
Racine, Wisconsin, USA
caseih.com

The Early Riser® 2150S Front-Fold Split-Row Planter offers a 50-inch split-row offset (front to back) design, maximizing residue flow and minimizing residue plugging. A combination of 16-inch total row unit travel, 30-degree total wing flex, in-cab adjustable hydraulic wing downforce, patent-pending in-cab adjustable hydraulic rear sub-frame downforce, and automated hydraulic downforce per row unit result in accurate ground-following, seed placement, and seed depth in challenging field topography. The 525-gallon liquid fertilizer capacity, 100-bushel seed capacity, and 10 mph high-speed planting capability maximize in-field productivity (for a 30- to 40-foot Split-Row Planter with carrying wheels between the rows). A rear camera and individual seed tank scale options increase productivity and safety. Nearly all settings can be made from the cab, including tool-less conversion from 15- to 30-inch row spacing.

CCpilot V1x00 Display Computer

CrossControl AB
Västerås, Sweden
crosscontrol.com

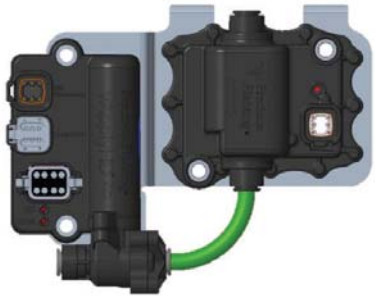
The CCpilot V1x00 ARM-based display computer, available in 10- and 12-inch sizes, uses an i.MX8X application processor with four ARM Cortex A72 cores. Compared to earlier display products based on i.MX6 or similar application processors with ARM Cortex A9 cores, graphics performance is improved and boot times can be reduced to less than 5 seconds. The display can be deployed as a multifunctional terminal, running ISOBUS UT and TC, section control, guidance, and video monitoring applications in parallel. The CCpilot V1x00 provides support for integrating an AI accelerator module, enabling advanced object detection applications as part of the functionality set of a display terminal. With an open software platform, system developers can deploy legacy software systems easily or use a prepackaged toolchain based on Qt to develop new applications.



Cerise365+GreenHouseDesigner™

SunTracker Technologies Ltd.
Victoria, British Columbia, Canada
suntrackertech.com

Cerise365+GreenHouseDesigner™ is a software-as-a-service (SaaS) application that enables users to design horticultural lighting systems for greenhouses and vertical farms using only a web browser. No computer-aided drafting (CAD) experience is required because the program automatically generates greenhouse and vertical farm models using a few basic user-specified parameters. The user selects horticultural luminaires from a list of major manufacturers, and the program calculates the photosynthetic photon flux density (PPFD) distribution on a two-foot grid at the plant canopy. The program can also calculate monthly daily light integral (DLI) distributions inside the greenhouse based on geographic location, building orientation, greenhouse roof style, and historical weather records.



EM HD Liquid Fertilizer Controller

Precision Planting
Tremont, Illinois, USA
precisionplanting.com

The EM HD is a liquid fertilizer controller and sensor that uses an electromagnetic flow sensor connected to a control module to provide row-by-row, high-speed liquid fertilizer rate control on row crop planters, side-dress implements, and strip till implements. This upgrade to the vApplyHD® liquid fertilizer control module combines precision control of the valve in the controller with the electromagnetic flow sensor technology of the EM FlowSense. The EM HD uses immediate feedback from the electromagnetic flow sensor to make high-speed changes to the liquid valve control to maintain an accurate and consistent flow of liquid fertilizer to the application point.

Fendt 700 Gen7 Vario® Tractor

AGCO/Fendt
Duluth, Georgia, USA
fendt.com/us

The Fendt 700 Gen7 Vario® tractor has been redesigned to provide operators with the capabilities needed to improve performance, reduce costs, and increase productivity. The 700 Gen7 Vario is versatile and operator-friendly, with five models ranging from 203 to 283 engine horsepower, a standard VarioDrive™ CVT, customizable FendtONE™ operators' station, fuel-efficient AGCO Power™ 7.5 liter engine, Concentric Air System (CAS) cooling fan, and agronomic-boosting features such as the VarioGrip™ Central Tire Inflation System (CTIS). Designed for the needs of North American operators, the 700 Gen7 Vario® tractor is available with a wide array of row-crop compatible tires and an optional 58 gpm hydraulic system to power demanding implements.

Flush Effluent Management System

RealmFive
Lincoln, Nebraska, USA
realmfive.com

RealmFive's Flush Effluent Management System monitors the effluent components of livestock enterprises by tying together the many unconnected parts of those operations. It uses a "system of systems" of interconnected cloud-connected devices and an integrated cloud-based software platform for visualization and alerting of all the components. The non-mobile hardware portion of the Flush Effluent Management System includes monitoring of the lagoon level, deep pit level, slurry tank level, transfer pump, pipeline pressure, and flow. The mobile portion of the system includes pivot position, runtime monitoring, mobile slurry transporters, dragline activity, and run-time monitoring. Each device includes a wireless connection to the cloud. Data from the system can be viewed in RealmFive View software, including visualization of the data over time and alerting.

Geo-Bird® Operational Planning Tool

Fuse® from AGCO
Duluth, Georgia, USA
geo-bird.com

Geo-Bird® is a free and intuitive web application from AGCO's Fuse® brand that leverages advanced logarithms to automatically optimize waylines for multiple fields and implements. Geo-Bird's controlled-traffic farming (CTF) waylines help operators reduce time and cost requirements by optimizing turns, wheel traffic, and headland overlap, reducing fuel usage and CO_2 footprints, and avoiding yield-reducing soil compaction. This application also allows operators to easily contrast Geo-Bird's suggestions with their current waylines in only a few steps, saving them time and money while becoming more sustainable. Geo-Bird supports operators with terminals of different brands, as its waylines are exportable to various terminals for greater ease of use across disparate operations.

Guardian Water Monitoring Device

RealmFive
Lincoln, Nebraska, USA
realmfive.com

Guardian, developed by RealmFive and jointly commercialized by RealmFive and Behlen Country, is a smart system for monitoring remote stock water tanks that includes a cloud-connected device and an integrated cloud-based software platform for visualizations and alerting. The hardware portion of Guardian includes an integrated solar panel for long uninterrupted operation, on-board ranging sensors and data storage, and a wireless connection to the cloud. Guardian was designed for fast installation, as easy as dropping the device into a water tank, and can be moved easily from one tank to another. Guardian intermittently measures the water level in the tank as well as the water temperature. RealmFive View software provides visualization of the data over time, alerts for water level and temperature, as well as freeze warning alerts, based on user settings.

Halo VRT Tillage Tool

Salford Group, Inc.
Salford, Ontario, Canada
salfordgroup.com

Salford's Halo VRT is a variable-intensity tillage tool on a forward-folding, high-speed disk frame. The blade angle hydraulically adjusts from 2 to 15 degrees during operation, allowing operators to respond to varying field conditions in real-time. This tillage tool can achieve different tillage goals, such as a fall residue incorporation and spring seedbed preparation. Independently mounted blades offer performance advantages compared to gang-based tillage tools. The Halo VRT has more clearance, improved obstacle protection for higher operating speeds, greater durability, and improved serviceability. When running at lower blade angles, the Halo VRT minimizes fuel costs and emissions by requiring lower horsepower. The operator can also increase the blade angle to perform more intense tillage operations. Road transport is safer and easier with the VRT's forward-folding, narrow transport frame.

Integrated Baler Control for T7 Tractors

New Holland
Basildon, United Kingdom
newholland.com

The Integrated Baler Control for New Holland T7 Series tractors is designed to improve operator comfort and increase efficiency when operating a large square baler. Driver comfort and baler output are undermined by the cyclical forces exerted by the baler on the tractor chassis. The forces from the compression stroke act on the tractor's drawbar, which compresses and extends the tractor suspension with every baler cycle. The compression of the crop creates a load spike, resulting in momentary dips in engine speed, which impacts forward speed and is felt by the driver, and in PTO speed, which reduces output. The integrated control logic actively controls the tractor suspension and engine governor to minimize the impact of these cyclical loads. Cab movement is reduced by 15%, variation in engine speed is reduced by 26%, and fuel consumption is reduced by up to 12%.

