March/April 2025

RESOURCE

engineering and technology for a sustainable world

Satellite Remote Sensing on Crop Fields

Also inside:

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- Recapping the 2024 Global Collaboration Webinar Series
- Last Word: We Are BioSystems Engineers

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Leading the Future

A bright spot during the long winter was the Agricultural Equipment Technology Conference (AETC) in Louisville, Kentucky. Attendance was very strong this year, despite the headwinds of a declining ag economy. In addition, a record number of students attended, supported by sponsorships from industry partners and the ASABE KEYS fund.

Each year, the sessions at the conference showcase the latest trends and innovations in agriculture. My favorite part of AETC is the presentation of the AE50 Awards. This year, as ASABE President, I had the opportunity to personally congratulate each of the AE50 winners for their efforts in delivering a great new product to market. The AE50 Awards give well-deserved recognition to the people who are driving productivity and technology in agriculture.

Thanks to the dedication of the AETC planning committee, the conference provides a great opportunity for student interaction with industry representatives. This year, students were active in all of the technical sessions and panel discussions. Overall, AETC is a great opportunity for students to discover the benefits of collaboration.

Speaking of students, this year's AETC also included a roundtable session on Ag Technologies and Systems Management (ATSM), led by **ASABE Fellow Leon Schumacher** and **ASABE Past-President and Fellow Dana Porter, P.E.** The session generated several actions for improving the value that ASABE can provide to students and young professionals with ATSM or equivalent degrees. Our goal is for ASABE to be their preferred technical society, as we are for traditional engineering programs.

We are in challenging times due to pressure on the ag economy, volatility in government agencies, and geopolitical uncertainty. For all of our members who have been negatively impacted by these (and other) factors, ASABE stands with you to provide support in any way possible. In times like these, professional collaboration is critical, including connections to a broad network of technical experts.

In my inaugural address at last year's AIM, I introduced the Leading the Future campaign. As part of this campaign, I called on ASABE members like you to advocate for ag engineering and technology and drive the value that ASABE has for you. Since then, you have answered that call.

Keep up the great work! I'm continually impressed by the results of our collaborations. Thanks to you, we are making a positive impact every day!

I'm grateful for the opportunity to serve as your President and advocate for our profession. Together we are Leading the Future of agricultural and biological engineering!

Doug Otto
doug.otto@newholland.com

upcoming events

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.

2025

March 31-April 2 — **2025 AI in Agriculture and Natural Resources Conference** (endorsed event). Starkville, Miss., USA.

June 2-5 — **3rd U.S. Precision Livestock Farming Conference** (endorsed event). Lincoln, Neb., USA.

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

2026

Jan.11-17 — **ASABE Global Symposium on Sustainable Microirrigation Advances: Drop to Boom.** Aguadilla, Puerto Rico, USA.

Feb. 8-11 — **Agricultural Equipment Technology Conference (AETC).** Louisville, Ky., USA.

March 15-18 — **Sustainability of Agro-Eco-Systems through Climate Change Resilience.** Transilvania University of Brasov, Romania.

July 11-14 — **ASABE Annual International Meeting.** Indianapolis, Ind., USA.

2027

July 17-20 — **ASABE Annual International Meeting.** New Orleans, La., USA.

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The sky's the limit!
Find out about satellite remote sensing on crop fields on page 4.

ASABE
Engineering a Sustainable Future

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Satellite Remote Sensing on Crop Fields

The future of digital agriculture

James Y. Kim

Over his morning coffee, a farmer uses his laptop computer to monitor several 5,000-acre fields. He can check the crop health across the fields and monitor the vegetation status and growth rates within each field. A few days later, when a plant health issue arises, the software alerts the farmer of the abnormality and identifies the field to be addressed.

This farmer is using satellite remote sensing for spatiotemporal field monitoring. These systems allow growers to monitor field conditions from home or in the office, providing useful, data-driven insights on where and how to manage their crops.

Satellite remote sensing

Timely crop information is essential for informed management decisions. Satellite remote sensing provides a method for monitoring crops on a large scale. Since the first Landsat satellite in 1972, the quality and availability of satellite imagery have remarkably improved. New constellations of micro or cube satellites can now provide daily information on crop health.

The satellites used for agricultural applications include Planet Scope, SkySat, Rapid Eye, Sentinel 2, and Landsat 8. Each of these is actually a group of satellites, ranging from three satellites for Sentinel to 180 for Planet Scope, all at a specific altitude.

Their image resolution ranges from 3 to 30 m, and the update frequency ranges from daily to a 16-day interval. Other satellites are commercially available with sub-meter resolution from DigitalGlobe (0.5 m), GeoEye (0.4 m), and WorldView (WV) 1 (0.5 m), WV2 (0.4 m), and WV3 (0.3 m).

It's reported that small satellite (SmallSat) launching companies, such as Rocket Lab, Vector Launch, and Virgin Orbit, will dramatically reduce their launching costs from $2B to $5M, which will increase the constellations of SmallSats from the current 700 to as many as 10,000 within the next decade.

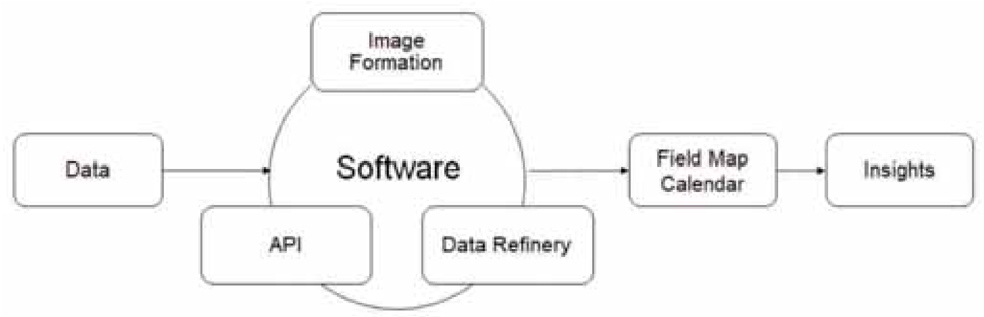
The increasing availability of SmallSats has created many opportunities for remote sensing. Satellite-based multispectral imaging has enabled an exceptional understanding of the Earth beyond the visible spectrum. These high-frequency, high-resolution images can reveal patterns in rapidly changing infrastructure systems, natural landscapes, and water resources.

However, satellite images have been less useful for agricultural producers due to the limited access to analytical software. To bridge the gap between satellite resources and agricultural users, USDA-ARS researchers at the Edward T. Schafer Agricultural Research Center in Fargo, North Dakota, have been working on developing satellite image analysis software for crop health monitoring.

Examples of satellites from commercial (Planet Scope, SkySat, and RapidEye) and public (Sentinel and Landsat) sources, showing the number of satellites, altitude, and weight. They all operate in Sun-synchronous orbit (SSO).

Image transformation

Imagery from satellites needs to be processed to transform the surface observations into crop metrics. This transformation from raw data to useful insights requires the integration of image formation, an application program interface (API), and a data refinery, which are executed in the analytical software through filtering, mapping, and metrics extraction.



System integration to transform satellite image data into useful insights.

Satellite images are typically 16-bit, which provides trillions of possible colors and far more depth of pixel than 8-bit images. When a field image is clipped to the area of interest (AOI) from the original tile image, a 16-bit to 8-bit conversion is applied with the range of the tile image on the AOI image.

“ The large number of small satellites in Sun-synchronous orbit provides daily images of the same location at the same time, allowing users to compare how their AOI changes over time.

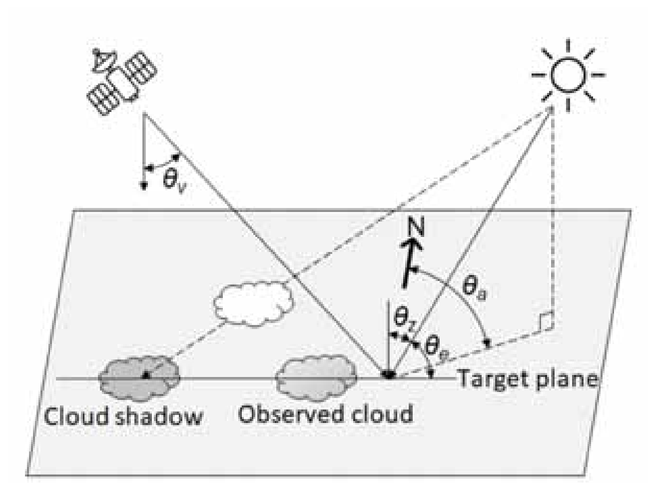
Data access and data refining

Accessing the satellite images is initiated through a web portal or command line interface (CLI)-based API script. The web and script tools both provide a bulk download of satellite images through queuing, activation, and download. Images can be downloaded with no clipping or clipped to the AOI, and they can include other user-defined search features, such as time, cloud conditions, coverage area, and image type. Access to Planet Scope satellite imagery is available via a web portal or bulk downloader using an API key provided with a license agreement or the NASA Commercial SmallSat Data Acquisition (CSDA) Program.

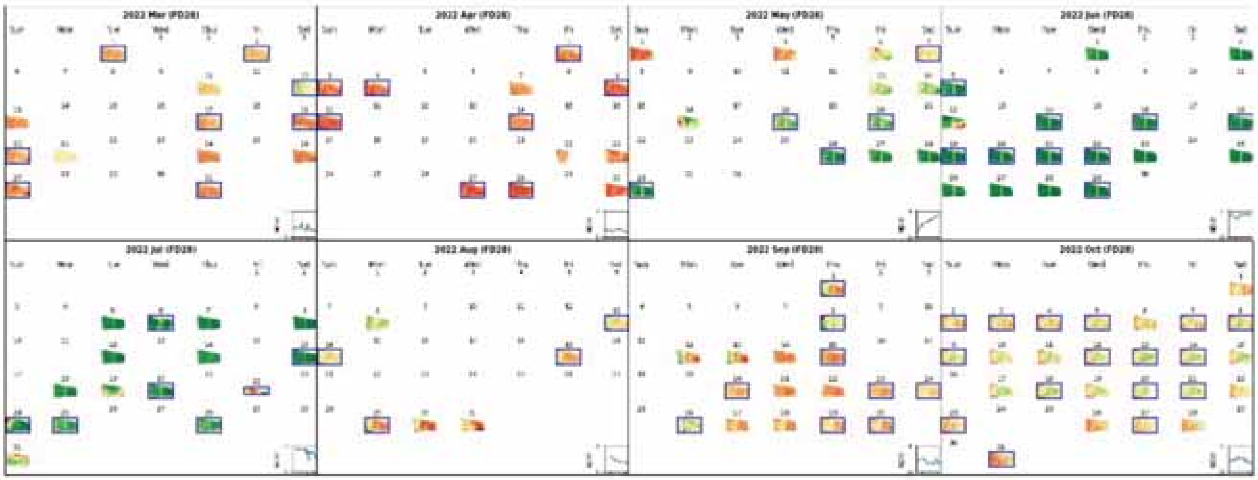
The large number of small satellites in Sun-synchronous orbit provides daily images of the same location at the same time, allowing users to compare how their AOI changes over time. However, this abundance of images also requires data refining to extract valid images. Atmospheric effects caused by clouds, haze, and shadows are the most significant disturbances of satellite images of the ground surface. Another concern arises when multiple images are generated of the same field on the same day; this requires determining which image best represents the field.

