Sustainable Agriculture Research and Education (SARE) Poultry Waste Projects

SARE is a competitive grants program funded by USDA

As of 2006, the Sustainable Agriculture Research and Education Program (SARE) has funded more than 200 projects addressing ways to make poultry production more profitable, environmentally sound and beneficial to rural communities. Topics range from researching ways to convert manure into a valuable by-product to training small farmers how to raise high-value pastured poultry. The projects highlighted below address waste handling in conventional poultry operations. See the SARE bulletin Pastured Poultry Profits for an overview of more sustainable systems.

Some small farms find pastured poultry an asset to a diversified operation. The birds spread their own manure in low-cost day-range systems utilizing electric poultry netting and movable coops. Fresh air, sunshine, and clean footing allow them to be raised without antibiotics, which makes them command a premium price of about $1.85 per pound nationwide. Project LS99-105 developed a toolbox of educational materials to guide pastured poultry farmers looking to expand their operations.

Manure Management on the Fly

In the 1980s University of Georgia entomologist Craig Sheppard foresaw that the burgeoning poultry industry needed some innovative strategies to manage the manure it was producing. His research took a leap forward in 1990 and again in 1993, when he was awarded Southern SARE grants to test a system he had designed that encouraged wild populations of the black soldier fly, *Hermetica illucens* (L.) to lay their eggs directly under caged layers. He aimed to prove that the resulting larvae would reduce the manure piles, control housefly populations and then self-harvest themselves so they could be sold as a nutrient-rich ingredient in feedstuffs.

At that time, no other grant resources were available to explore such a low-tech, non-chemical solution. The SARE funds supported the building of a small-scale (1900 hens) layer house to determine feasibility of transferring this technology to a full-sized house. One reason Sheppard's experimental system received high marks from SARE was because no separate facility or special equipment is needed for production or harvest of the black soldier fly; therefore, it would not create a significant financial investment for the producer.

The system relies on the life cycle of the large wasp-like flies who lay their eggs in manure piles but don't become pests like houseflies. The hatched larvae consume manure until they are ready to pupate, then they seek a way out to a drier environment for pupating. Sheppard's simple system using a ramp and PVC pipe offers the larvae a one-way path out of the manure directly into collection buckets.

The research results were promising. The soldier fly-driven manure management system reduced the volume of poultry droppings by more than half and practically eliminated housefly populations. Savings in manure hauling and pesticide spraying alone would add up to thousands of dollars per year for a layer operation. Additionally the system produced almost 1.2 pounds of larvae per hen annually, from May to December. This would be 58 tons of larvae in a 100,000-hen layer house.

So what would a producer do with 58 tons of larvae? Sheppard anticipates that someday poultry farmers will sell them to replace expensive fish, meat or bone meal in some animal rations. In three replicated feeding trials conducted by aquaculturist Gary Burtle, a pelleted diet incorporating 7.5% prepupae meal supported catfish growth better than conventional catfish rations containing menhaden fish meal. The researchers estimate that prepupae meal will eventually have at least the value of fish meal, currently about $550 per ton.

The dried larvae also have made impressive showings in feeding tests involving chickens, swine and bullfrogs. The dried prepupae, as collected in the poultry system, contain 42% protein and 35% fat. Fat and protein meal fractions were easily separated by a commercial rendering plant.

Sheppard's SARE research concluded that black soldier fly is an attractive manure management agent since it can eliminate house fly breeding, reduce manure bulk by half or more and produce economically attractive quantities of larval-based feedstuff.

His post-SARE research has expanded into evaluating completely captive populations of black soldier fly for year-round bioconversion of manure, rather than depending on the seasonal habits of wild populations.

"Other areas we have just touched on are bacteriology and odor reduction," says Sheppard. "We have indications that some pathogens may be limited by larval activity, and we have very good data that many malodors are essentially eliminated very quickly.

Highlights from some recent SARE poultry waste projects

This is huge, what with all the odor complaints against animal producers."

A pioneer in the area of bioconversion of manure, Sheppard says other scientists are now developing an interest in the topic. In order to stimulate more research he posts papers from his work at http://nespal.cpes.uga.edu/sustain/fly.asp.

Project reports for LS90-027 and LS93-056 can be found in the SARE project data base at www.sare.org.

A group of citrus farmers in Puerto Rico used a Southern SARE producer grant to develop a system of using waste from a local fruit processing plant and poultry farms to make compost for their badly eroded soils. Project FS95-028

Composting in Layer Houses

Spurred by one of Utah's largest egg producers, researchers and extension educators at Utah State University used a Western SARE grant to study how to compost manure inside layer houses. Rich Koenig, a former USU soils specialist now at Washington State University, along with USU Extension County Agent Dean Miner, began studying in-house composting after Spanish Fork, Utah, producer Mike Shepherd received a SARE farmer/rancher grant to better manage manure. Shepherd's Eggs, a 60-year family operation with 325,000 layers, was seeking to placate new neighbors and comply with environmental regulations about manure. "Our initial experiences with indoor composting show great promise for reductions in odor and flies," Shepherd said. The composted manure became a value-added product he distributed to farmers and others.

Following Koenig's research, project leaders recommended a mix of straw to manure to generate enough heat to both compost the material and kill flies. Reducing flies translated to a savings of $15,000 in pesticide use over nine months. Moreover, producers could sell compost for about $15 a cubic yard. Those savings and the extra income offset the costs of new compost turners and other equipment in about three years, said Miner, who was Shepherd's project adviser. Challenges remain, including avoiding dangerous ammonia buildup inside the layer house. One option is better ventilation; another is to apply aluminum sulfate to acidify the manure. Meanwhile, egg producers have adopted the new manure management strategy – three in Utah and others in Idaho and Arizona. The project report for FW99-080 can be found in the SARE project data base at www.sare.org.

Training in nutrient management

Rapid growth in Kentucky's poultry industry has heightened public awareness of potential problems with manure disposal. Farmers are under pressure to keep up with EPA CAFO rules, NRCS nutrient management standards, nutrient requirements in Kentucky's Agriculture Water Plan and other regulations they may not even know about.

Southern SARE invested more than $83,000 to support a multi-agency training activity for ag educators and technical advisors who work with livestock farmers. The Professional Development Project was led by Stephen Coleman of Kentucky's Division of Conservation. Team members were representatives from NRCS, Kentucky Cooperative Extension, University of Kentucky and Kentucky State University. The two-day training was conducted in 10 different locations and reached 400 people.

The primary objective of the project was to move the entire state of Kentucky from an animal manure disposal mindset to a nutrient management recycling mindset. The trainings in 2000 consisted of three parts: a classroom-based science session; another classroom session on policy guidelines, and a field exercise to develop a comprehensive nutrient management plan at two research farms. Follow up events included a nutrient management farm tour in 2002 and update sessions in 2003 to give previous participants the latest information on nutrient management policy.

Training materials developed with the SARE funds included a nutrient management manual, video and website. An online training and testing site can be accessed at:

http://www.ca.uky.edu/enri/nutmgt.htm

The project report for ES00-49 can be found in the SARE project data base at ww.sare.org.

SARE research and education projects are funded by USDA. Grants are available through all four regional offices for professional researchers, educators, farmers/ranchers, non-profit groups and government agencies. Additionally in the Southern Region there are grants for communities and graduate students. For information about applying for SARE grants go to www.sare.org

Retrieve project reports from SARE's Project Data Base at www.sare.org