IRROcloud® IC-10 Sensor Monitor

Irrometer Company Inc.
Riverside, California, USA
irrometer.com

The IRROcloud® IC-10 Sensor Monitor is an affordable cellular device that automatically transmits field sensor readings to the cloud for viewing on any web-enabled device. Low-power cellular LTE-M or NB-IoT direct-to-cloud connectivity enables longer battery life with four standard C alkaline batteries. The IC-10 can be installed anywhere, with no height or solar panel requirements. The IRROcloud® dashboard provides real-time and historical data for precise irrigation scheduling and includes device status indicators, location maps, and a quick-reference sensor display with adjustable thresholds. The full-featured graph and reporting suite supports detailed analysis of soil moisture, air and soil temperatures, rainfall, irrigation events, and text message alerts for frost monitoring. The data can be delivered through an API for display on web-enabled platforms from other companies or industries.

Iyris Heat-Blocking Greenhouse Roof

RedSea
Tucson, Arizona, USA
redsea.ag

The Iyris Heat-Blocking Greenhouse Roof includes a proprietary near-infrared (NIR) absorbing, transparent nanomaterial to prevent overheating in greenhouses. The roof absorbs solar radiation in the NIR range while allowing photosynthetically active radiation (PAR) to pass through. The benefits of this roof are particularly noticeable in hot climates, where significant water and energy are used to cool greenhouses and remove the heat gain caused by solar radiation. In such climates, where shading is necessary to mitigate excess heat, the selective heat blocking benefits the crop by increasing light quantity via a higher daylight integral (DLI) while simultaneously reducing the operating costs for the grower.

John Deere eAutoPowr™/ Electric Variable Transmission (EVT)

John Deere
Waterloo, Iowa, USA
deere.com

The eAutoPowr™/Electric Variable Transmission (EVT) for John Deere 8 Series tractors is an innovative, electro-mechanical, split path, infinitely variable transmission. Leveraging years of field experience from Deere's construction division, the EVT delivers efficiency, controllability, increased comfort, new diagnostic capabilities, and maximum reliability by using solid-state power electronics and brushless electric machines. The EVT replaces conventional hydro-modules with an electro-mechanical module that provides up to 100 kW of offboard electrical power for traction axles, and in the future pumps, fans, conveyors, and seed metering drives. This enables new levels of precision, automation, efficiency, productivity, and sustainability. The EVT is offered on 8R, 8RX, and 8RT tractors at 410 rated and 443 peak power.

LB2200 Series Large Square Baler

Hesston by Massey Ferguson®
Duluth, Georgia, USA
masseyferguson.com

The Hesston by Massey Ferguson® LB2200 Series large square baler combines the mechanical design and reliability of previous models with cutting-edge technology advancements. This baler features a new pickup design that has five full-length tine bars with poly wrappers to improve baler feeding and component reliability, while also reducing noise from the pickup. New axle and tire offerings with a single-bogie suspension setup increase ground clearance and result in a smoother ride in the field and on the road. Re-engineered electronics and controls that incorporate common electric architecture (CEA) provide greater information and control via an ISOBUS terminal of components, including tractor implement management (TIM), the baler, bale ejection, and bale chute folding.

Minotaur DL550 Compact Dozer Loader

Case Construction
Wichita, Kansas, USA
casece.com

The Minotaur DL550 compact dozer loader features a chassis-integrated C-frame and six-way blade, a heavy-duty bucket with 1.25 cubic yard capacity, and compatibility with hundreds of attachments for job site versatility. The integrated C-frame is a significant advance compared to previous "attachment-style" dozer blades, providing increased performance, longevity, and controllability while retaining the ability for quick detachment from the machine. With the blade removed, the Minotaur DL550 provides a loading capability that meets or exceeds any large compact track loader. Combined with a vehicle control system that can be configured for both dozing and loading applications, the Minotaur DL550 is a unique two-in-one tool that serves as a small bulldozer and a track loader in a variety of agricultural and construction applications.

Ops Tracking

RealmFive
Lincoln, Nebraska, USA
realmfive.com

Ops Tracking is a patented "system of systems" that connects mobile data streams to stationary data streams across agriculture. Ops Tracking consists of a scalable network of wireless and wired devices, cloud database networks, and powerful back-end software that enables combinations of data to achieve automated pairing of data streams and operating metrics. RealmFive Fleet hardware can be easily retrofitted to any brand of mobile equipment as diverse as trucks, mobile tanks, and harvesters. Smart devices actively collect geospatial and activity data from the installed equipment, sending the data to the cloud. Powerful cloud capabilities enable automated pairing of the collected data to deliver reliable matched order-of-operations records. Ops Tracking is an innovative and powerful solution for complex enterprises needing a brand-agnostic solution to digitize their operations to gain labor-saving and productivity savings.

Pro-Belt™ Series Variable Chamber Round Balers

New Holland Agriculture and Case IH Agriculture
Lancaster, Pennsylvania, USA
agriculture.newholland.com

The Pro-Belt™ Series variable-chamber round balers deliver the performance and durability that baling contractors and other high-use operations demand. The ActiveDrop™ rotor drop floor sensors provide valuable crop flow information, alerting the operator when the load is approaching maximum capacity. This system allows the operator to adjust the baling speed, thereby avoiding a potential rotor plug, and increases overall productivity. Additionally, monitoring the position of the drop floor and the knife bank pressure give the operator valuable information on rotor cutter knife engagement, helping to ensure optimal cut quality.

Radicle Agronomics

Precision Planting
Tremont, Illinois, USA
precisionplanting.com

Radicle Agronomics is a suite of tools that enable professional agronomists to focus their time on the agronomic issues faced by growers. Radicle Lab is a fully automated soil laboratory. Workflow is simplified by its small footprint, self-calibration technology, and ability to run hundreds of samples unattended. GeoPress mounts on any field-ready vehicle and automatically blends and stores soil samples in geo-referenced, reusable containers. The full containers are returned to Radicle Lab where they are loaded into the system, associated with their field locations, and analyzed for soil nutrients. Data flows seamlessly between GeoPress and Radicle Lab. To complete the suite, a cloud-based software package connects all steps of the field-to-lab process so agronomists can deliver superior nutrient management recommendations to their clients.

ReClaim Sprayer Boom Recirculation System

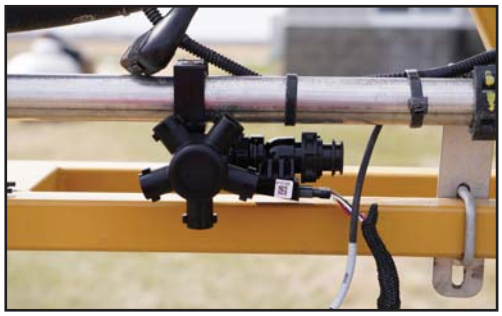
Precision Planting
Tremont, Illinois, USA
precisionplanting.com

ReClaim enables sprayer boom recirculation for improved product agitation, faster boom priming, and improved boom clean-out, reducing the amount of product that is wasted on the ground. ReClaim provides a return path by replacing the nozzle bar end caps and sending the product back to the tank for agitation. This eliminates the dead end zones in conventional booms, where chemicals can become concentrated and settle out of solution. ReClaim also eliminates chemical buildup in the boom, which can cause crop damage due to misapplication, and decreases nozzle tip plugging. ReClaim primes empty booms by circulating product through the boom and pushing the product back to the tank. ReClaim also improves sprayer clean-out by using compressed air to push product through the boom and back to the tank, where it can be drained and disposed of properly.