Each satellite image is recorded with metadata that describes the image quality, atmospheric conditions, solar elevation, and other factors. To avoid uncertain spectral signatures due to different satellites with different viewing angles, users can filter out multiple images by specifying a sun elevation angle close to 90°. When an image is acquired with a higher sun elevation, the image will be less saturated by bidirectional effects.

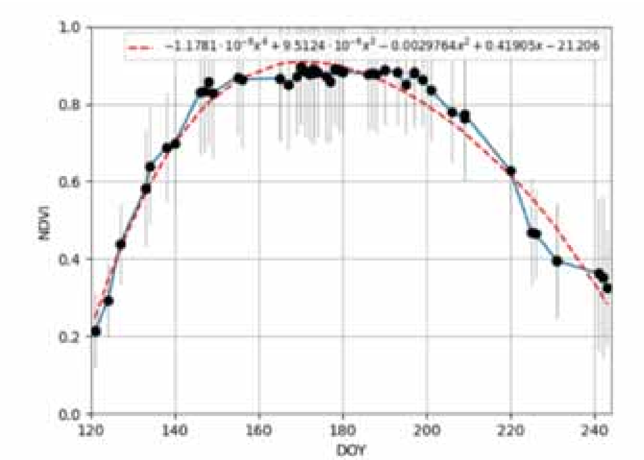
Typically half of the satellite images will be multiples that need to be singularized. With additional filtering for saturated images, the total number of valid images can drop to one-third of the original number.



Satellite imaging geometry, where θ_z is the solar zenith angle, θ_e is the sun elevation angle, θ_a is the solar azimuth angle, and θ_v is the satellite view zenith angle.



(a)



(b)

Outputs generated by open-source iCalendar software from satellite imagery acquired during March to October 2022 from a corn field in Leland, Mississippi: (a) field map calendar showing the transition of vegetation status, and (b) seasonal NDVI profile along the day of year (DOY).

This is a significant reduction in the number of images, and it is essential to eliminate unusable images and ensure correct interpretation of the field conditions.

Crop monitoring with iCalendar

Satellite-based crop health monitoring is also implemented with software. The Planet API produces a raw image dataset from the cloud for each field polygon. After the datasets are validated by filtering out unusable images, image analysis is performed to generate field-level vegetation metrics.

An open-source software program, called iCalendar, has been developed for high-throughput image analysis and spatiotemporal monitoring of crop health throughout the growing season. Using raw field boundary images clipped from the satellite tile images, iCalendar executes a sequence of algorithms to produce a field map calendar and a seasonal vegetation profile.

The field map calendar displays the transition of vegetation status in the field from bare soil to healthy crop growth and senescence, and a profile of the seasonal normalized difference vegetation index (NDVI) displays the quantitative vegetation status with a regression line fitting the trend in NDVI across the season.

The iCalendar package includes the data download, refining, calibration, and batch processes and is publicly available from the National Ag Library (doi.org/10.15482/USDA.ADC/25797007).

Growers and industry innovators are rapidly adopting high-frequency satellite imagery as a foundational tool for precision agriculture. Satellite-based field monitoring delivers quick and continuous assessments of crop health and thus provides the insights that growers need to make informed decisions for proactive management, resource use efficiency, and sustainable agriculture.

ASABE member James Y. Kim, Research Agricultural Engineer, USDA-ARS Edward T. Schafer Agricultural Research Center, Fargo, North Dakota, USA, james.y.kim@usda.gov.

The Tenet of Reproducible Research

Astina Joice and C. Igathinathane

Human civilization progresses through the transfer of previous knowledge, but modern science's complexity (e.g., quantum mechanics, climate change, differential equations, computer vision, deep learning, regenerative agriculture, circular bioeconomy, and so on) often makes it impossible to communicate information to researchers and students in other fields, as well as the general public. Effective science communication has a broader impact than science. Therefore, there is a need for the reproducibility of scientific research.

The significance of reproducibility

Research outcomes, funded by limited resources, are wasteful if they are not effectively communicated for replication. For example, researchers in crop yield improvement expect producers to follow their recommendations and obtain similar outcomes. To achieve this, the researchers must share their information in such a manner as to ensure consistent practices. Their efforts should prioritize knowledge transfer and effective communication, thereby allowing reproducibility.

One of the ways to make this happen is to follow the principles of reproducible research (RR). Unfortunately, there is a crunch for research results reproducibility, leading to significant waste of time and funds due to non-adoption or lack of awareness of RR principles. In addition, because of the diverse and voluminous data, dataset management and standardization are challenging, and researchers struggle with computational resources and complex models. There is also a lack of proper documentation of methodologies, data processing, and model parameters, where minimal variations can lead to inconsistent or even chaotic results.

This situation necessitates a simplified and well-established framework for presenting scientific findings that everyone can use and independently validate. Researchers should explain their experimental procedures with replication in mind. This approach to reproducibility can guide their research and enable their readers to test and comprehend the results beyond the scope of the original study.

The reproducibility crisis

In agricultural engineering and in modern agriculture, data-driven approaches are on the rise. Technologies such as remote sensing, genomics, artificial intelligence, and advanced statistics provide useful insights, but they also increase the methodological complexity. And while computational power has increased enormously, the computational demand can quickly exhaust the available resources.

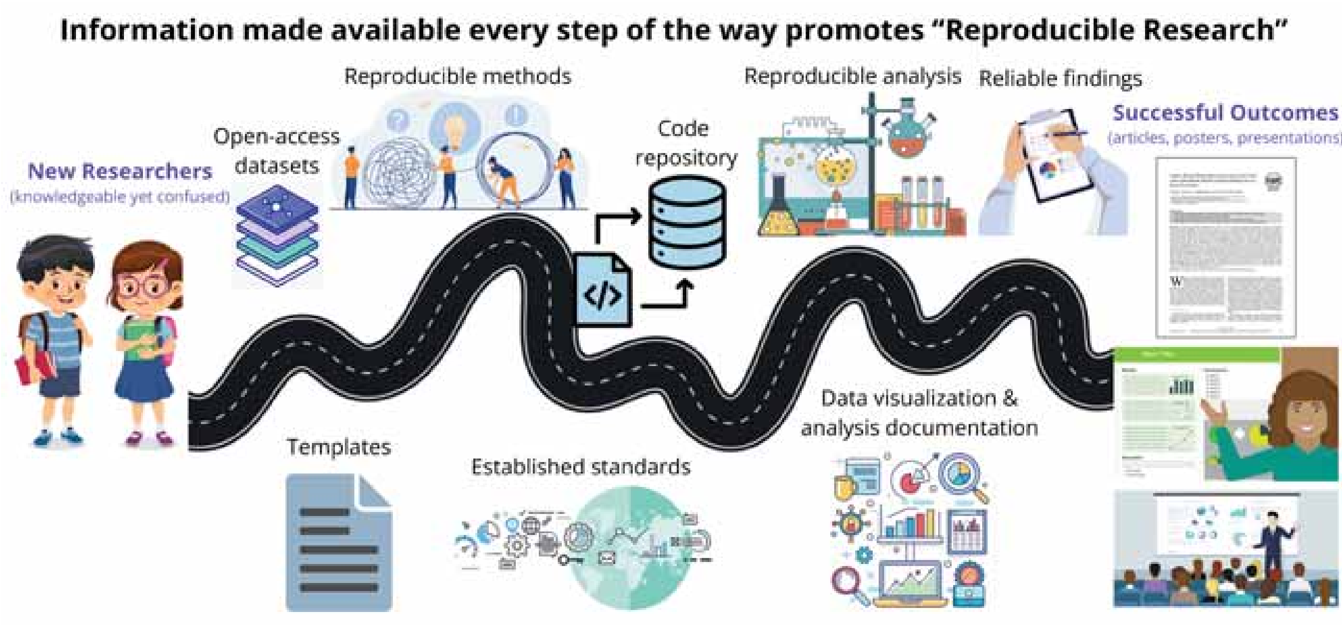
One reason for this increasing demand is that new developments solve previously unsolvable problems and bring larger challenges, which in turn require greater computational power. This cycle, although it advances our knowledge, also adds to methodological complexity and creates challenges for effective communication. In this context, the adoption of RR principles offers a path forward.

Extraordinary amounts of time, effort, and resources are often wasted during a project's initial phase because the necessary oversight and supervision cannot be sufficiently detailed for the expected progress. As research moves from planning to publication, each phase of the research process should be conducted with reproducibility in mind, and this commitment represents responsible academic conduct. Put simply, applying RR principles avoids reinventing the wheel and maximizes the value of funding, thereby reducing waste.

The Science Advisory Council has identified several key impediments to reproducibility, including data dredging, omitting null results, underpowered studies, errors, underspecified methods, and weak experimental design and execution, highlighting an urgent need for change. Recognizing the reproducibility crisis, researchers increasingly question whether their methods and results are reliable and repeatable, raising concerns about the reproducibility of their findings.

A simpler concept of RR

Graduate students and new researchers often find themselves at a crossroads, despite their fundamental knowledge, especially when developing research plans, methodologies, coding models, analyses, data visualization, and then publishing their findings. RR enables



Reproducible research benefits all stakeholders, avoids confusion, and eliminates redundancy.

researchers to understand, replicate, and validate their experiments, thereby ensuring that their results are not products of unique conditions and are generalizable to different systems. Accessible methods and datasets also benefit other researchers in performing further research, thereby strengthening the experimental evidence.

Fueled by advances in technology, RR is a vast and rapidly growing topic. However, some simple steps can be implemented to achieve the holistic goals of RR. For example, research components, such as model development, data analysis, statistical procedures, data visualization (graphs and tables), and textual outputs (articles, slides, and posters), can be developed using open-source tools that promote RR. Here are some examples:

Open-access datasets: Making datasets accessible allows other researchers to conduct post hoc examinations to validate the original findings. All datasets should be shared—not just the positive or significant ones. This openness and accountability enhance the quality, adaptability, and reliability of research.

Reproducible methods: Sharing methods and experimental designs, for successes and for failures, also benefits other researchers. Exchanging information promotes the standardization of best practices, benefitting everyone in the field. When researchers share their methodologies, they facilitate greater scrutiny and discussion, leading to general improvements in research design and implementation.

Templates: The use of standard templates adds coherent structure to documents, presentations, and analytical techniques. In addition to simplifying the documentation process, templates help ensure that the research is well-documented, uniformly formatted, and easy to reproduce. Key benefits include consistency, streamlined processes, faster collaboration, and minimal errors.

Established standards: Researchers are well-guided by established standards, ensuring high integrity from data collection to reporting, which helps to ensure reproducibility. Adhering to these standards allows researchers to focus on their research, without being hindered by procedures that are best left to standards.

