Optimizing Poultry Welfare & Production

NE-1042 (2009-2014)

Poultry Systems Face Animal and Environmental Welfare Issues

Poultry meat and eggs are popular food choices among Americans; however, consumers and the general public are increasingly concerned about animal welfare and environmental impacts of poultry production. For poultry producers, energy and resource efficient production systems are a high priority, especially as feed and fuel prices climb. Optimizing poultry welfare and resource use requires a thorough understanding of the influence of different nutrition, lighting, and ventilation strategies on poultry performance, air quality, and environmental footprint. If acceptable conditions and practices are not defined, the US poultry industry could be less competitive in domestic and global markets.

Research & Extension Activities

In 2009, Multistate Research Project NE-1042 formed to develop poultry production systems that safeguard poultry welfare, use resources efficiently, and have minimal environmental impacts. The project brings together diverse expertise, equipment and facilities, and other resources, enabling the group to efficiently tackle complex problems. The project's Extension members are in direct contact with poultry producers, facilitating the flow of information in both directions and strengthening the impact of the project.

To better monitor and measure stress in poultry, project scientists at the University of Connecticut recorded poultry vocalizations and used computer programs and models to sort different vocalizations into stress-related and non-stress classes. NE-1042 researchers measured the effects of stress on egg production, hatchability, growth rate, feed efficiency, skeletal development, and behavior.

Project members also studied ways to manipulate stressors, like heat and light, to reduce their effects on poultry. For example, scientists at the University of Georgia examined the effects of air velocity on poultry performance in tunnel-ventilated housing. Other researchers evaluated the energy consumption and cost-effectiveness of various lighting and ventilation manipulations and set parameters for lighting intensity and coverage.

NE-1042 researchers studied the effects of different intensities and colors of lighting on poultry welfare. Top photo by Rob Flynn, USDA-ARS. Bottom photo by Michael Czarick, University of Georgia College of Agriculture and Environmental Sciences.

NE-1042 scientists also assessed alternative hen housing systems. Enriched cages, aviaries, small group systems, and outdoor housing were evaluated based on hen welfare (hen health, behavior, physiology, and egg production and quality), resource use, indoor air quality, and environmental footprint.

Researchers at multiple participating universities examined the effects of diet manipulations on poultry welfare and performance. Nutritionists at the University of Illinois, University of Minnesota, and the University of Nebraska determined the influence of varying nutrient levels and the use of alternative ingredients (such as dried distillers grains and low-protein formulas) on energy level, feed intake, and ammonia emissions. Collaborative efforts among Iowa State University, University of California, University of Minnesota, and Pennsylvania State University led to over $2.5 million in grants for projects to monitor and mitigate ammonia emissions from poultry operations.

During the last five years, group members published over 100 peer-reviewed journal articles, nine peer-reviewed Extension reports, 10 popular press articles, and 55 proceedings at national and international meetings. These materials are helping raise awareness of optimal poultry production conditions and new strategies and technologies to achieve those conditions.

Multistate Project Makes Poultry Housing and Nutrition Safer, More Sustainable

Optimizing environmental conditions and management practices is enabling poultry production systems that protect poultry welfare and performance, food safety, and environmental soundness.

- Ventilation and lighting manipulations recommended by NE-1042 are being used to improve facility designs. Adoption of recommended lighting programs and energy efficient lighting has resulted in significant savings by producers in California, Connecticut, and Georgia.

- These recommendations are further augmented by the group's economic analyses, which are helping farmers determine the most efficient and profitable housing systems for poultry.

- NE-1042's poultry vocalization classifications give operators a way to identify physical and psychological stress early on and regulate poultry welfare.

- NE-1042 data on ammonia emissions and new feed sources for poultry are being used to improve nutrition management. For example, based on NE-1042 research on ethanol co-products in poultry diets, 80% of commercial egg producers have adopted new feeding programs, and turkey producers have decreased feed costs.

NE-1042 studied feed types and feeding strategies to help improve poultry nutrition and reduce ammonia emissions, which contribute to air and water quality issues around poultry farms. Photo by Hongwei Xin, Iowa State University.

Enriched colony layer houses still use cages, but provide at least double the space of conventional cages, making sure hens have enough room to lie down, spread their wings, and turn around. They offer nests, perches, and scratching areas. Photo by Hongwei Xin, Iowa State University.

Want to know more?

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In this improved poultry building, new radiant heaters keep the chickens warm during cold weather. On warm days, ceiling vents let heat escape; when chicken house temperatures are estimated to be above 90 degrees, fans pull air through water evaporator elements, creating a tunnel of cooled air along the building. Each of these features is computer controlled, making them easy for producers to use and adjust. Chickens benefit from reduced heat and moisture, minimized dust and odor, and limited buildup of ammonia and carbon dioxide. Photo by Lance Cheung, USDA.