Recon SpraySense™

Intelligent Ag™
Duluth, Georgia, USA
intelligentag.com

Recon SpraySense™ is a retrofit product for agricultural sprayers that monitors the spray quality at every nozzle tip. The system measures the pressure and flow at each nozzle and determines how accurately these spray properties match the target coverage and rate. Recon SpraySense™ uses GPS to determine machine speed and includes a database of nozzles from all major manufacturers to infer droplet size. The performance of each nozzle is presented to the grower. The information is also condensed into a spray quality score that indicates the overall application precision. This information is provided through an iPad app. Recon SpraySense™ is a turn-key solution for providing state-of-the-art technology on both old and new sprayers.



S5 Pressure-Compensating Heavywall Dripline

Rain Bird Corporation
Azusa, California, USA
rainbird.com/agriculture

The "S" in the S5 Pressure-Compensating Heavywall Dripline stands for "smart spacing" because it allows growers to water plants only where needed. Growers can specify repeating patterns of variable emitter spacing to deliver water directly to the plants and not to the areas between plants. For example, a grower can specify 24-inch spacing between the first three emitters, followed by a 48-inch space, and then repeat the pattern. In this example, an emitter is placed 24 inches before and after a tree trunk, with a third emitter at the base of the tree, followed by a 48-inch gap to the next set of emitters. The S5 dripline features Rain Bird's Agricultural GritX™ self-flushing emitters that consistently deliver precise flow rates.

See & Spray™ Ultimate

John Deere
Ankeny, Iowa, USA
deere.com

See & Spray™ Ultimate allows John Deere self-propelled sprayers to use boom-mounted cameras to identify weeds in the field and spray only the areas with weeds. With this technology, operators can save money on chemicals, collect additional production data, and control weeds while reducing environmental impacts. To enable this technology, Deere developed the See & Spray™ components, including proprietary multispectral cameras, ruggedized super-computers, and deep-learning models for corn, cotton, and soybeans. To enable precision, the sprayer has a new control system and a carbon truss boom. The chemical management system allows two chemicals to be sprayed at once. See & Spray™ Ultimate also collects detailed plant-level data that is available in the cab and off-board.

Smart Sites for Ag Retail

RealmFive
Lincoln, Nebraska, USA
realmfive.com

Smart Sites for Ag Retail is a "system of systems" that connects the data streams for various operations across typical ag retail sites. Smart Sites consists of a scalable network of wireless and wired devices, cloud database networks, and powerful back-end software that enables combinations of data to provide site-level and enterprise-level visibility of typical inventories, such as UAN and NH3 fertilizer, grain, and mobile rolling stock. RealmFive Fleet hardware can be easily retrofitted to any brand of mobile equipment as diverse as trucks, mobile tanks, and harvesters. These smart devices actively collect applicable data from the installed equipment, wirelessly sending the collected data to the cloud. Powerful cloud capabilities enable visibility of that data in RealmFive's Inventory View. Smart Sites enables better visibility and increased operating efficiency across complex organizations.

TC80 Rock Picker

TerraClear Inc.
Grangeville, Idaho, USA
terraclear.com

TerraClear's TC80 Rock Picker is a versatile solution that enables highly efficient and precise rock picking with minimal soil disruption. It delivers a new way to pick rocks, capable of operating in a wide range of field conditions, and is compatible with most tractors, skid steers, and CTLs. Operators who use the TC80 can easily pick their most problematic rocks, which can range in size from 4 inches all the way up to large 26-inch rocks. The TC80 also picks buried and flat rocks. With easy-to-use controls and an incredible picking rate of 400+ rocks per hour, the TC80 Rock Picker is efficient and speedy.

Rock Map

TerraClear Inc.
Grangeville, Idaho, USA
terraclear.com

TerraClear's drone-derived Rock Map locates frustrating rocks in a field before they become a problem. It shows the size and location of each rock, allowing prioritization of what needs to be picked. Delivered via an app available on Android and iOS, operators can filter the rocks by size and be guided to each rock using GPS on a phone or tablet. As the operator picks each rock, the app records it as picked, giving farm managers the ability to delegate rocking picking and verify that the job is done.

TM100 Tractor Mount

MacDon Industries
Winnipeg, Manitoba, Canada
macdon.com

MacDon's windrowing solutions, including the D Series headers and the TM100 Tractor Mount, help widen the harvest window and give operators more options to manage risk. With swathing comes great harvesting benefits, including quicker harvest times, fully organic harvesting, a shorter harvest season, an alternative to natural drying or desiccation, and even crop ripening. The TM100 allows mounting of any MacDon D1 Series draper header to all major brand tractors via the three-point hitch system, providing convenient and innovative harvesting performance. This versatility allows users to repurpose the header for direct head combining.

TRU-aPLYr Dry™

Orthman Manufacturing Inc.
Lexington, Nebraska, USA
orthman.com

The Orthman TRU-aPLYr Dry™ is an all-electric bulk granular fertilizer delivery and metering system. This dual-product, four-section metering system is driven by eight DC electric motors. Innovative software allows individual section calibration and active monitoring of section performance. The technology reduces input costs by applying dual products accurately and more consistently across the implement width, while the hydraulic drives have improved response time to reach the required application rate. The individual section calibration and improved response time allow the user to adapt application rates more accurately compared to current hydraulic versions. A further benefit is four times the rate resolution across the application width, compared to other market offerings.

WR Series Windrowers

Hesston by Massey Ferguson®
Duluth, Georgia, USA
masseyferguson.com

The Hesston by Massey Ferguson® WR Series windrowers include three models with up to 282 peak horsepower and a new closed-center hydraulic system for improved fuel efficiency and increased available header horsepower. This innovation eliminates the need to add a secondary pump for auxiliary functions such as a TWA or a biomass auger. The WR Series includes an array of technologies to improve field efficiency, reduce operator stress, and allow real-time tracking and data management. The factory-standard MF Guide allows the operator to autosteer at speeds up to 18 mph in the field with laser-straight accuracy to minimize pass-to-pass overlap. For high-speed road transport, the optional rear steer allows the operator to easily and safely control the machine at 24.5 mph.

INDEX OF WINNERS BY COMPANY

360 RAIN Irrigation Machine
360 Yield Center

AGCO/Fendt
Fendt 700 Gen7 Vario® Tractor

AGCO Grain & Protein
AP-6010 Pit Level Monitor for Swine Facilities

Case Construction
Minotaur DL550 Compact Dozer Loader

Case IH
Case IH Early Riser® 2150S Front-Fold Split-Row Planter

CNH Industrial
Case IH 620 Hp Rear Three-Point Hitch

CNH Industrial-New Holland Agriculture
2023 Guardian Front Boom Sprayer with PLM Intelligence

CrossControl AB
CCpilot V1x00 Display Computer

Duo Lift Manufacturing Company, Inc.
AST62D Eight Wheel Steering Combine Head Hauler® Trailer

Forest Concepts, LLC
3-D Biomass Cubical Triaxial Tester

Fuse® from AGCO
Geo-Bird® Operational Planning Tool

Hesston by Massey Ferguson®
LB2200 Series Large Square Baler
WR Series Windrowers

Intelligent Ag™
Recon SpraySense™

Irrometer Company Inc.
IRROcloud® IC-10 Sensor Monitor

John Deere
800R Floater
John Deere eAutoPowr™/Electric Variable Transmission (EVT)
See & Spray™ Ultimate

MacDon Industries
TM100 Tractor Mount

McFarlane Ag Manufacturing
CanTILLeaf™ Spring

New Holland
Integrated Baler Control for T7 Tractors

New Holland Agriculture and Case IH Agriculture
Pro-Belt™ Series Variable Chamber Round Balers

Orthman Manufacturing Inc.
1tRIPr® II Row Unit
TRU-aPLYr Dry™

Precision Planting
Blockage Expansion Module
EM HD Liquid Fertilizer Controller
Radicle Agronomics
ReClaim Sprayer Boom Recirculation System

Rain Bird Corporation
S5 Pressure-Compensating Heavywall Dripline

RealmFive
Flush Effluent Management System
Guardian Water Monitoring Device
Ops Tracking
Smart Sites for Ag Retail

RedSea
Iyris Heat-Blocking Greenhouse Roof

Salford Group, Inc.
Halo VRT Tillage Tool

SunTracker Technologies Ltd.
Cerise365+GreenHouseDesigner™

TerraClear Inc.
TC80 Rock Picker
Rock Map

Will your company introduce a new product in 2023?