Code repository: Accessible repositories, such as GitHub and Kaggle, serve as a centralized platform for researchers to share, store, and manage their source codes, models, visualization processes, and other documentation.

Best practices for RR

Kohrs et al. (2023) provide eleven strategies for reproducible research and open science (RROS) training in research institutions: (1) adapt the curriculum to RROS training, (2) mandate RROS in undergraduate and graduate theses, (3) incorporate RROS practices in research assessment, (4) offer RROS courses, (5) integrate RROS skills into courses, (6) provide hands-on training, (7) conduct educational interventions, (8) perform meta-research studies, (9) organize journal clubs, (10) create resource hubs, and (11) connect individuals involved in RROS practices.

Guided by these general strategies, it would be feasible to develop specialization-specific RR strategies, such as for agricultural engineering. As an example, Griffith University developed a nine-item checklist for electronic services in research: (1) documentation, (2) file naming, (3) folder structure, (4) automation, (5) version control, (6) cloud backups, (7) security, (8) de-identification, and (9) object IDs. This checklist can help ensure consistent documentation, discoverability, and reproducibility.

Open-source tools

To benefit from the RR solution and adopt best practices, the tools employed must be capable, accessible, and of high quality. Many open-source tools meet these criteria and often surpass the capability of the status quo tools. These open-source tools are popular due to their free-to-use philosophy and easy accessibility. Documentation tools such as LaTeX, combined with R or Python, can create documents (e.g., articles, reports, presentations) with tables, equations, figures, and bibliographies. When RR is conducted using these tools, access to research documents becomes straightforward, reducing ambiguity, facilitating collaboration, and enhancing replicability.

Data management repositories such as GitHub and Kaggle facilitate global sharing of research. R and Python are used for analyzing and visualizing large datasets, ensuring that the results are reproducible without compromising the quality. These tools use English-like codes (for commands and text) that are human-readable, easy to follow, and reproduce the analysis or output.

Benefits to the research community

RR benefits the research community by sharing datasets, codes, methods, and results, leading to progress in methodological development and innovation. In particular, RR enables new users to learn from experienced researchers. For example, graduate students who are new to research can access the details of published work, allowing them to learn the methods, perform the tests, and validate the results. This helps them understand the concepts and motivates them to pursue their own research with confidence.

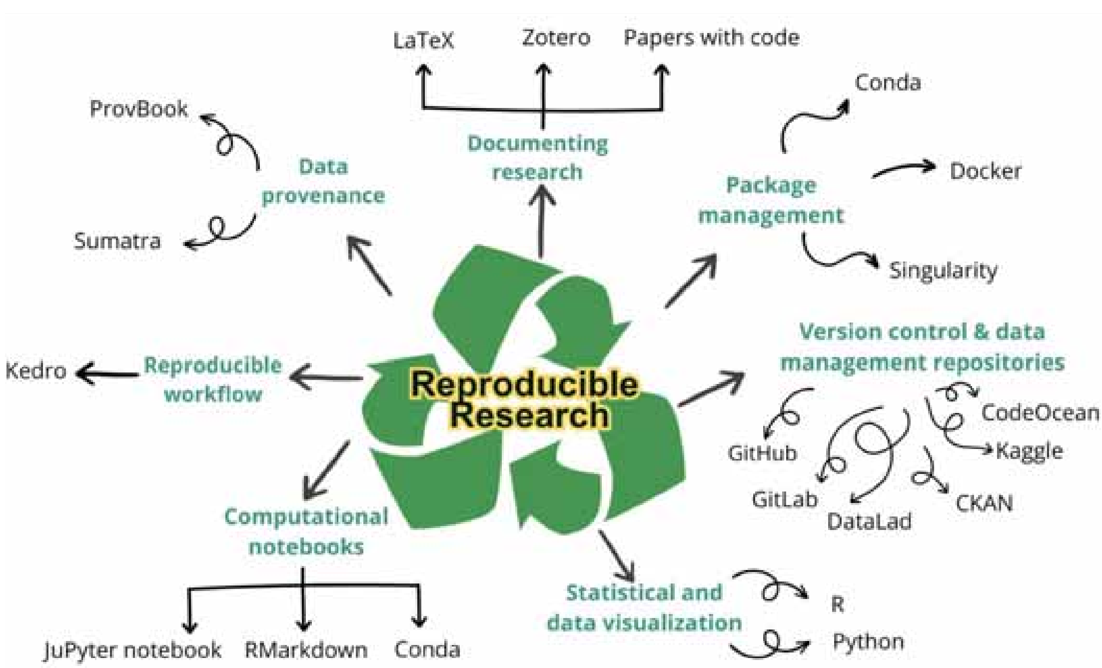
RR also enhances trust and credibility within the research community. It underscores the importance of sharing methodologies, datasets, and codes as a professional responsibility. Providing access to methodologies allows critical analysis and validation before publication. Reproducing published research strengthens the findings and validates the conclusions drawn from the earlier study. Most of all, RR allows researchers to learn from others' mistakes.

The final word

In this data-driven era, RR is essential for advancing agricultural science and engineering. Along with the increase in technological complexity, our research methods and communication practices must also advance to efficiently capture what is known and what is to be done, dispelling doubts and avoiding redundancy.

RR should be viewed as an academic practice that guides students and professionals in conducting research and publishing their findings in a consistent manner, avoiding unnecessary distraction and duplication, focusing on the problem at hand, and optimizing their often limited resources. Academics and research institutions must recognize the need for reproducibility and adopt RR principles that enable others to recreate, test, and validate their results.

This can only be achieved if researchers are willing to share their methodologies, datasets, and source codes with others, so the research community must encourage such activities. Open-access datasets, standardized methods, and published templates can be efficiently implemented through high-quality, open-source tools for



Most popular examples of open-source tools that promote reproducible research.

building a strong foundation for further research and scientific innovation.

For researchers in agricultural and biological engineering, applying RR principles will enhance the rigor and impact of our work, benefiting all stakeholders in efficiently addressing the global challenges.

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ASABE member Igathinathane Cannayen, Associate Professor, Department of Agricultural and Biosystems Engineering, North Dakota State University, Fargo, USA, i.cannayen@ndsu.edu.

Further reading

Alston, J. M., & Rick, J. A. (2021). A beginner's guide to conducting reproducible research. Bulletin of the Ecological Society of America, 102(2), e01801. https://doi.org/10.1002/bes2.1801

Barba, L. A. (2022). Defining the role of open-source software in research reproducibility. *Computer, 55*(8), 40-48. https://doi.org/10.1109/MC.2022.3177133

Freedman, L. P., Cockburn, I. M., & Simcoe, T. S. (2015). The economics of reproducibility in preclinical research. *PLoS Biology, 13*(6), e1002165. https://doi.org/10.1371/journal.pbio.1002165

Griffith University. (2020). 9 Reproducible research things: A checklist for researchers. Queensland, Australia: Griffith University Library, eResearch Services. https://gueres lib.github.io/Reproducible-Research-Things/2020-12-07_nine-reproducible-research-things.pdf

Igathinathane, C. (2024). Open-source software for agricultural engineering. *Resource Magazine* (May/June), 8-11. St. Joseph, MI: ASABE.

Kohrs et al. (2023). Eleven strategies for making reproducible research and open-science training the norm at research institutions. Cambridge, UK: eLife Sciences Publications. https://doi.org/10.7554/eLife.89736

McLellan, M., Brannon, P., Campa, A., Daley-Laursen, S., Kannan, G., Olson, N., & Thilmany, D. (2016). Reproducibility and rigor in REE's portfolio of research. Technical report. Washington, DC: USDA Science Advisory Council. https://doi.org/10.13140/RG.2.2.24369.17761

Peng, R. D., & Hicks, S. C. (2021). Reproducible research: A retrospective. *Annual Review of Public Health,* 42, 79-93. https://doi.org/10.1146/annurev-publhealth-012420-105110

Sileshi, G. W. (2023). Analytic transparency is key for the reproducibility of agricultural research. *CABI Agriculture and Bioscience, 4,* article 2. https://doi.org/10.1186/s43170-023-00144-8

The Turing Way. (2024). Guide for reproducible research. In: *The Turing Way handbook to reproducible, ethical, and collaborative data science.* https://book.the-turing-way.org/reproducible-research/reproducible-research.

ASABE and Engineers Week

How did you celebrate Engineers Week? Your professional Society celebrated the profession, in part, by sponsoring a special award at the Future City Competition Finals, held during Engineers Week in February in Washington, DC. The competition challenges middle-school teams to dream of a city of the future and leverage all of the engineering components that will make it a wonderful place to live.

Thanks to these ASABE members from the Maryland/DC section, who served as our judges (*from left*): National Agricultural Engineer (ret.) **ASABE Fellow Wayne Bogovich, P.E.,** National Agricultural Engineer **J'Que Jones,** and National Energy Engineer **Terri Ruch, P.E.**

ASABE's special award recognizes the team that presents the Most Sustainable Food Production System. This year's winner was the Pui Ching Academy team from Macau, who impressed our judges by using multiple innovative solutions to sustainably feed its population. Our judges also liked their use of wind turbines that pulled moisture out of the air.

Learn more about Future City competition at www.futurecity.org.

Pui Ching Academy, in Macau, earned ASABE's special award for Most Sustainable Food Production System.

The ASABE Foundation

Engineering a Foundation of Philanthropy

The ASABE Foundation continues to build its brand as the philanthropic arm of ASABE. From donor relations to funding opportunities for the next generation of agricultural engineers, the Foundation is at the center of the conversation between donors who want to make a difference and opportunities within ASABE for networking and professional development, outreach and education, as well as innovative projects and strategic initiatives.

Here is a summary of some recent Foundation activities:

Past Presidents Challenge

The ASABE Foundation raised more than $100,000 through the Past Presidents Challenge, which was held during October through December of 2024. These funds will support a variety of Foundation efforts to further the Society's mission of promoting engineering in food, water, energy, fiber, and the environment. This achievement speaks volumes about the commitment of ASABE members and supporters to agricultural and biological engineering.

Financial planning for engineering professionals

The recent Foundation Member Hour on Financial Planning Fundamentals for Engineering Professionals was a valuable resource for members looking to navigate their financial future. This session covered topics such as retirement planning, investment strategies, and estate planning tailored specifically for professionals in engineering. The attendees left with actionable insights and a deeper understanding of how to manage their finances for long-term success. These educational opportunities are just one way the Foundation supports ASABE members beyond traditional engineering expertise (available at www.youtube.com/watch?v=aC3TuTmU6iI).

KEYS Fund brings future leaders to AETC

Through the KEYS Fund, students had the opportunity to attend the 2024 Agricultural Equipment Technology Conference (AETC) in Louisville, Kentucky. At the conference, the students engaged with industry leaders, gained hands-on experience, and had access to invaluable networking opportunities. This experience contributes to the development of the next generation of agricultural engineers.

