Diapers for *On-the-Run* Livestock

In the spring of 1998, some of the lambs frolicking on steep, grassy West Virginia hillsides wore diapers—toddler size.

They wore them for only a few days, with frequent changes. But their unusual attire was part of ARS animal scientist Kenneth E. Turner's data collection method for comparing the nutritive value of various legume-gras

s combinations for grazing livestock. The lamb's "playpen" was a fenced-off pasture at ARS' Appalachian Farming Systems Research Center in Beaver, West Virginia.

The research, which Turner also plans for beef cattle and goats, is designed to measure nitrogen lost from the sheep. Knowing how much is excreted by animals in urine and feces helps him and his colleagues recommend the best combinations of plants and livestock.

The nitrogen measurements enable him to figure out how thoroughly the animals digest the plants and how much of the plant protein is used in making lean muscle for beef cattle, goats, and sheep.

Another concern: Wasted protein, in nitrogen form, becomes a contaminant if it is converted to nitrate and winds up in groundwater. "We want to help farmers control nitrogen losses to the environment at the source—the animal's diet," says Turner.

"In several years of research, we have so far found that livestock contribute significant amounts of nitrogen and other nutrients to pasture land through their urine and feces," Turner says. "This needs to be credited to the overall nutrient management plan for a farm before adding commercial fertilizer," he says. "By using more intensive grazing methods—such as dividing larger pastures into several smaller paddocks and moving livestock to new paddocks more often—we can more evenly distribute urine and feces in pastures as livestock graze. This prevents manure nutrients from being concentrated around watering troughs and trees used for shade by livestock."

The diapers, which at first were placed over the genitalia of male lambs, were wrung out to collect urine. The animals also wore a canvas bag that collected feces.

But the diapers didn't work as well as hoped; lambs apparently frolic more than toddlers. So, in spring 1999, Turner switched to female lambs fitted with a urinary catheter bag hooked to the fecal bag, which was strapped securely but comfortably to the lambs' hindquarters.

"It's the same type of thing scientists do for animal nutrition studies where livestock are placed in a metabolism chamber for 24 to 72 hours to collect all the feces and urine and to control what the animal eats, " Turner says. "But we needed portable collection devices for animals on the run in a small pasture."—By **Don Comis,** ARS.

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Sunflower Bee's a Great Pollinator!

A hard-working native bee can sometimes top the pollination prowess of the domesticated honey bee—even when badly outnumbered. "In our experiments using outdoor enclosures," says ARS entomologist Vincent J. Tepedino, "sunflower leafcutting bees spread out evenly among sunflowers instead of visiting just the plants nearest their nesting boxes."

Tepedino has affectionately nicknamed the bees "megapugs," short for *Megachile pugnata*. They're native to southern Canada and most of the United States except the lower Mississippi Valley and Gulf Coast.

Dark-colored and about 3/4- to 1-inch-long, the bee forages on sunflowers and other species in the sunflower family. It uses leaf pieces and moistened soil to make partitions between compartments, or cells, that house its young.

"Megapugs could be used wherever sunflowers are grown," Tepedino notes. "They are charming and dutiful. Every sunflower grower should have a bunch."

Tepedino used four 100-by-20-foot screened enclosures, owned by Pioneer Hi-Bred International, Inc., at Woodland, California, for the experiment. One kind of sunflower produced significantly larger and heavier seeds after being pollinated by the megapugs than when pollinated by domesticated honey bees, *Apis mellifera*.

The test was the first using sunflower leafcutting bees to pollinate hybrid sunflowers in field cages, says Tepedino. In earlier work, other ARS researchers at Logan, Utah—where Tepedino is based—scrutinized megapug performance in open fields. There, too, the bees were better than honey bees as outdoor pollinators of sunflowers.

In the new test, Tepedino enclosed bees within the four cages, each with about 600 sunflower plants inside. For around 2-1/2 weeks, about 100 sunflower bees in each of two cages performed pollination chores. Meanwhile, a few thousand domestic honey bees—more than 10 times more than the megapugs—performed the same task in two other cages.

For one type of sunflower, there was no significant difference in the size of seeds harvested or the total seed weight per flower head. For the second kind of sunflower included in the experiment, however, those pollinated by the sunflower leafcutting bee produced seeds that were about 30 percent larger, on average, than seeds on plants pollinated by honey bees. Total seed weight per flower head was also about 30 percent greater.

Tepedino expects to have results of a follow-up study late this year or in early 2000.—By **Marcia Wood,** ARS.

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