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 2023, 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).

Update: ASABE's Circular Bioeconomy Systems Initiative

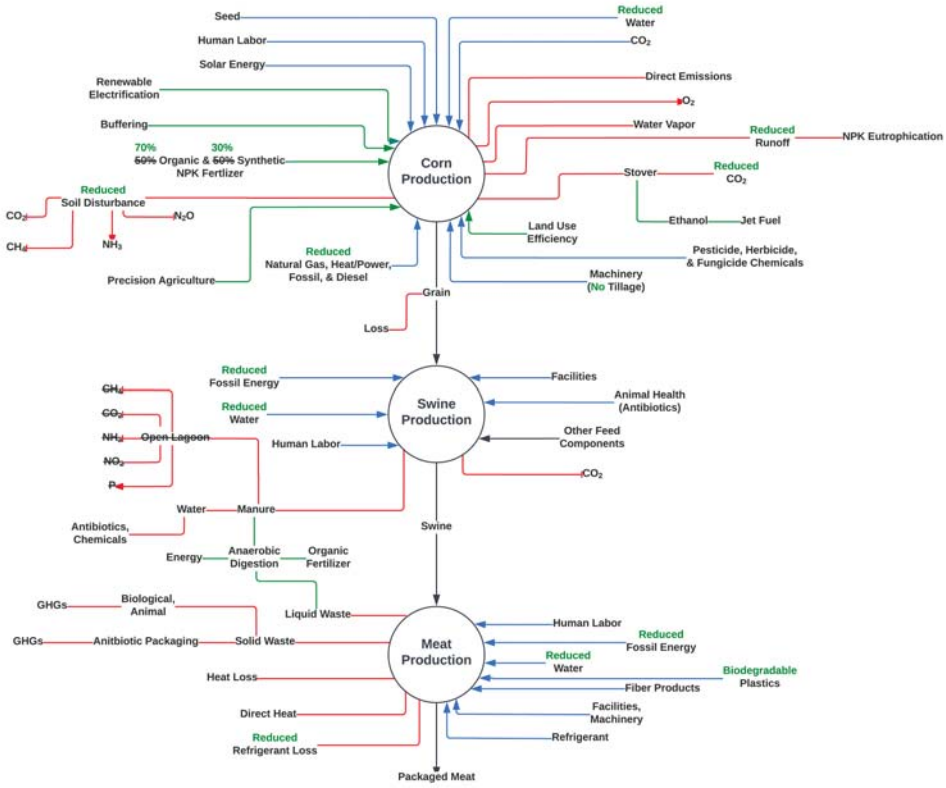
W. Joe Sagues

The Circular Bioeconomy Systems (CBS) Initiative held a workshop at the 2022 Annual International Meeting to inform ASABE members about our ongoing efforts. **ASABE member Sudhagar Mani** of the University of Georgia gave a presentation on the importance of life cycle assessment (LCA) in enhancing the circularity of bioeconomy systems. Dr. Mani encouraged ASABE members of all backgrounds and interests to investigate ways in which LCA methods can be leveraged to increase the circularity of bioeconomy systems relevant to their own work.

In a breakout session, groups of participants were asked to select one of five production systems:

- Field crop production, led by **ASABE member Bruno Basso, P.E.**, of Michigan State University.
- Animal production, led by **ASABE member Angela Green-Miller** of the University of Illinois.
- Controlled environment production, led by **ASABE Fellow KC Ting, P.E.,** of the University of Illinois.
- Bioenergy production, led by **ASABE member Joe Sagues** of North Carolina State University.
- Food processing and waste, led by **ASABE member Ziynet Boz** of the University of Florida.

For each system, the participants were asked to envision opportunities to enhance the circularity of current systems. The participants identified changes needed to current systems that would increase their circularity and sustainability, and they identified challenges that must be overcome to implement the design changes on a commercial scale. Due to strong interest in the CBS Initiative across ASABE, further activities are being planned for the 2023 AIM in Omaha.



Example of a production system that was redesigned by a breakout group at the Circular Bioeconomy Systems (CBS) workshop at the 2022 Annual International Meeting. The blue and red arrows represent the original inputs and outputs, respectively. The green text and arrows represent modifications to the system's mass and energy flows that would enhance the circularity of the system.

ASABE member W. Joe Sagues, Assistant Professor, North Carolina State University, Raleigh, USA, wjsagues@ncsu.edu.

CBS Activities Planned for the 2023 AIM:

- Hands-on continuing professional development in LCA methods.
- "CBS day" with plenary keynote talks, concurrent technical sessions, and posters.
- Student competition on increasing circularity of bioprocesses.
- "Farm of the Future" tour.

Choosing an Ecological Ideal: The Ethics of Ecosystem Services Modeling

Marali Kalra

The Hetch Hetchy Valley is located in the northwest corner of Yosemite National Park.

Editor's note: ASABE member Marali Kalra, a student at The Pennsylvania State University, took first place in the 2022 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 Shelly Hunt,** North Carolina State University, for "Ethical Data Management in Biological and Agricultural Research" and third place was awarded to **ASABE member Md Hamidul Haque,** The Pennsylvania State University, for "Towards Ethical Transformation of Food and Agriculture Systems into Circular Systems." Congratulations to our 2022 finalists, who presented their essays at the 2022 Annual International Meeting in Houston, Texas. These winning essays can be found at asabe.org/Awards-and-Competitions/Student-Awards-Competitions-Scholarships/Ethics-Essay-Competition.

The flooding of the Hetch Hetchy Valley has become an article of American folklore. In 1908, the city of San Francisco received permission to convert Hetch Hetchy into a reservoir, inciting outrage among environmentalist groups (Keel, 2020). The resulting battle is typically portrayed as a duel between Gifford Pinchot, the chief of the United States Forest Service, and John Muir, the founder of the Sierra Club. Pinchot, a conservationist who believed natural resources should be used for human benefit, saw the construction of the reservoir as a means of securing the San Francisco water supply. Muir saw the construction as a tragedy, a desecration of natural beauty. His furious opposition to the reservoir has lingered in the popular imagination, turning Hetch Hetchy into a lost Eden. The issue was effectively closed after a 1913 federal law greenlighted the building of a reservoir in the Hetch Hetchy Valley (Keel, 2020). However, the basic elements of the Hetch Hetchy controversy remain relevant today: in debates over environmental management, from climate mitigation to land development to drilling rights, those who wish to preserve natural resources are pitted against those who wish to put them to practical use.

The growing field of ecosystem services research attempts to reconcile the two sides of this conflict, connecting the environmental value of preservation to the economics of resource use. The central premise of the ecosystem services framework is that human society depends on natural ecosys-

tems to provide certain life-supporting services—for instance, clean air, clean water, and food crops (Daily et al., 1997). A typical study assigns indicator variables to a selected set of ecosystem services, then measures the indicators within a study area. Computational modeling technology allows a single analysis to cover a large study area, producing landscape-scale results valuable to land managers and policymakers.

However, the implementation of the ecosystem services framework brings several ethical issues to the fore. In any evaluation of ecosystem services, the implication is that some outcomes are "better" than others. A study that tests different strategies for increasing crop yield and reducing soil loss is making a tacit statement that crop yield should be raise and erosion should be curbed. Followed to its logical extreme, this ecosystem services evaluation structure suggests that there is some optimal or ideal state—the purest water, the most fertile soil, the maximum crop production—that ecosystems can attain (Calow, 1992). Some type of ecological ideal is implied in every ecosystem services modeling study.

These ideals are an expression of the modelers' personal values. In order to preserve the objectivity of ecosystem services modeling, the normative judgments behind the choice of an ecological ideal must be made explicit. To that end, this essay will identify four ecological ideals that appear frequently in the literature and discuss the ethical issues associated with each.