Connecting funding sources with ASABE priorities

The ASABE Ambassadors group is working to match funding sources with the Society's priorities. Their efforts ensure that resources are directed toward initiatives that support student awards, meetings, special projects, and more. This collaboration helps maximize the impact of ASABE's programs and ensures that the most pressing needs are addressed.

A special event at the 2025 AIM

An exciting new event, the Friends of the Foundation Murder Mystery, will take place at the 2025 Annual International Meeting (AIM). This event will raise funds for the Circular Bioeconomy Systems Institute (CBSI), one of ASABE's important new strategic initiatives. This event is an opportunity to support ongoing efforts to address the challenges of sustainability in agriculture. Enrollment is limited, so be sure to add Friends of the Foundation tickets to your 2025 AIM Registration.
Here are the details for the event:

Date: Tuesday, July 15 (doors open at 6:30 p.m., dinner at 7:30 p.m., followed by entertainment until 9:30 p.m.).

Location: Arcadian Loft, 8th Floor, Simpson Tower, 401 Bay St., Toronto.

A limited number of free tickets are available for students, please contact metts@asabe.org for details.

You can make a difference!

There are many other ways to support the philanthropic efforts of the ASABE Foundation. Engage with the Foundation on social media, attend a Foundation Member Hour, introduce your employer to the mission of ASABE, join in committee work, or make a contribution to a fund. Together, we can engineer a better tomorrow!

Liz Metts, Director of Development, ASABE, St. Joseph, Michigan, USA, metts@asabe.org.

March/April 2025

update

Getting a grip on automated blackberry harvesting

In brief: *Hand-harvesting of delicate blackberries is labor-intensive. Technologies developed by researchers at Mississippi State University could help automate this tedious process.*

Many agricultural crops are picked by machines, and **ASABE member Xin Zhang,** assistant professor in MSU's Department of Agricultural and Biological Engineering, is working to do the same for blackberries, taking this high-value specialty crop from special handling to robotic harvesting.

At MSU's Mississippi Agricultural and Forestry Experiment Station, Zhang and her team are developing a blackberry detection and localization system for a robotic harvester that is powered by an innovative, AI-driven, deep learning approach.

As the team develops this critical component of the blackberry harvester, their partners at Georgia Tech are working on a soft-touch robotic arm and gripper and a bipedal mobile platform. The prototype gripper is equipped with sensors located at the ends, like tiny fingertips, that allow it to grasp and pick blackberries without damaging them. A third team at the University of Arkansas is focused on post-harvest fruit analysis.

The perception system designed by Zhang and her team is powered by YOLO, a vision-based object detection model that identifies and locates objects of interest—in this case, ripe blackberries—quickly and accurately. This technology is powerful enough to support robots, surveillance systems, and self-driving cars.

The team trained a series of YOLO models to identify each blackberry on a bush and determine each berry's level of ripeness based on color, from unripe (green) to ripening (red) to ripe (black). The training process used more than 1,000 images from plant canopies in various commercial orchards and prepared the model to identify single ripe berries for harvest while keeping track of other berries in preparation for the next round of picking.

"Our focus is on detecting ripe blackberries, but we added the other two ripeness categories to provide a total berry count," said Zhang. "This way, the model identifies harvest-ready berries and also provides an estimate of the total harvest."

During tests with multiple configurations and variants, the best-performing model was 94% accurate in identifying ripe berries, 91% accurate for ripening berries and 88% accurate for unripe berries. It also detected impressively high-resolution images in real-time at 21.5 ms per image.

"The perception system identifies each ripe berry and sends its 3D coordinates, including distance, to the robotic arm, which uses that information to reach out and pick the berry," said Zhang. "It's critical that the

Researchers at Mississippi State University, in collaboration with Georgia Tech and the University of Arkansas, have developed a robotic blackberry picker (*photo by Anthony Gunderman, Georgia Tech and University of Arkansas System Division of Agriculture*).

perception system communicates quickly and accurately with the arm and gripper system."

In addition to the blackberry harvester, Zhang and her team are developing a mobile app based on their image detection system. "The app is a separate project, but it would give growers a quick and easy way to forecast their total harvest at the beginning of the harvest season so they can quickly adjust their marketing strategy," said Zhang.

For more information, contact **Meg Henderson,** mjm419@msstate.edu.

Improving energy efficiency for grain elevators

In brief: *Grain elevators have evolved enormously since the 1900s, when they became common practice for grain storage and cleaning. The first modern grain elevators were powered by steam engines. Now, they're electric, which allows faster processing time. But what's the next step in efficiency?*

ASABE member Younus Bhuiyan Sabbir, a doctoral student at Iowa State University, is collecting data on energy consumption at local grain elevators to understand what's next. "All over the world, agriculture contributes to greenhouse gas emissions during harvest processing," said Sabbir. "To find ways to reduce these emission, I'm analyzing the energy use of grain elevators."

Sabbir recently received the Thamodaran Family Innovation in Agriculture Student Award for his research proposal. This award provides funding to bring innovative agricultural solutions to reality through research and development.

ASABE member Younus Bhuiyan Sabbir is looking for ways to reduce energy consumption at grain elevators.

"Lots of factors are involved in determining how to improve the grain storage process," said Sabbir. "Defining the energy needs of grain elevators will help us find suitable alternatives for powering the elevators and move toward achieving net-zero carbon emissions in agriculture."

Sabbir works with **ASABE members Dirk Maier, Tom Brumm, Kurt Rosentrater, and Carl Bern,** all faculty members in ISU's Department of Agricultural and Biosystems Engineering. Together, the team has vast experience in grain elevator design and operation, which is needed to challenge the status quo.

Sabbir does his research at ISU's Kent Feed Mill, where he also supports in-house grain processing and assists in teaching feed technology in the Iowa Corn Education Building next door. He works with the processes he is striving to improve every day.

"The Kent Feed Mill and Grain Science Complex give students access to experiences that they wouldn't otherwise have in their course material," said Sabbir. "This is a space for them to get hands-on training in feed and grain processing before they enter the industry."

For more information, contact **Anna Keplinger,** annakep@iastate.edu.

New research shows how to mitigate nitrogen runoff from grazing land

In brief: *Livestock production is an important component of U.S. agriculture, with global demand for meat and dairy expected to double in the coming decades. This increase will lead to intensified grazing, potentially exacerbating water quality degradation from livestock waste runoff into waterways.*

A new study from the University of Illinois Urbana-Champaign examines the combined influence of grazing and climate on the outflow of nitrogen from pastures into water resources under different grazing schemes. The researchers conclude that climate conditions can mitigate the effects of grazing on water quality, and that producers should consider the weather when making management decisions.

"The goal of this research is to identify factors that affect the transport of nitrogen into nearby water bodies and determine the right combination of stocking rate, grazing duration, and precipitation to maximize production while minimizing nitrogen transport," said **ASABE member Maria Chu,** associate professor in U of I's Department of Agricultural and Biological Engineering.

The researchers developed a model that simulated nitrogen transport from livestock grazing under different climate conditions. They evaluated the model using data from the USDA-ARS Oklahoma and Central Plains Agricultural Research Center. They collected data on

A new study suggests ways to mitigate nitrogen runoff from grazing land by aligning management decisions with local weather.

land use, soil moisture, precipitation, temperature, and evapotranspiration, as well as water quality in the area.

The modeling framework featured seven different grazing schemes, including continuous and intermittent grazing implemented at low, recommended, and high stocking rates. The scenarios also included varying precipitation conditions at the time of grazing, from low to heavy rainfall events. For each scenario, the researchers estimated the total nitrogen concentration in the overland flow.

"Our results suggest that the impact of grazing on nitrogen loss cannot be generalized," said **ASABE member Jeric Sadsad,** a doctoral student and lead author of the paper. "It's not always true that more cattle in the field leads to greater nutrient loss. Nutrient loss also depends on the prevailing weather conditions during grazing,"

While factors like stocking rate, grazing duration, and grazing frequency are critical, their influence on nutrient outflows can be minimized if the management decisions are aligned with the prevailing climatic and hydrologic conditions in the pasture, Sadsad noted.

"In the future, there will be an increasing demand for livestock production due to the increasing global population," said Sadsad. "Expected increases in heavy rainfall and other extreme weather events will also affect the transport of nitrogen into water bodies."

"One application of our research is to implement flexible or adaptive grazing schemes that incorporate weather forecasting into the decision-making process," said Sadsad. "For example, if there's substantial rainfall, producers should reduce the number of animals that are allowed to graze in the area during that time to reduce nutrient runoff."

The researchers recommend a strategy that matches grazing activities with prevailing weather patterns to increase livestock production while promoting environmental sustainability. "Management tools, like the model we've developed, can help livestock producers achieve a sustainable balance by implementing practices that maximize productivity while minimizing their environmental footprint," said Chu.

For more information, contact **Marianne Stein,** mfstein@illinois.edu.

How thirsty are your crops?

In brief: *Researchers use massive scales to study crop water use.*

People who grow plants know that potting flowers or putting vegetables in a raised bed can yield great results. But what can you accomplish with containers that hold over 85,000 pounds of soil? For a group of ARS scientists in Bushland, Texas, the answer is quite a lot, as they use the enormous metal boxes to directly measure how much water crops are using. With that information, they can produce remarkably accurate recommendations on how much farmers should irrigate, providing a vast improvement over existing estimates.

The containers in question are called weighing lysimeters, and today, four of them sit embedded in a 48-acre field at the ARS Conservation and Production Research Laboratory in Bushland. The lysimeters date back to the late 1980s; the original builders planned to use them for 10 years of research to develop regional crop coefficients, which estimate crop water use for different crops using weather data. But today, researchers continue to grow crops inside and in the fields around the lysimeters, allowing them to measure all kinds of climate and agronomic variables for the soil and plants within the containers. The variable of greatest interest is crop water usage.

The lysimeters, each measuring 10 × 10 × 8 feet deep, sit on scales that record the entire mass of the soil and plants inside them over time, including the amount of water added either by irrigation or rainfall and water used by plants, which is returned to the atmosphere in a process known as evapotranspiration (ET). By tracking the changes in mass throughout the growing season, scientists can accurately determine how much water crops use and, in turn, how much they truly need. This knowl-

A new study suggests ways to mitigate nitrogen runoff from grazing land by aligning management decisions with local weather.

edge represents a significant improvement over alternative methods for estimating crop water needs.

According to **ASABE member Gary Marek,** a Research Agricultural Engineer at the Soil and Water Management Research Unit in Bushland, many producers look to soil water sensors to monitor crop water use. Those sensors vary in complexity, and according to Marek, data from some sensors can be difficult to interpret because of their technical nature, while others can be inaccurate.

"Many sensors can give you an indication of whether you're low or high on soil water," he said, but "precision scheduling is challenging."

Accuracy matters since estimates that come up short could reduce yields or even kill crops, and those that call for more water than needed risk drawing down a critical resource, at an added cost to the farmer who pays to pump the water.

With the lysimeters, Marek said, "We have 40 years of data for nine different crops, and it's really valuable because it's highly accurate crop water use data, and we measure a suite of parameters—everything you'd want to know agronomically."

