Enhancing Poultry Production with Emerging Technologies and Husbandry Practices

Poultry meat and eggs are popular food options worldwide. The U.S. poultry industry is a major producer and exporter, contributing significantly to the global economy and food supply. However, the industry faces challenges, including growing demand, consumer preferences, and disease outbreaks.

Researchers are working together to provide sustainable, cost-effective solutions to the changing needs of the poultry industry. Incorporating advanced science and technology will enhance production efficiency, protect poultry welfare, and provide consumers with safe, nutritious supply of poultry products.

The multidisciplinary, multistate approach enables researchers to share ideas, resources, and facilities and coordinate activities to address localized and nationwide issues and different aspects of the poultry system. Project members work closely with industry so that research efforts are relevant and feasible, and they serve on advisory committees to guide science-based standards. With members at universities nationwide, this project is able to provide education and outreach. In particular, workforce training helps large-scale and small-scale producers and processors learn best practices and achieve USDA certification, and youth programs foster the next generation of poultry industry professionals.

This project is supported in part by USDA NIFA through Hatch Multistate Research Fund allocations to participating State Agricultural Experiment Stations at land-grant universities: Auburn University, University of Arkansas, University of California, Davis, Clemson University, University of Connecticut, University of Delaware, University of Georgia, University of Hawaii, University of Illinois, Iowa State University, University of Kentucky, University of Maryland, Michigan State University, University of Minnesota, Mississippi State University, University of Nebraska, North Carolina State University, Pennsylvania State University, Purdue University, University of Tennessee, Texas A&M AgriLife Research, and Virginia Tech. Previous and ongoing cycles of this project may include additional participants. **Learn more**: https://nimss.org/projects/18577.

This Impact Statement was produced in 2025 by the Multistate Research Fund Impacts Program, which is supported by agInnovation, the State Agricultural Experiment Stations, and the Hatch Multistate Research Fund provided by USDA NIFA. **Learn more: mrfimpacts.org**

Multistate Research Fund IMPACTS

agInnovation science that feeds the world

Research Highlights (2019-2024)

Automation, **artificial intelligence**, and **precision technologies** have helped producers optimize poultry management. Scientists created automated, AI-supported systems that detect, track, record, and predict the behavior of individual birds, enabling less labor-intensive flock monitoring (Michigan State University, University of Georgia, University of Maryland, University of Arkansas) as well as a tool that can interpret different duck quacks to provide real-time, ongoing assessment of flock health and welfare (Purdue University).

This project has provided valuable insights and tools for production of **cage-free eggs**, which are in high demand. Researchers identified which genetic varieties of laying hens are best suited for cage-free production (North Carolina State University), and collaborative efforts among multiple states have led to better management techniques to increase performance efficiency of laying hens in cage-free systems. Scientists also designed a robotic computer vision system that prevents cage-free hens from laying eggs on the floor where they are more susceptible to damage, feces, and debris and are harder to collect (Michigan State University, Clemson University). Other studies shed light on ways to mitigate keel bone damage, which is painful and prevalent in cage-free hens (University of Bern, Michigan State University, University of California, Davis, Purdue University).

Researchers designed and evaluated **housing features** to enrich poultry welfare. Innovations include a partial slotted **flooring** system that reduces the need for litter maintenance and improves turkey health and performance (University of Minnesota); **vegetative buffers** that can improve air and water quality, conserve energy, and provide protection for outdoor birds from predators and weather (Pennsylvania State University); and **preening cups** that provide a source of water where ducks can express their natural behaviors (Purdue University).

Heating, **cooling**, **ventilation**, and **lighting** are critical for poultry health, but can rack up costs for producers and place high demands on power suppliers. To optimize these systems, project members:

- Assessed the effectiveness of strategies to mitigate heat stress, including cooling perches (USDA-ARS, Purdue University, University of California, Davis, University of Illinois) and sprinklers and evaporative cooling pads (University of Arkansas).
- Determined winter and summer ventilation needs to reduce gas concentrations in commercial layer houses (University of Illinois).
- Implemented new ventilation technology, including variable speed fans that allow energy efficient airflow control (University of Arkansas) and air filters with UV treatment that mitigate airborne bacteria concentrations (Iowa State University).
- Evaluated the effects of light wavelength on the stress responses and growth of broiler chickens (University of Arkansas) and fertility (Purdue University) and identified a wavelength that can reduce bacteria growth without affecting meat quality (Mississippi State University).

Researchers advised the industry about how genetic lines, feeding strategies, stress and fearfulness, and management practices are related to **meat quality issues**, which cause losses worth hundreds of millions each year (University of California, Davis, Purdue University, North Carolina State University, University of Bern, USDA-ARS).

Project members assessed the impacts of **feed quality**. Studies determined optimal **feed particle size** for different systems (Mississippi State University; Auburn University) and showed that careful control of diet can reduce nitrogen excretion (University of Kentucky).

Researchers also explored **feed additives**, such as:

- Trace minerals to improve eggshells and egg hatch (Mississippi State University).
- Probiotics to improve skeletal health in laying hens (Purdue University).
- New types of protein and lipid supplements for turkeys (Iowa State University).
- Peanut-based proteins (North Carolina State University).
- Antioxidants to mitigate heat stress (University of Hawaii).
- A dietary fat emulsifier to aid growth in broiler chickens fed soybean meals (Virginia Tech).
- Hemp supplementation for broiler chickens (Alabama A&M University).
- Small amounts of restaurant grease, bakery byproducts, distillers grains, and food waste.
- A new hydration product that can stimulate foraging and feeding behavior in young poultry (University of Arkansas).

Researchers made new discoveries and developed new tools and techniques for **poultry disease management** and **food safety**, including:

- Documents, websites, and presentations to help backyard and commercial poultry producers prepare biosecurity strategies for **avian influenza**.
- A mobile platform that can identify diseases via images of poultry feces with over 90% accuracy in less than one second (Iowa State University).
- Potential **vaccines** to reduce bacteria colonization in the poultry gut (Mississippi State University).
- Feed additives, such as plant-derived **antimicrobials** and **essential oils** against drug-resistant Salmonella (University of Minnesota), a **probiotic** to reduce Salmonella on eggs (University of Connecticut).
- Best practices for manufacturing and storing feed and cleaning feed mills (Auburn University).
- Insights about how to control **beetles** that spread diseases and parasites to poultry (Mississippi State University; Auburn University).
- Pulsed UV light to inactivate bacteria on eggshells (Pennsylvania State University).
- Pressurized steam and forced hot air to sanitize transport containers (Auburn University).
- Refrigeration and freezing methods to decrease bacteria on chicken meat (Mississippi State University).
- Tools and guidance for ethical depopulation of diseased flocks (North Carolina State University).