The most common ecological ideal in ecosystem services research is the idea that ecosystems should be productive. Theoretically, every ecosystem service can be assigned a monetary value. However, some services overlap when considered from a strictly financial viewpoint. For instance, it is difficult to separate the value of soil nutrient cycling from the cash value of crops. In order to avoid counting the same service more than once, the definition of ecosystem services must be restricted to include only the ecosystem processes and function that provide direct benefits to humans (Boyd and Banzhaf, 2007). The productivity ideal emphasizes marketable outputs. It allows ecological value to be translated easily into economic value, which makes ecosystem services more competitive in conventional markets (Lant et al., 2008). However, studies organized according to the productivity ideal are biased in favor of the few ecosystem services that can easily be commodified and sold (Kull et al., 2015). Productivity-oriented studies also overlook other types of value. For instance, the productivity ideal works on the assumption that the value of nature is purely utilitarian—contingent on its usefulness to humans. If, however, nature has intrinsic value, then the buying and selling of ecosystem services becomes an ethical violation (Jax et al., 2013). For this reason, although the productivity ideal is the conventional approach to ecosystem services research, it is widely critiqued in the literature.

The wilderness ideal dictates that ecosystems should be returned to a "natural", undisturbed state.

Another common ecological ideal is the idea of nature as a pristine wilderness, free of human influence. This wilderness ideal dictates that ecosystems should be returned to a "natural", undisturbed state, as they were in pre-Columbian or pre-settlement times (Anderson, 1991). The wilderness ideal is implied whenever a study assumes without justification that, for instance, present levels of soil loss should be reduced, current biodiversity should be increased, or the species composition of the biotic community should be restored to some historical standard. The wilderness ideal is intuitive to both laypeople and specialists. It has a powerful emotional appeal—firstly because beautiful areas like the Hetch Hetchy Valley have been mythologized in American culture, and secondly because people often have a sentimental attachment to the landscapes where they live or where they grew up. However, what constitutes unspoiled wilderness tends to differ from person to person and from culture to culture. There is no objective definition that can satisfy all stakeholders. Some theorists have attempted to formalize the wilderness ideal by tying it to a pre-human reference landscape (Suter II, 1992). If a sample of undisturbed nature could be identified and studied, it might be possible to remove the subjectivity from the term "wilderness". But this approach can also be misleading, because most supposedly untouched landscapes have historically been managed by indigenous peoples (Redman, 1999). Thus the wilderness ideal, though compelling, is not a sound basis for scientific research.

> **"Ecosystem services modeling is closely intertwined with environmental ethics. In choosing an ecological ideal, researchers are consciously or unconsciously taking a political stance."**

Some land managers have made stability their ecological ideal. In ecologies that are subject to periodic disturbance, the idea of an ecosystem that behaves in a predictable, controllable manner can be attractive. The stability ideal is associated with management strategies that aim to prevent or mitigate natural disasters such as floods and forest fires. Two notable examples from American history are the fire suppression policy implemented by the U.S. Forest Service until the 1960s (van Wagtendonk, 2007), and the levee system built to control floods on the Mississippi River. In the short term, stability-oriented management can provide increased security to people living under the threat of ecological disturbance.

However, ecosystems rarely attain states of equilibrium (Barkmann et al., 2001); they undergo both periodic disruptions and incremental changes. Attempting to buffer or end these cycles can backfire spectacularly. Forest fire suppression, for instance, has been shown to cause a buildup of flammable material that ultimately leads to more severe fires (Harris et al., 2021).

River engineering, rather than reducing flooding along the Mississippi, has contributed substantially to a long-term increase in the magnitude of Mississippi River floods (Munoz et al., 2018). Though important historically, the stability ideal is not a viable organizing principle for ecosystem services research.

The sustainability ideal has emerged as a compromise among the different value systems that influence ecosystem services research. Sustainability, in the literal sense of the word, entails land management practices that can be applied

continuously without long-term harm. As described by the UN Sustainable Development Goals, the term "sustainability" incorporates multiple objectives: biodiversity, income security, and public health, among others (UN, 2015). Seen in this light, ecosystem services research is not a monolith but a collection of diverse studies with sometimes competing motivations. The sustainability ideal is inclusive in that it accounts for the needs of stakeholders with opposing ecological ideals. However, the sustainability ideal requires modelers to cope with a broad range of variables and perspectives. An ecosystem services evaluation based on the principle of sustainability may be beyond the scope of any one study. Furthermore, sustainability remains an ambiguous concept. Of the four ecological ideals discussed here, sustainability is the most defensible, but modelers must define the term carefully if they choose to use it; otherwise, they risk inviting another source of controversy into ecosystem services research.

Ecosystem services modeling is closely intertwined with environmental ethics. In choosing an ecological ideal, researchers are consciously or unconsciously taking a political stance. As a result, some legitimate science may be discounted by parties who do not share its underlying values. One researcher may, in a peer-reviewed publication, call another researcher's views "revolting" (Norgaard, 2010). This does not mean ecosystem services modeling research should cease. However, modelers must state their ideals and objectives clearly in order to avoid imposing their personal values on other stakeholders.

Furthermore, research must take place in tandem with a larger public debate about ecological goals and priorities. Science can clarify, but ultimately cannot resolve, the value-laden questions at the core of ecosystem services research.

ASABE member Marali Kalra, graduate student, The Pennsylvania State University, State College, Pennsylvania, USA, mmk5750@psu.edu.

References

Anderson, J. E. (1991). A conceptual framework for evaluating and quantifying naturalness. *Conservation Biology 5*(3), 347-352. https://doi.org/10.1111/j.1523-1739.1991.tb00148.x

Barkmann, J., Baumann, R., Meyer, U., Mueller, F., & Windhorst, W. (2001). Ökologische Integrität: Risikovorsorge im nachhaltigen Landschaftsmanagement. *GAIA, 10*(2), 97-108. https://doi.org/10.14512/gaia.10.2.5

Boyd, J.,& Banzhaf, S. (2007). What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics, 63*, 616-626. https://doi.org/10.1016/j.ecolecon.2007.01.002

Calow, P. (1992). Can ecosystems be healthy? Critical consideration of concepts. *J. of Aquatic Ecosystem Health, 1*, 1-5. https://doi.org/10.1007/BF00044403

Daily, G. C., Alexander, S., Ehrlich, P. R., Goulder, L., Lubchenco, J., Matson, P. A., Mooney, H. A., Postel, S., Schneider, S. H., Tilman, D., & Woodwell, G. M. (1997). Ecosystem services: Benefits supplied to human societies by natural ecosystems. *Issues in Ecology* (2), 1-17. https://www.researchgate.net/publication/313766775_Ecosystem_services_Benefits_supplied_to_human_societies_by_natural_ecosystems

Harris, L. B., Drury, S. A., Farris, C. A., & Taylor, A. H. (2021). Prescribed fire and fire suppression operations influence wildfire severity under severe weather in Lassen Volcanic National Park, California, USA. *Intl. J. of Wildland Fire, 30*(7), 536-551. https://doi.org/10.1071/WF20163

Jax, K., Barton, D. N., Chan, K. M. A., de Groot, R., Doyle, U., Eser, U., Görg, C., Gómez-Baggethun, E., Griewald, Y., Haber, W., Haines-Young, R., Heink, U., Jahn, T., Joosten, H., Kerschbaumer, L., Korn, H., Luck, G. W., Matzdorf, B., Muraca, B., hover, C., Norton, B., Ott, K., Potschin, M., Rauschmayer, F., von Haaren, C., & Wichmann, S. (2013). Ecosystem services and ethics. *Ecological economics, 93*, 260-268. https://doi.org/10.1016/j.ecolecon.2013.06.008

Keel, L. (2020). Frenemies John Muir and Gifford Pinchot: Have their differences been overstated? *Humanities, 41*(1). https://www.neh.gov/article/frenemies-john-muir-and-gifford-pinchot

Kull, C. A., Arnauld de Sartre, X., & Castro-Larrañaga, M. (2015). The political ecology of ecosystem services. *Geoforum, 61,* 122-134. https://doi.org/10.1016/j.geoforum.2015.03.004

Lant, C. L., Ruhl, J. B., & Kraft, S. E. (2008). The tragedy of ecosystem services. *BioScience, 58*(10), 969- 974. https://doi.org/10.1641/B581010

Munoz, S. E., Giosan, L., Therrell, M. D., Remo, J. W. F., Shen, Z., Sullivan, R. M., Wiman, C., O'Donnell, M., & Donnelly, J. P. (2018). Climatic control of Mississippi River flood hazard amplified by river engineering. *Nature, 556*, 95-98. https://doi.org/10.1038/nature26145

Norgaard, R. B. (2010). Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecological Economics, 69*, 1219-1227. https://doi.org/10.1016/j.ecolecon.2009.11.009

Redman, C. L. (1999). *Human Impact on Ancient Environments.* Tucson: University of Arizona Press.