Early research using the lysimeters compared crop water use under dryland and sprinkler irrigation systems, but today, the researchers compare different irrigation systems. Since 2013, a major focus of their research has been comparing crop water usage under sub-surface drip irrigation (SDI) and sprinkler irrigation systems. Importantly, seasonal crop water use with SDI is as much as five inches less than for sprinklers, while crop yields remain the same or sometimes increase with SDI. The lack of soil surface wetting with SDI means less evaporative loss and decreased weed pressure during the season.

The researchers are also comparing ET measurements from lysimeters to those estimated using a commonly used instrument called an eddy covariance (EC) system, which uses high-frequency measurements of meteorological conditions. Results indicate that the EC systems often underestimate daily ET values from the lysimeters by more than 20%, highlighting the need for improved accuracy of alternative ET estimation systems. These results also call into question current satellite-based ET estimates because the satellite systems are mostly trained on EC system ET data and thus could deliver underestimates of ET.

While the lysimeters in Bushland are not the only ones in existence, they are among the largest and best-maintained, according to Marek. He and his team plan to apply them to another topic of increasing importance in their region: limited irrigation for forage crops, especially alfalfa. As conditions become drier and water becomes more scarce, local dairy and cattle producers cannot justify the cost of importing water-heavy forages and are interested in ways to grow them locally. Lysimeter data might help them determine how best to do that in an area where they can't always provide the crop with the full complement of water it needs.

In all of their research endeavors, Marek said, "Our main goal is to help the farmer maintain profitability as our water resources decline because there are a lot of people who have to make a decision: 'How am I going to keep going? I have to make this work.'"

For more information, contact **Kathryn Markham,** ARS Office of Communications, Kathryn.Markham@usda.gov.

Recapping the 2024 Global Collaboration Webinar Series

Roselle Barretto, Rania Marie Buenavista, Jaden Tatum

In an increasingly interconnected world, the challenges we face—from food insecurity and climate change to sustainable development—demand global solutions. To address these challenges, collaboration among graduate students and young professionals in agricultural and biological engineering is not just beneficial—it's essential.

The 2024 Global Collaboration Webinar Series, hosted by the YPC Global Engagement Committee, emphasized the significant potential of such partnerships. By presenting insights from leading experts, tools for effective collaboration, and strategies for building sustainable partnerships, the series provided a path forward for aspiring global changemakers.

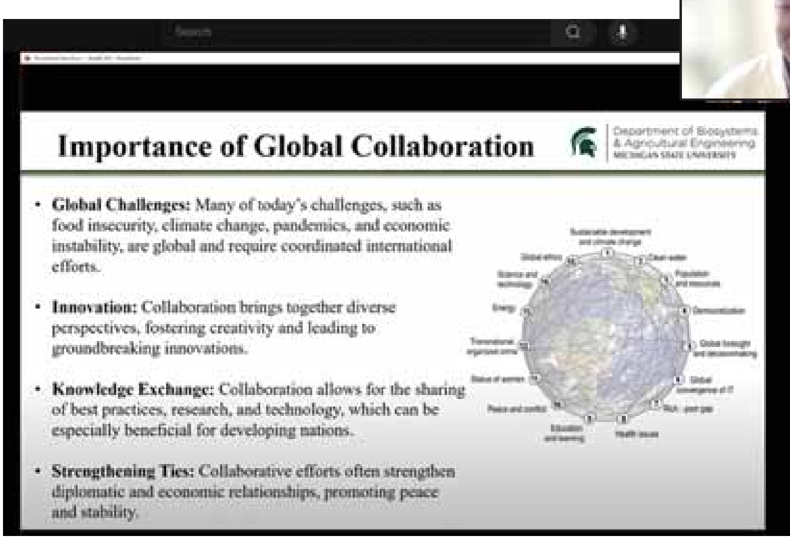
The case for global collaboration

The foundation of global collaboration lies in addressing shared challenges with innovative solutions. As **ASABE Fellow Kasiviswanathan Muthukumarappan** and **ASABE member Daniel Uyeh** highlighted during the first webinar ("Introduction to Global Collaboration in Agricultural and Biological Engineering"), collaboration across borders is vital to tackling issues like food insecurity, climate change, and resource management.

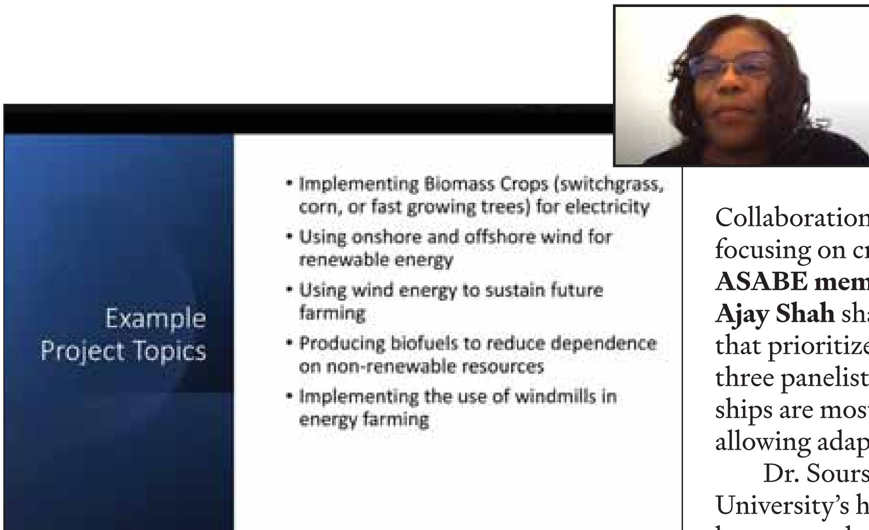
For example, the development of golden rice, which is enriched with vitamin A to combat malnutrition and was pioneered by the International Rice Research Institute in the Philippines, demonstrates how global expertise can converge to address a critical issue.

In addition, Dr. Uyeh emphasized the role of global collaboration in advancing precision agriculture through the use of diverse datasets, which enhance the development of robust decision-making tools. However, challenges such as time zone differences, language barriers, accreditation issues, and cultural nuances can hinder progress. The speakers shared how building trust, establishing clear communication, and aligning goals are critical to overcoming these barriers.

Because agriculture is multifaceted, cross-industry partnerships can drive innovations across different sectors. For instance, the technology sector has made significant contributions to the agricultural sector through advances in precision farming, automation, and data analytics, which have led to more efficient resource management and real-time decision-making. Similarly, the renewable energy sector has enabled clean energy solutions in irrigation systems and other farming operations through solar-powered equipment and processing systems.



ASABE member Daniel Uyeh spoke about the importance of global collaboration in the first webinar.



In the second webinar, Lila Carden introduced project management frameworks and technologies that help overcome the challenges of working across different time zones and cultural contexts.

Tools and technologies: Bridging the distance

Effective collaboration is as much about leveraging the right tools as it is about shared vision. In the second webinar ("Tools and Technology for Global Collaboration in Agricultural and Biological Engineering"), Dr. Lila Carden, Associate Professor in Technology Project Management at the University of Houston, introduced project management frameworks and technologies that are designed to overcome the challenges of working across different time zones and cultural contexts. Tools such as Microsoft Project and structured communication plans were highlighted as critical for managing resources, timelines, and budgets efficiently.

Dr. Carden also underscored the importance of project charters, which provide clarity on objectives, scope, and team responsibilities. These documents are foundational for aligning team members and ensuring project success. For sustainable agriculture projects with global environmental goals, additional management considerations, including sustainability activities, risk management, and structured communication, were emphasized as key components of success.

In addition to these project management tools, Microsoft Teams and other collaborative platforms also play a vital role in connecting teams across continents. These tools facilitate real-time communication, ensuring that all stakeholders remain informed and engaged despite their geographical separation.

Building sustainable partnerships

The final webinar ("Building Sustainable Partnerships for Global Collaboration") brought the discussion full circle by focusing on creating long-term, impactful partnerships. **ASABE members Patrick Sours, Manuel Reyes, and Ajay Shah** shared strategies for building relationships that prioritize community needs and sustainability. The three panelists noted that sustainable global partnerships are most successful when they span many years, allowing adaptation and continuity.

Dr. Sours shared the impact of Ohio State University's humanitarian engineering program, which has engaged more than 250 students since 2015 in addressing real-world projects in countries including Honduras, Tanzania, and Ghana. In Honduras, students collaborated with local partners such as AguaClara Reach and Agua Para el Pueblo to implement 25 passive gravity-based water treatment plants serving over 100,000 people. This initiative highlighted the importance of local collaboration, cultural awareness, and integrating community needs into project planning.

Dr. Reyes highlighted conservation agriculture efforts in the Philippines and Cambodia, where accredited training centers, such as the Conservation Agriculture with Trees Learning Center (located in Claveria, Misamis Oriental, Philippines) and the Center of Excellence in Sustainable Agricultural Intensification and Nutrition (located at the Royal University of Agriculture Khan Dangkor, Phnom Penh, Cambodia), have institutionalized sustainable practices such as minimal soil disturbance and diverse cover crops. These projects engaged local scientists and farmers, demonstrating how local capacity-building fosters long-term sustainability.

In the final webinar of the series, **ASABE member Manuel Reyes** highlighted conservation agriculture efforts in the Philippines and Cambodia.

ASABE member Ajay Shah shared a transformative project in Tanzania in the final webinar.

Dr. Shah shared a transformative project in Tanzania, where repurposed 55-gallon drums were designed as integrated grain drying and storage systems. This innovation created hermetic conditions at low cost, reducing significant post-harvest losses while being competitive in productivity and affordability.

Key strategies for building sustainable partnerships include institutionalizing projects by engaging government and private sectors to ensure long-term impact without ongoing external funding. Metrics such as community health improvements, enhanced educational opportunities, consistent legal and regulatory compliance, and economic growth were emphasized as essential indicators of success.

Two-way communication, cultural sensitivity, and respect for local customs were repeatedly stressed as vital for fostering trust and ensuring project alignment with community priorities. These elements enhance collaboration and help embed projects within local systems for lasting impact.

Charting the path forward

Mentorship and networking play pivotal roles in fostering global collaboration. The webinar series emphasized the value of mentorship programs and professional associations in helping young professionals establish credibility and access opportunities.

By connecting with experienced researchers and practitioners, early-career professionals can gain insights, build confidence, and expand their networks. Networking events, both virtual and in-person, serve as platforms for exchanging ideas, exploring funding opportunities, and identifying potential collaborators. These connections can pave the way for joint research projects, cross-cultural exchanges, and innovative solutions to shared challenges.

As global collaboration becomes more prevalent, ethical considerations must remain at the forefront. Researchers and professionals must uphold principles of equity, transparency, and respect for cultural diversity. Addressing power imbalances, ensuring equitable resource distribution, and nurturing mutual respect are essential for maintaining trust and integrity in collaborative efforts.

Additionally, the responsible conduct of research, including data sharing, intellectual property rights, and adherence to ethical guidelines, is critical to the success and sustainability of global projects. By prioritizing these values, young professionals can contribute to a culture of accountability and inclusivity.