Suter II, G. W. (1992). A critique of ecosystem health concepts and indexes. *Environmental Toxicology and Chemistry, 12,* 1533-1539. https://doi.org/10.1002/etc.5620120903

United Nations (UN) General Assembly. Transforming our world: The 2030 agenda for sustainable development. A/RES/70/1. https://sdgs.un.org/2030agenda

van Wagtendonk, J. W. (2007). The history and evolution of wildland fire use. *Fire Ecology, 3*, 3-17.

Celebrating 20 Years of YPC: The Beginning (2001-2008)

Naomi Bernstein, P.E.

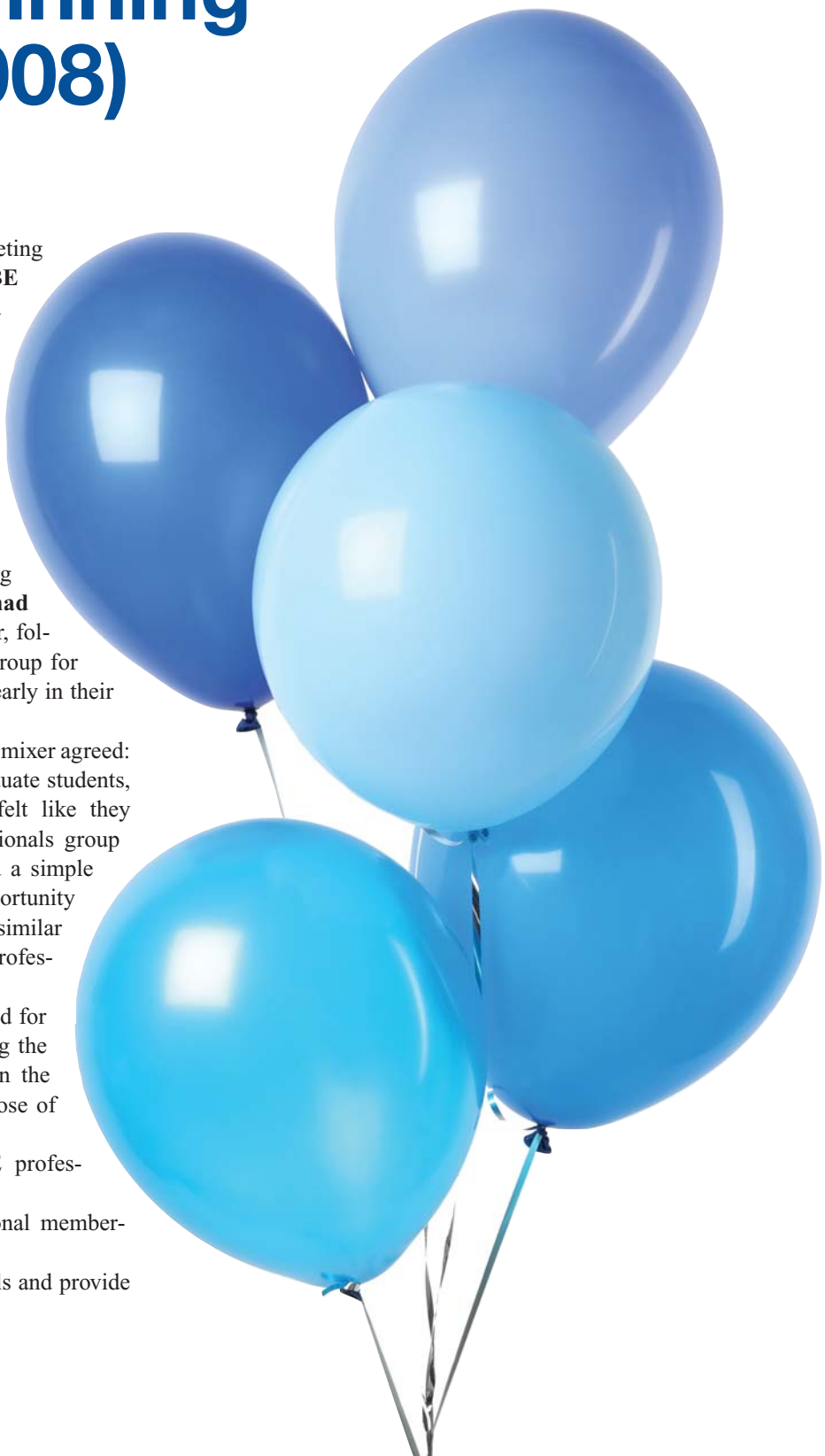
At the 2001 Annual International Meeting in Sacramento, California, **ASABE member Russell Persyn** gathered a small group of students and young professionals to discuss why many students didn't continue their ASABE membership after graduation. They wanted to help students understand what ASABE could do for them in their careers.

The following year, at the 2002 AIM in Chicago, Illinois, several small events were hosted by young professionals. At the young professionals mixer, **ASABE member Chad Yagow,** who later served as the first YPC chair, followed up on the idea of forming an official group for members who were still graduate students or early in their careers.

Other attendees at the young professionals mixer agreed: ASABE needed to provide a place where graduate students, recent graduates, and young professionals felt like they belonged. When asked why a young professionals group was important, one of the attendees provided a simple answer: "I want to provide a networking opportunity for young professionals, to meet people of similar ages and situations, and to share ideas and professional development."

During 2002-2003, the foundation was laid for the Young Professionals Community, including the creation and adoption of bylaws. As listed in the bylaws, updated in November 2006, the purpose of the YPC is to:

1. Bring young professionals into ASABE professional membership.
2. Promote the transition from preprofessional membership to young professional membership.
3. Confront issues facing young professionals and provide necessary training and discussion.



2003 - 2023 YPC 20 Years

2003 - 2008 Executive Committees

	2003 Las Vegas, NV	2004 Ottawa, ONT, CA	2005 Tampa, FL	2006 Portland, OR	2007 Minneapolis, MN	2008 Providence, RI
Chair	Chad Yagow	Audrey Alexander	Audrey Alexander	Candi Engler	Candi Engler	John Eisenmann
Vice/Past Chair	Audrey Alexander	Chad Yagow	Candi Engler	Audrey Alexander	John Eisenmann	Candi Engler
Membership Development Council Representative	Stefanie Rucker	Stefanie Rucker	Carolyn Jones	Carolyn Jones	Rebecca Ostermann	Rebecca Meyer
Meeting Council Representative	Doug Sorenson	Doug Sorenson	Mark Bowers	Mark Bowers	Carolyn Jones	Carolyn Jones
Standards and Technical Council Representative	Mark Bowers	Mark Bowers	Andrew Easter	Andrew Easter	Scott Dixon	Scott Dixon
Publications Council Representative			Laura Christianson	Laura Christianson	Sherry Hunt	Naomi Bernstein
Members at Large	Jason Schickedanz Jill Huenink Travis Tsunemori	Jill Huenink Jason Madsen Russell Persyn Jason Schickendanz Travis Tsunemori	Sherry Hunt Charles Ogborn Travis Tsunemori Erin Wilkerson Michael Chesser Jason Madsen	Sherry Hunt Charles Ogborn Travis Tsunemori Jason Madsen Aaron Fluoro Betsy Gerwig Brad Lewis Ginger L'Heureux	Katryn Duguid Courtney Fisk Betsy Gerwig Ginger L'Heureux Brady Lewis Travis Tsunemori Naomi Bernstein	Joe Biggerstaff Andy Lenkaitas Brady Lewis Dirk Reum Josh Sander Anthony Vandermuss Cale Boriack Courtney Fisk

4. Provide a social body that extends networking opportunities to its members.
5. Promote Society objectives among YPC members.
6. Foster formation of young professional communities at the section level.