The 2024 Global Collaboration Webinar Series offered a roadmap for graduate students and young professionals who are eager to make a difference. From understanding the fundamentals of collaboration to mastering the tools and strategies needed for success, the series equipped participants with the knowledge and inspiration to tackle pressing challenges through collective action.

“The webinar series emphasized the value of mentorship programs and professional associations in helping young professionals establish credibility and access opportunities.

As the next generation of leaders in agricultural and biological engineering, young professionals have the opportunity to drive transformative change. By embracing global collaboration, we can break down barriers, bridge gaps, and build a more sustainable and equitable future. The world is ready to see what we can achieve together.

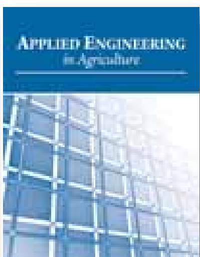
Recordings of the three webinars are available on the ASABE YouTube page at www.youtube.com/@AgBioEngineers.

ASABE member Roselle Barretto, YPC E-2050 Global Engagement Representative, YPC Global Engagement Committee chair, and AMAA Youth Representative, Kansas State University, Manhattan, Kansas, USA, rosellebarretto@ksu.edu; **ASABE member Rania Marie Buenavista,** YPC Global Engagement Committee member, Kansas State University, Manhattan, Kansas, USA, rania@ksu.edu; and **ASABE member Jaden Tatum,** YPC Global Engagement Committee member, USDA-ARS, Fort Collins, Colorado, jaden.tatum@usda.gov.

ASABE Journals

Recent research from our publications

ASABE has been a trusted source of authoritative research for well over a century. Our peer-reviewed journals contain pioneering research in ag and bio engineering. Here are some highlights from our most recently published journals. All journal articles are available free of charge as a member benefit at elibrary.asabe.org/toc.asp. ASABE members are in bold type.



Applied Engineering in Agriculture

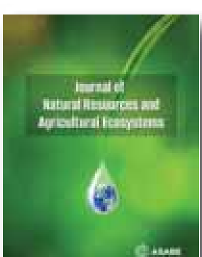
Vol. 41(1), 37-41
doi.org/10.13031/aea.16164

Effect of Dimming Wave Characteristics on LED Lamp Performance during Early Operational Life

Joseph L. Purswell, Matthew R. Rowland, **Jeremiah D. Davis, Jesse C. Campbell,** Klinton McCafferty, **Cody R Smith**

Highlights

- Dimming waveform (leading edge, trailing edge, hybrid) did not affect lamp lumen depreciation in LED lamps used in poultry housing applications.
- From Flock 2 to 10, the rate of luminous flux decrease was not significantly different (P > 0.05) among waveform treatments and were -11.7, -12.7, and -14.2 lumen/flock for the leading edge, trailing edge, and hybrid waveforms, respectively.
- No lamp failures were recorded during this experiment, indicating that sources of catastrophic failure in commercial broiler house applications are likely due to the housing environment or quality of power distribution.



Journal of Natural Resources and Agricultural Ecosystems

Vol. 2(4), 213-225
doi.org/10.13031/jnrae.16057

Context-Dependent Macroinvertebrate Responses to Prolonged Biological and Chemical Treatment in Urbanized Lentic Ecosystems

Matthew Chaffee, **Aaron R. Mittelstet,** Steven Comfort, **Tiffany Messer,** Daniel R. Uden, Jenna McCoy

Highlights

- Treatment improved water quality at Densmore Pond but not Wilderness Ridge Pond.
- Macroinvertebrate populations showed context-dependent patterns from FTW treatment.
- FTWs acted as refugia for ponds with eutrophic conditions.
- Macroinvertebrate predator species diversification increased at Densmore Pond.

Journal of the ASABE

Vol. 68(1), 13-24
doi.org/10.13031/ja.16108

Detection of Woody Breast Condition in Broiler Breast Fillets Using Light Scattering Imaging

Jiaxu Cai, **Yuzhen Lu**

Highlights

- Broadband light scattering images were acquired from broiler breast fillets affected with woody breast (WB).
- Both deep-learning-based and hand-crafted features were extracted from scattering images for model development.
- The hand-crafted scattering image features performed better in differentiating normal from WB-affected samples.
- An overall accuracy of 92.3% was achieved by the model based on selected hand-crafted scattering features.

Journal of Agricultural Safety and Health

Vol. 31(1), 15-30
doi.org/10.13031/jash.16111

Developing Effective Protocols to Protect Farmworkers from Heat Stress and Illness While Working in Polytunnels

Isabella Kaser, Maripaula Valdes-Berriz, Annemiek C. Schilder, Maureen McGuire, Catherine Carpenter, Ellen Brokaw, Michael Dimock, Gina M. Solomon

Highlights

- Farmworkers are at high risk of heat-related illness, especially those working in polytunnels.
- There is a gap in knowledge regarding working conditions inside polytunnels.
- Polytunnels are prevalent in California's Central Coast region.
- Recommendations to reduce the risk of heat-related illness among workers in polytunnels were formulated.

I wouldn't BE ME without ASABE

Amy Kaleita

Professional Engineer
ASABE member since 1995
Professor and Chair
Department of Agricultural and Biosystems Engineering
Iowa State University
Ames, Iowa USA

I joined ASABE in 1995 or so. Back then, ASABE was known as ASAE, and I was an undergraduate at Penn State who needed a copy of the *ASAE Standards* to use in some of my classes. This was back when the Standards were available as a bound book, and joining ASAE seemed like a smart way to get an affordable copy.

At the time, I thought I was just "using" the Society to get a book that I needed for my classes, but of course the Society has given me much more than that!

How has an ASABE member inspired you?

Harvey Manbeck, who has been retired for a number of years, and **Dennis Buckmaster,** who's now at Purdue, were both Penn State faculty at the time, and they did a couple of amazing things for me very early on.

First, in the summer before my senior year of high school, they ran an outreach program for prospective college students that opened my mind to the possibilities in engineering, specifically agricultural engineering. Until then, I'd never heard of agricultural engineering, and I certainly didn't know that it was a major that I might find interesting.

The second great thing that Harvey and Dennis did for me was when I was a student in their department. Toward the end of my degree program, they encouraged me to try teaching, and they hired me as an undergraduate TA. That really sparked my interest, and teaching became my career.

In graduate school and beyond, I've had many amazing mentors and inspiring colleagues, from my PhD advisor **Mike Hirschi** to colleagues at Iowa State like **Steve Hoff, Jay Harmon, Ramesh Kanwar, Steve Mickelson, Carl Bern, Tom Brumm,** and **Raj Raman**—all them members of ASABE.

I know that sounds like a lot of people, and it is. One of the best parts of being involved in ASABE is the access to a community of passionate people who are willing to invest their time in helping others.

I have also had ASABE colleagues who opened my eyes to different ways of making the world better: **Candy Engler, Dana Porter, Paul Heineman, Alex Thomasson,** and **Deepak Keshwani,** to name just a few. Each of them has given me new ideas and inspiration, and helped me discover what I can bring to ASABE and to our profession.

On a site visit to a stream channel with (*back left to right*) ASABE members Matt Helmers and Carl Bern, and (*right*) our colleague Sara McMillan.

That's me on the right with **ASABE members Kurt Rosentrater, Josh Peschel, and Gretchen Mosher** at the 2023 AIM in Omaha.

Checking out the Pop Tarts Bowl trophy with my family before an ISU basketball game.

> One of the best parts of being involved in ASABE is the access to a community of passionate people who are willing to invest their time in helping others.

What was your first Annual International Meeting?

I attended my first AIM as a graduate student in maybe 2001. When I arrived at the venue, I thought, "All these people seem to know each other already." At that first moment, I felt like an outsider who would never break into the group. I had previously attended the annual conferences of two other professional societies, and I felt invisible at them.

But the AIM was different. Soon after I arrived, people were striking up conversations with me, inviting me into the conversations they were already having, and introducing me to others. It was impossible to be invisible, even if I'd wanted to!

Would you encourage others to attend the AIM?

After several decades of ASABE membership, I've become one of those people who seems to know everybody, and I use that superpower to help others get connected, the same way that other ASABE members helped me. I haven't missed an AIM since the first one I attended. Meet me at the AIM, and I'll help you get connected!

Thanking the ISU Ag Systems Technology Club for servicing my snowblower at their annual snowblower service day.

2025 Agricultural Equipment Technology Conference

What a great event celebrating 30 years! In February, nearly 200 people gathered at the Omni Louisville Hotel in Louisville, Kentucky, to take part in the 2025 Agricultural Equipment Technology Conference (AETC). For 30 years, this conference has focused on the latest advancements in agricultural machinery and technology. It is a great platform for professionals, researchers, and students to discuss emerging technologies and trends in agricultural equipment, fostering collaboration and innovation within the industry. Join us next year—February 8-11, 2026!

ASABE Meetings Manager Jessica Bell is always ready to answer any questions. Here, she chats with **ASABE member Michael Vande Voort.**

ASABE President Doug Otto (*left*) with the winners of the graduate student poster contest. *Second from left to right:* **ASABE members Jacob Sizemore** and **Louie Harris** from Auburn University, and **Eli Barrow** from University of Kentucky.

The CNH Student Sponsorship Reception was a great opportunity for the recipients of the CNH Student Sponsorship to meet and network with CNH professionals.

Benno Pichlmaier (*right*) and Markus Ehrl (*on screen in back*) were presented with certificates of appreciation for their Distinguished Lecture Series on battery electric tractor design principles. **ASABE Fellow Tom Way** (*left*) holds Ehrl's certificate.

ASABE Past President and Fellow Dana Porter encourages students to participate in the ATSM roundtable.

Coffee breaks are essential for colleagues to connect.

Students can answer questions and discuss their research during the poster competition.

30th Anniversary
ASABE Agricultural Equipment Technology Conference | 1995 – 2025

The Student & Industry Social was a big hit! Students and professionals met at Tavern on Fourth to discuss career paths in a relaxed setting. Many thanks to Kondex and the ASABE Foundation Keys Fund for sponsoring the event.

ASABE member and 2025 AETC Chair Cale Boriack, P.E., speaks at the Monday luncheon.

The AE50 Awards Luncheon is a favorite event at AETC. AE50 recognizes the most innovative products in the agricultural industry, highlighting advancements that enhance productivity and efficiency. Above, attendees enjoy their lunch. Below, the plaques are ready and waiting to be in the hands of the winners.

All sessions at AETC have guest speakers and are always well-attended.

Thanks to our sponsors!

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Meet the

ASABE Fellows

Honoring the newly elected

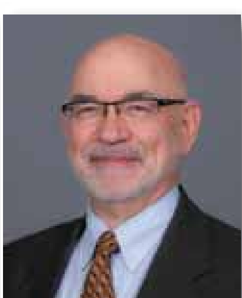
ASABE recognized 11 new Fellows at the 2024 Annual International Meeting in Anaheim, California. In this issue of *Resource,* we highlight four more fellows. Throughout the next few issues we will highlight the rest.