The YPC was the first ASABE committee to adopt a leadership cycle of one year for vice chair, two years for chair, and one year for past chair. This is a longer leadership cycle than most other ASABE committees because the YPC founders wanted to provide time for leadership development and mentoring. The YPC founders also recognized the need to include YPC representative on the major councils. These YPC representatives are the voice of ASABE members in their careers, and they increase the visibility of the YPC community and their needs.

One of the goals of the YPC was to provide high-quality continuing professional development (CPD) opportunities at a low cost. The YPC recognized that CPD experts wouldn't work for free, so funding was needed. In the early 2000s, ASABE was not in the strong financial health that it is today.

Fun Run
2006 Sponsors
ASABE

The first YPC Fun Run was held in Portland, Ore., in 2006. The run/walk remains a popular event at the Annual International Meeting with participants spanning all different age groups.

Initiative funds were not available, and the YPC needed to support itself. This resulted in the creation of fundraising events at the Annual International Meetings, including the Fun Run in 2006 and the All in Good Fun Contest in 2007.

The Fun Run is a 5K run/walk that raises funds through entry fees and sponsorship opportunities. The All in Good Fun Contest involved prominent members in mock competitions. Participants typically included ASABE staff, the YPC chair, the Board of Trustees, and the International Pre-professional Community (now the International Student Branch). Depending on the contest rules, the participants competed against each other to raise the most money, or they encouraged others to contribute the most money, all of which benefitted the YPC. The Fun Run and the All in Good Fun Contest were popular AIM events, as well as a great way to raise the visibility of the YPC among the ASABE membership.

Thanks to the strong foundation created 20 years ago by the members who saw a need and did something about it, the YPC has grown and thrived. Those founding members are proud of the legacy they created, and they're excited to see the new ideas that the YPC will bring to our Society in the next 20 years.

ASABE member Naomi Bernstein, P.E., Project Manager, University of Wisconsin, Madison, USA, ncuhlenhake@uwalumni.com.

The First 100 Days: How to Get Started in Your First Job

Starting your first real job after college is an exciting and nerve-wracking time. You're eager to use the knowledge you learned in school, you're anxious about contributing to the team, and you don't want to do anything wrong. Here are four tips for making a great first impression on your first real job:

#1. Take notes

Write down all the procedures that you're shown as well as the answers to all the questions that you ask. Taking notes ensures that you don't have to ask the same question twice. Your notes will be a great reference when you're asked to perform a task on your own, and you may even be able to write a standard procedure for training others. Bonus points if you also keep track of your accomplishments—to update your résumé and shine in your performance reviews.

#2. Ask questions

No one expects you to know everything right away. Take this opportunity to clarify anything that doesn't make sense to you. Your clients and coworkers would rather answer a question now than discover a mistake later. During your first three months, you will need to absorb a lot of information, so remember the 90/10 rule: listening 90% of the time will help you absorb new information faster. Asking lots of questions also helps you make progress on tip #1!

#3. Find a mentor

Your manager may assign a mentor to you. If not, then find one on your own, and it's okay to have more than one. Your mentor should be someone you can go to with questions that you don't want to ask your manager. Your mentor can also give you career advice. If your mentor is in a position that would like to have someday, then your mentor can tell you how to get there. Don't be afraid to meet new people. You might find a mentor in a different department. Your mentor can also be a good source of non-technical information about the job, such as: "What's the culture like?" or "Are the work hours flexible?"

#4. Review and improve

At the end of your first three months, schedule a review meeting with your manager to assess your progress and set new goals. Your manager may suggest areas where you can improve and can help you identify a path toward those improvements. Keep track of your progress (see tip #1) so that you can demonstrate your accomplishments at your next review.

ASABE member and YPC Executive Committee Member-At-Large Abby Schaefer, Project Engineer, SLR International Corporation, New Haven, Conn., USA, ae.schaef@outlook.com.

VisualChallenge12

WHAT DO YOU SEE?

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 *VisualChallenge*12, we were eager to see what would be submitted. We are excited to showcase a smattering of the entries that we received for our twelfth 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. In 2023, remember to pull out your camera or phone and take a shot for next year's Visual Challenge!

ASABE member Ekramul Haque Ehite, ***Graduate Student, Department of Biosystems Engineering and Soil Science, University of Tennessee, Knoxville, USA.***

WHERE SKY AND WATER MEET, WHERE THE WAVES GROW SWEET

This photo was taken on a misty morning in Seward, Alaska. The ship in the water is an oceanographic research vessel observing the behavior of seabirds and marine mammals in the Kenai Fjords National Park. Understanding the biodiversity of marine life is vital to preserving this little piece of heaven on earth for generations to come.

ASABE member Tom Gettings, P.E., *Senior Chief Technical Engineer—Storage, AGCO Grain and Protein/GSI, Assumption, Illinois, USA.*

MAIN STREET

Grain bins and an elevator reach to the sky at the end of Main Street in Assumption, Illinois. The steel grain bins were manufactured by GSI-AGCO Grain and Protein, and the elevator is part of the Assumption Co-Op Grain Company.

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

FENCELESS HERD

These cows wear collars that establish virtual fences. As the cows move closer to the boundary, they receive an audible tone. When they reach the boundary, they receive a mild electric shock. The producer uses regenerative grazing techniques and can set new boundaries with a smart phone.

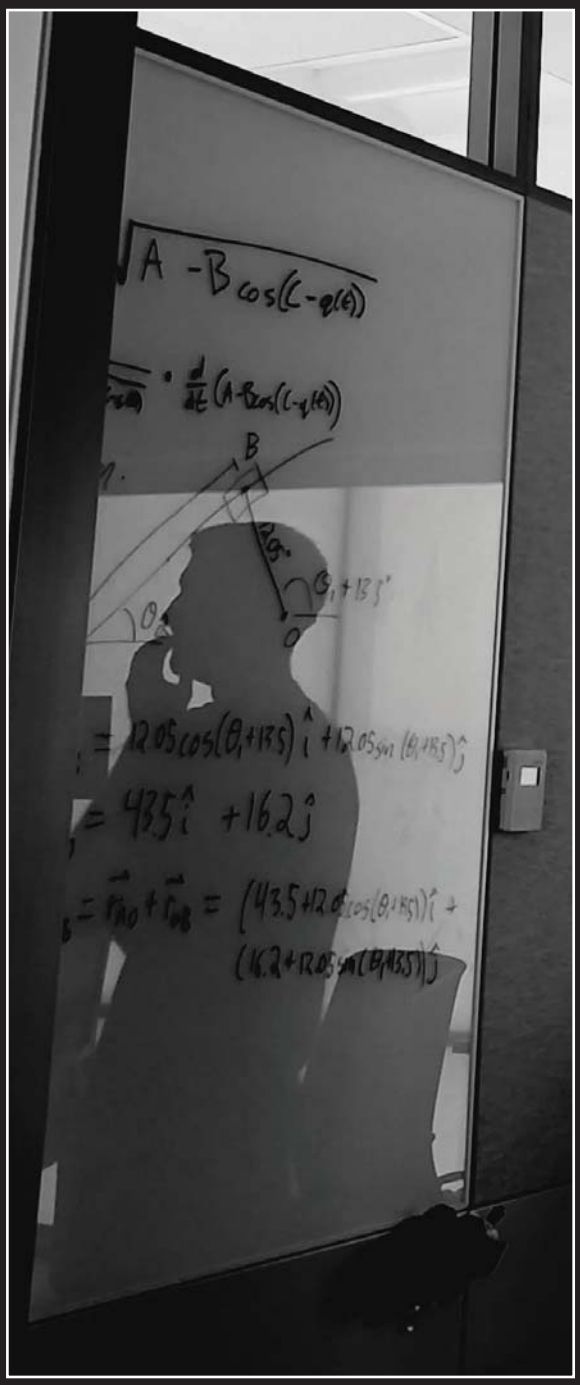
ASABE member Marty Matlock, P.E., ***Professor, University of Arkansas, Fayetteville, USA.***

MOONSET AT SUNRISE—***Sunrise on National Agriculture Day on the National Mall, Washington, D.C., 2022.***

ASABE Fellow John Schueller,
Professor, Mechanical and Aerospace Engineering, University of Florida, Gainesville, USA.

"I'LL BE BACK" … TERMINATOR CHICKENS

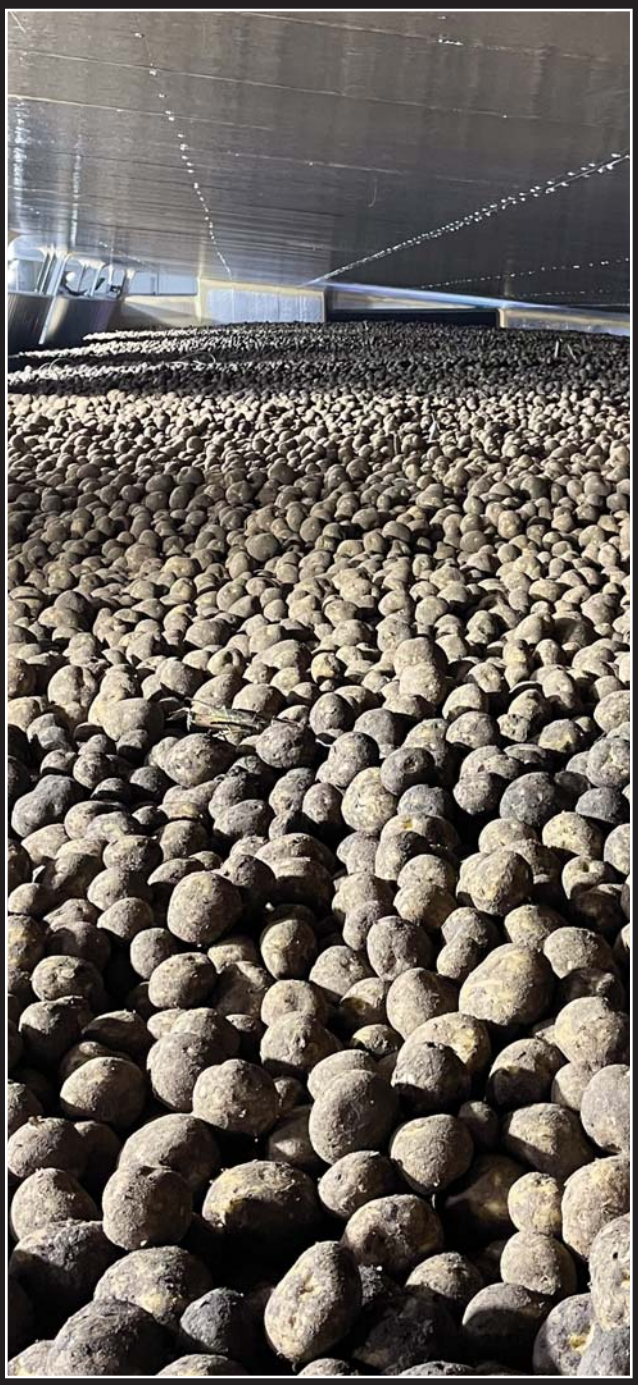
Florida urban farmers and engineers (left to right) Erica and Donald MacArthur demonstrate their mobile coop for laying hens to ASABE member Karl Wild of the University of Applied Sciences, Dresden, Germany. The hens terminate the cover crop and organically fertilize the soil for the following vegetable crop.



ASABE member Allison Graham, P.Eng.,
R&D Shared Services Manager, Väderstad Industries Inc., Langbank, Saskatchewan, Canada.

A TIME FOR REFLECTION

It's not every day that calculus shows up in air seeder design, so when it does engineers stop to reflect on its beauty … and double-check the formulas.



ASABE President and Fellow Keith Tinsey, P.E.,
Director of Operations (Midwest), Black Gold Farms, Grand Ledge, Michigan, USA.

3,500 TONS OF CHIPPED, FRIED, BAKED, OR MASHED

A sea of sustenance in the form of potatoes relaxed and adrift in an engineered storage.

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

ROLLER GINNING CALIFORNIA PIMA COTTON

Gin Plant 5, owned by J.G. Boswell Company in Corcoran, California, is running smoothly, thanks to the meticulous care that the employees lavish on it.

ASABE member Santosh Pitla,
Associate Professor, Machine Automation and Agricultural Robotics (MAARS), Department of Biological Systems Engineering, University of Nebraska, Lincoln, USA.

FLEX-RO ROBOTIC PLANTER

We just finished mounting row units on our robotic planter. Testing will begin in the 2023 planting season.

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

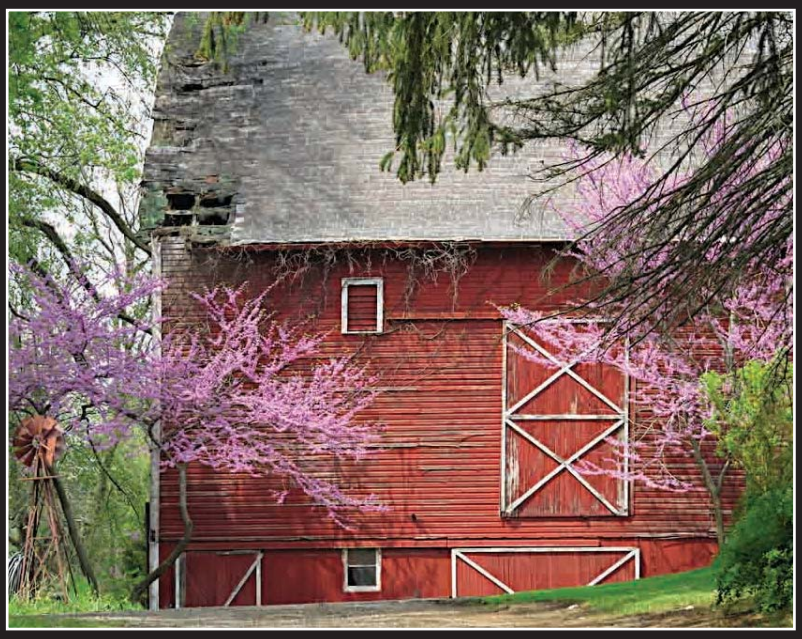
A TAPESTRY OF LIGHT AND LAND

I decided to carry my camera up with me while going for an evening flight in my paramotor and was rewarded with a beautiful sunset over Indiana agriculture. Taken in late July, the fields are still lush green with corn and soybeans, with a few homes scattered throughout the landscape to break up the patchwork quilt of fields.

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

BURST OF COLOR

Whether sold as cut flowers or flowering plants, these gerberas are grown in a carefully controlled greenhouse environment.



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

BARN WITH REDBUDS

I stumbled on this scene of a veteran barn complemented by redbud trees in Berrien County, Michigan, the second-most diverse county in the U.S. for crop and fruit varieties. The abundant redbuds and dogwoods are a bonus.

COMBINE IN THE SNOW

The best intentions often fall short when trying to complete the corn harvest in Berrien County, especially after an early-season snowstorm. Lake Michigan keeps the local climate mild, but it also creates "lake effect" snow.

ASABE member Jasper Cunningham,
North America Processing Vegetables, Bayer CropScience, Ravenna, Michigan, USA.

EDNA VALLEY, CALIFORNIA

The Edna Valley American Viticultural Area (AVA) enjoys some unique features, including calcium-rich volcanic soil and maritime fog, making it a world-class location for grape production and fermentation science.

Don’t wait, register today for AETC!

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