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.

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.

"Election to Fellow is one of the highest distinctions an ASABE member can achieve.

The 2024 class of ASABE Fellows.



Thomas J. Brumm, Professor, Iowa State University, is honored for his professional impacts in engineering and technology education, post-harvest engineering, and international development.

Brumm is the Mary and Charles Sukup Global Professor in Food Security in the Department of Agricultural and Biosystems Engineering at Iowa State University. He is the department's associate chair for teaching, the associate director for ISU's Center for Sustainable Rural Livelihoods, and holds leadership roles in faculty governance across the university. His research involves postharvest technologies for smallholder farmers in low-income countries.

Brumm consistently demonstrates a passion for student learning and well-being. He is consistently ranked highly by students, and he was instrumental in implementing learning communities at ISU. Brumm was professor-in-charge of online learning programs for two colleges at ISU, delivering online coursework and degree programs to thousands of students each semester. For eight years, he oversaw accreditation as the director of assessment for ISU's College of Engineering.

As associate director of ISU's Center for Sustainable Livelihoods, Brumm leads water, sanitation, hygiene, and postharvest technology programs for the ISU Uganda Program, an NGO that works to improve livelihoods in the Kamuli district of Uganda. These programs have resulted in more than 50,000 additional people having access to clean water. Through his efforts, the food supply chain for more than 20,000 school lunches and infant feedings per week is now protected from mycotoxin contamination and insect infestation. Brumm co-leads a university student service-learning experience where students from ISU and Makerere University work together in primary schools in the Kamuli district.

Ann D. Christy, P.E., Associate Dean and Director for Academic Programs in the College of Food, Agricultural, and Environmental Sciences at The Ohio State University, is honored for her outstanding contributions to the scholarship of teaching and learning and for her leadership in positive academic changes.

As associate dean and director for academic programs, Christy's responsibilities include providing leadership for teaching and learning, recruitment, enrollment, retention, career services, education, and professional growth of the college's undergraduate students, as well as collaborating with faculty on teaching, learning, assessment, and curricular changes and innovations. In this role, she leads the office of academic programs, which consists of more than 20 staff.

Christy's faculty appointment is a joint position between the Department of Food, Agricultural, and Biological Engineering and the relatively new Department of Engineering Education, for which she led the development. As an instructor and advisor, she has been a source of encouragement and inspiration to more than a thousand students. As one of two provost faculty fellows, Christy helped lead the university's conversion from an academic quarter system to a semester calendar. Prior to joining the faculty at Ohio State, Christy worked for an environmental engineering firm doing hazardous waste cleanups, and she continues to collaborate within that industry, serving on the board of directors for a local environmental consulting firm. Throughout her career, Christy has served as an academic change agent, achieving positive change on an institutional scale as well as on an individual scale, one student at a time.

Kyle R. Mankin, Research Leader and Agricultural Engineer, USDA Agricultural Research Service, is honored for his visionary leadership in soil and water engineering for source-water forests, limited-water agroecosystems, and wetland and vegetative systems.

Mankin's diverse career has spanned three years in the space industry, 17 years as a Kansas State University faculty member, three years on the Everglades program team with the U.S. Fish and Wildlife Service, three years as a USGS research hydrologist in New Mexico, and five years with the USDA-ARS in Colorado. His research advances have built on our understanding of fundamental hydrologic processes and added new transdisciplinary methodological and interpretive dimensions to address elusive agro-eco-hydrological problems. Mankin's inspiration and guidance of graduate students and postdocs has shaped a new generation of research leaders, including eight university faculty members and one federal scientist.

Mankin currently leads a team of scientists and engineers in broad research to promote resilient and sustainable water-limited agricultural production systems including mountain-source waters, limited-irrigation crop production, and dryland agricultural systems. He and his team develop simulation models and tools applicable from plant to watershed scales that extend field research and serve as decision support tools for producers, practitioners, and action agencies. His research spans treatment wetlands, wetland ecohydrology, and watershed modeling in forests and croplands. He has participated on influential committees related to Gulf of Mexico hypoxia, Upper Rio Grande water operations, and Everglades operations and water quality.

Michelle L. Soupir, Professor and Associate Dean, Iowa State University, is honored for her significant contributions in the field of water engineering to provide safe, clean water for the global population.

Soupir is a professor in the Department of Agricultural and Biosystems Engineering and associate dean in the Graduate College at Iowa State University. From 2019 to 2022, she served as equity advisor for ISU's College of Engineering. During that time, she led DEI training, established the Women Faculty Network, chaired the college diversity committee, and engaged faculty and students to improve the college and departmental culture. As associate dean of operations in the Graduate College, she is leading continuous improvement efforts to modernize and enhance operations supporting graduate students, postdoctoral scholars, graduate faculty, and support staff.

Soupir's research focuses on the impacts of agricultural practices on water quality, with an emphasis on nonpoint-source pollution control, watershed management, and water quality monitoring. Her research projects encompass multiple scales to answer basic and applied questions regarding the occurrence, fate, and transport of pathogens, pathogen indicators, nutrients, and contaminants of emerging environmental concern, such as antibiotics and antimicrobial resistance to surface and tile systems.

Her current work on denitrifying bioreactors is improving our understanding of carbon substrates to support microbial communities for complete denitrification while minimizing unintended byproducts. Her work connects agricultural practices to public health through watershed-scale monitoring and modeling, and she has been instrumental in tracking the impact of agricultural antibiotic use on downstream waters and broader impacts on public health. Her research has local, national, and international implications.

To the Editor,

I read with interest the essay on Large Language Models (LLMs) and ethics by **Ketan Shende** in the Jan/Feb 2025 issue of *Resource*. He obviously has had more experience with LLMs than have I, but when it comes to his calls for ethical guardrails and eliminating bias in LLMs, I wish that he had expounded a lot more about how he thinks that can happen. Obviously for me at least, the devil is in the details.

Ethics and biasness are both subjective and contextual. They reflect societal norms, but are culturally, temporally, and geographically distributed. Take, for example, the attitudes toward slaves and slavery in America 200-300 years ago. These attitudes varied from moral opposition, to disinterested acceptance, to necessary adoption, to benevolent advocacy, depending a lot on where one lived and what kind of experiences they had had with slaves. This range of attitudes was one of the major stumbling blocks to the creation of the U.S. Constitution.

Ethical behavior can also be fluid at times. Expediency can change some ethical behavior that is not held too deeply. I once would not ever enter a Walmart store because I did not like how they undercut prices at small mom-and-pop shops, and thus put them out of business. And then I found out that a particular type of tub that I needed for my potted citrus trees was only available for me at Walmart. So, despite my lofty objection to the business practices of Walmart, I have gone there several times since. So much for principle.

We have seen lately where expediency and personal interest have also changed the behavioral standards of our politicians and business leaders. Fact-checking programs have been dismantled, and criticisms have been silenced, all because of threats to the status quo of those who feel vulnerable. Everyone, it seems, has their price.

It is not realistic to expect LLMs to be able to detect their own biases or hallucinations, just as it is also sometimes difficult even for humans to see their own faults. Even this statement reflects the judgments of others with their own stated standards. Unless the user of an LLM has some (or, maybe, detailed) knowledge of the subject matter at hand, it is doubtful that the user would be able to detect the validity, or the bias, of an LLM output.

Establishing guardrails on the outputs of LLMs to eliminate blatant bias also has the problem of imposing one set of values on others who may or may not agree to the same value set. And then, it would be expected that those whose ox is gored would protest the most loudly.

Finding a set of values to satisfy everyone is virtually impossible. Why would we expect that we could do better with LLMs than we can with our own brothers and sisters?

It would have been interesting and informative to know what Mr. Shende proposes when he calls for regulatory oversight of LLM interpretations and uses. It is much easier to recommend in generalities than to flesh out the details. That's where the hard work actually lies.

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We Are BioSystems Engineers

Brahm P. Verma

Twenty years ago, in March 2005, we approved changing the name of our society from the American Society of Agricultural Engineers (ASAE) to the American Society of Agricultural and Biological Engineers (ASABE). It's time to rethink who we are and what we call ourselves!

> *Those that fail to learn from history are doomed to repeat it.*
>
> Winston Churchill

I have always thought that we are systems engineers: integrating knowledge from multiple disciplines with practical experience to innovate solutions for life-sustaining systems. Specifically, our systems of interest are those that produce biomass on land, in water, and in the laboratory; synthesize biomass into new products, chemicals, and materials for human needs (e.g., food, feed, fiber, fuel, chemicals, and more); and provide ecosystem services to sustain natural resources. These intertwined life-sustaining systems form complex "systems of systems" that are best characterized as BioSystems. Accordingly, we are BioSystems Engineers. In the following, I share a historical perspective and a rationale for this futurist proposal.

The first seven decades

In the first decade of the 20th century, our profession emerged to address the need to mechanize farm labor. Seven decades later, mechanized tillage, planting, harvesting, and handling of major row crops was at the cusp of completion. A milestone was the successful introduction of the field tomato harvester in 1968. Adoption of these machines in the U.S. and other countries contributed to a remarkable increase in global food production. The National Academy of Engineering (NAE) celebrated this success by listing agricultural mechanization as the seventh greatest achievement of the 20th century, one place ahead of computers, which were listed eighth.

But the decade of the 1970s also brought tension between growers and field workers, who saw their jobs taken over by machines. This tension culminated in a lawsuit, filed on January 17, 1979, by a California Rural Legal Assistance attorney on behalf of 19 farm workers who claimed: "We believe it is a travesty for the government to use tax monies to force people out of work and drive small family farmers off the land" (Gorney, 1979). The lawsuit further claimed that "the university's massive financing of the research that produced these machines constitutes an illegal use of public money."

Perhaps as a result of those events, funding for mechanization research began to dry up, and our profession entered a phase of questioning its purpose, as was experienced by NASA after the first moon landing in 1969: What next?

From the 1980s to 2005

Interest in our profession began to decline, and in the 1980s undergraduate enrollment in agricultural engineering programs plummeted. Programs at some historic Land Grant universities, such as the University of Minnesota, were on the chopping block.

Highlighting that "no subject is more important to the agricultural engineering profession than the future directions and programs of the university departments serving the profession," Don Edwards, department head at Michigan State University, took the lead in organizing a conference for the administrative heads of North American agricultural engineering departments to discuss the future of their departments. This conference was held on October 26-28, 1987, at The Ohio State University (Final Report, 1987).

In his keynote presentation at the conference, titled *The Age of Biology – Impact on Engineering,* ASAE past-president Carl Hall said, “We have had engineering based on physical sciences; we will have an engineering based on biology” (Hall, 1987). Hall’s presentation emphasized that the future of our profession would require giving equal importance to biological sciences in basic engineering as had been given to physical sciences in preparing our students.

Created by Brahm Verma.

Interestingly, half a century earlier, in 1937, the idea that “agricultural engineering is the engineering of biology... based on the energy transformations and transfers conducted by living cells” and that “a methodology and efficiency concept so based would open a new world to the agricultural engineer” was first proposed by C. O. Reed, who was a professor on the campus where we were meeting (Stewart, 1979).

There was considerable discussion on the need to add “bio” to the name of the departments and modify the curriculums, driven by the motivation to increase undergraduate enrollment. However, as departments began to select different names in the following years, a major concern emerged that without a common name and shared core requirements, “our discipline may become fragmented to the extent that its overall vitality and stature will be impaired” (ASAE, 1990). Consequently, ASAE’s Department Head Committee (P-210) held a workshop in St. Louis, Missouri, on April 24-25, 1990, with two objectives: to build consensus on a new name, and to identify core competencies to guide curriculums.

During this time, Roger Garrett, in his thoughtful essay titled *What’s in a Name,* described that, to some, agricultural engineering is engineering *for* agriculture, while to others it is engineering *of* agriculture, but no one limits it an engineering *to* agriculture only (Garrett, 1990). In addition, many say that agriculture means farming (growing crops and animals), while others argue that it includes systems beyond the farm gate.

Garrett wrote, “I like to think of agriculture as the management of the natural resources of land, air, water, and solar energy for controlled biological activities.” In this way, in addition to farming, agriculture includes forest, aquaculture, natural resources, and many other systems (e.g., plant tissue culture, bioreactors), as well as the processing and distribution of products in which natural resources are used to control biological activities.

Many, including me, felt that it was a stretch to effectively redefine agriculture to include all biologically active systems and have that definition universally accepted. It appeared to me that while engineering *for* and *of* these biological systems is beyond the scope of agricultural engineering, agricultural engineers are best prepared to advance the discipline of engineering *for* and *of* biological systems and transform ASAE into a society of biological engineers.

Accordingly, I proposed that the name of the American Society of Agricultural Engineers be changed to the Society of Biological and Agricultural Engineers (Verma, 1990), which led to a unanimous recommendation that P-210 Chair Andrew Hashimoto present the following resolution to the ASABE Executive Committee (Hashimoto, 1990):

“P-210 requests that the Society immediately consider a name change in view of the changing emphasis of our academic programs and engineering practices, and increase international scope of the Society, and

P-210 further recommends that the new name of the Society include biological engineering.”

The P-210 resolution was discussed at the ASAE Executive Committee Meeting on May 8-9, 1990, where President John Walker stated that “the purpose of a name is to communicate what/who you are,” and he submitted that our name at the time, the American Society of Agricultural Engineers, “does not communicate who/what this society is” (Walker, 1990).

In the 1990s, ASAE dealt with the tensions between maintaining the traditional purposes of agricultural engineering and taking the lead in advancing biological engineering. There was no resolution to form a clear and coherent direction. A semi-autonomous Institute of Biological Engineering (IBE) was formed with a mission of engineering *for* and *of* biological systems, but it failed to integrate into the Society. In the meantime, with a clearer set of goals and liberal financial support for advancing engineering *for* and *of* medical practice, biomedical engineering developed rapidly, and by default it became the face of biological engineering.

The emergence of biological engineering also became a topic of several scientific and professional societies and colleges of engineering. By the end of the 1990s, more than 30 new biomedical engineering departments were formed (today, nearly 150 institutions offer a major in biomedical engineering), and nearly all agricultural engineering departments added some version of "bio" to their names and recruited faculty with expertise in engineering *for* systems with biological activities.

Those activities reached a tipping point in February 2005 when MIT formed a Department of Biological Engineering and approved a BS degree in biological engineering, the American Institute of Chemical Engineers (AIChE) recommended that departments of chemical engineering change their names to either chemical and biological *or* chemical and biomolecular engineering, and ASAE approved adding biological to its name and became the American Society of Agricultural and Biological Engineers (ASABE).

Since then, advances in the knowledge and skills needed to synthesize biological systems for desired functions (the engineering science of biology) are driven by geneticists, microbiologists, molecular biologists, and synthetic biologists. They are leading the efforts to design biological systems for use. Consequently, is having "biological engineering" in our name still the best way to communicate who we are?

Finally, the time has come to reckon that the various names of our academic departments, and the mismatch between our professional work and our Society's name, confuse our message and dilute the recognition that we deserve.

Beyond 2005

Today, there is no consistency in the names of our academic departments. There is a lack of a coherent, unified view of how we uniquely contribute to the vast scope of biological engineering, what systems with biological activities are of interest to us, and which specific challenges we focus on. As a result, most faculty members in academic departments with an interest in engineering *for* and *of* biological systems do not see the benefit of joining ASABE.

I like the definition of agriculture offered by Roger Garrett as "the management of the natural resources of land, air, water, and solar energy for controlled biological activities," in which he implies the inclusion of forest, aquaculture, natural reserves, and other systems (e.g., plant tissue culture, bioreactors), as well as the processing and distribution of products in which natural resources are used to drive biological activities. However, I suggest that it would be better for us to refer to these systems as biosystems, and consider agriculture, among others, to be a biosystem of our interest.

In the 1950s, the publications of the Ferguson Foundation Agricultural Engineering Series, including *Tractors and their Power Units, Principles of Farm Machinery, and Soil* and *Water Conservation Engineering*, established the core content of our profession. Since then, our profession has grown. An important new textbook, *Introduction to Biosystems Engineering*, includes the engineering breadth of biosystems (i.e., systems with biological activities) beyond the systems covered in the Ferguson Series publications. (Holden et al., 2021).

This open-source biosystems engineering textbook can be rapidly updated to keep it current and meet the needs of our dynamic profession. Like the Ferguson Series publications of the past, this new textbook has potential for building a consensus, that biosystems engineering is systems engineering focused on biologically active, life-sustaining systems and communicating its value to a wide audience.

Similarly, the goal of the ASABE Circular Bioeconomy Systems Institute (CBSI) to meld disciplines in systems thinking for engineering *for* and *of* systems with biological activities (biosystems engineering) gives a broad focus to our profession. Specifically, CBSI aims to address simultaneous problems in multiple biosystems, in complex "systems of systems" (which include physical, chemical, biological, and socio-economic systems), and develop responsible and cyclical use of resources for the health of Earth's ecosystems while more than doubling biosystem outputs for the benefit of current and future generations.

The Future

Finally, the time has come to reckon that the various names of our academic departments, and the mismatch between our professional work and our Society's name, confuse our message and dilute the recognition that we deserve. Additionally, the lack of congruence among the multiple names is a great hindrance to effectively sharing what we do and demonstrating its importance. It is also a hindrance to conveying that we have much to do to innovate systems that provide products, materials, and services for human and ecosystem needs.

Thus, as I said at the beginning, we are BioSystems Engineers! Accordingly, our academic departments should be uniformly named BioSystems Engineering departments, and our professional society should be renamed either the BioSystems Engineering Society (BES or BSES) or the Society for BioSystems Engineering (SBE or SBSE).

I have purposefully capitalized the B and S in BioSystems. The B emphasizes our focus on systems with biological activities, and the S reminds us that we are systems engineers who integrate multiple sources of knowledge and practical experience to design useful new systems. I have chosen not to include "American" in my proposed names because our members represent many different countries, and I chose "Engineering" over "Engineers" to respect our current members and to invite new members who may not be engineers by training but who are "engineering" biosystems.

Historically, ASAE incubated engineering *for* and *of* food, forest, and aquacultural systems, only to see those fields of engineering gain momentum and move away from ASABE. Additionally, professionals who are applying advanced biological methods (e.g., synthetic biology, bioreactors) for producing food and other bio-based products do not know of or think about ASABE.

The Tri-Societies, which has been a model partnership of the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America, recently changed its name to the Science Societies, the professional home of Agronomic, Crop, Soil, and Environmental Science (ACSESS). With more than 20,000 members and certified professionals, ACSESS has magnified the impacts of all three of its professional societies. Together, their contributions have advanced use-inspired science and education, attracted practicing professionals, and influenced policy decisions for the benefit of stakeholders and society in general.

We have a similar opportunity in adopting BioSystems Engineering as our identity, but we have limited time to position our Society as the primary catalyst for forging partnerships with other engineering societies that focus on other components of the biosystems (e.g., food, forest, aquaculture, environment, and more). Let's act now!

In conclusion, WE ENGINEER SYSTEMS TO PRODUCE, USE AND REUSE BIOLOGICAL MATERIALS FOR HUMAN NEEDS AND PLANET HEALTH. I ask you to consider this proposal with an open mind. Changing our name from "Agricultural and Biological Engineers" to "BioSystems Engineering" is not narrowing but rather enlarging the scope of our contributions. Let's learn from the events following the introduction of the mechanized tomato harvester, as I described earlier, in which successes of the past impeded seeing the great opportunities for the future.

While our profession serves broad and unique purposes for meeting essential human needs, our work and our message have been lost due to a lack of clarity. Our profession must have a clear and coherent vision of what we contribute, and we must loudly communicate that vision to a wide audience.

Please do not hesitate to deliberate widely what is proposed here, and share your views with me at verma@uga.edu.

ASABE Fellow and Life Member Brahm P. Verma, Professor Emeritus of Biological and Agricultural Engineering and Associate Director Emeritus of the College of Engineering, University of Georgia, Athens, USA, verma@uga.edu.

The author is grateful to **ASABE Fellow James Jones,** Distinguished Professor of Agricultural and Biological Engineering at the University of Florida, for his critical review and input in the preparation of this article.

Further reading

ASAE. (1990). A vision for the future: A report of the agricultural engineering department heads workshop held in St. Louis, Missouri (Apr. 24-25, 1990). St. Joseph, MI: ASAE, P-210 Committee.

Final Report. (1987). Project 2001: Engineering for the 21st Century. International conference for administrative heads of North American agricultural engineering departments (Oct. 26-28, 1987). Columbus, OH: The Ohio State University.

Garrett, R. E. (1979). What's in a name. Essay distributed to members of ASAE's P-210 Committee.

Gorney, C. (1979). University is sued over development of sophisticated harvesting machines. *Washington Post* (Jan. 18, 1979).

Hall, C. W. (1987). The age of biology – Impact on engineering. Keynote presentation at Project 2001: Engineering for the 21st Century (Oct. 26-28, 1987). Columbus, OH: The Ohio State University.

Hashimoto, A. (1990). P-210 Department Heads Committee resolutions for the Society name change. Presented to ASAE President John Walker and discussed at the meeting of the Executive Committee. Recorded minutes of the Executive Committee (Mar. 8-9, 1990). St. Joseph, MI: ASAE.

Holden, N. M., Wolfe, M. L., Ogejo, J. A. & Cummins, E. J. (2021). *Introduction to Biosystems Engineering.* St. Joseph, MI: ASABE.

Stewart, R. E. (1979). *Seven Decades that Changed America: A History of the American Society of Agricultural Engineers 1907-1977* (pp. 131-132). St. Joseph, MI: ASAE.

Verma, B. P. (1990). Contemporary notes on department heads workshop held in St. Louis, Missouri (Apr. 24-25, 1990).

Walker, J. N. (1990). Recorded minutes of the Executive Committee (Mar. 8-9, 1990). St. Joseph, MI: ASAE

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