



PEGGY GREB (K9858-1)

# FORUM

## Turning to Nature To Address Some of Our Most Vexing Problems



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**T**he problems facing agriculture today are numerous and daunting. How do we maintain the quality of our soils? How do we provide a sufficient supply of food and fiber as the climate changes, water becomes more precious, and seasons and growing patterns are inevitably altered?

As a scientific research agency, how should the Agricultural Research Service address such complicated issues? Our scientists are meeting that challenge by looking to nature for solutions. A number of ARS efforts that focus on natural approaches to the challenges we face in agriculture today are described in this issue.

Depleted soils are a major challenge in many areas. At least part of the solution may be found by looking at North America's ecological history. Brush fires once burned freely over the prairies. Those prairie fires, damaging as they were, were part of the land's natural life cycle.

We now know that the charred remains of those grasses enriched the soil and made it fertile. ARS scientists are examining how the type of residue, or "biochar," produced by those fires can be exploited as a natural resource. The research, at ARS sites across the United States, is showing how biochar can be used not only to enrich soils, but also to reduce greenhouse gas emissions from soil.

ARS scientists in Florence, South Carolina, and Kimberly, Idaho, have examined how different biochars affect the water-holding capacity of soils in those regions. The research has

uncovered evidence that biochar made from switchgrass can enhance soil moisture in both soil types, and the benefit is twofold: more productive soil and more carbon stored underground instead of being released into the atmosphere.

ARS scientists in Ames, Iowa, have found that adding biochar to the soil has similar benefits—sequestering more carbon in the soil and reducing nitrous oxide emissions. Their colleagues in Prosser, Washington, are working on a technology that uses biochar to remove nitrogen and phosphorus from dairy manure and produces pellets that may be a suitable fertilizer. See the story on page 4 for details on ARS's biochar studies.

In efforts to promote adequate food and fiber production, ARS scientists in Byron, Georgia, and Stoneville, Mississippi, have developed a unique way of applying biological control nematodes to soil for control of larval stages of some crop pests. Some species of nematodes are well suited for biocontrol because of their entomopathogenic (insect-killing) capability and host specificity, meaning they attack only certain insects. Once inside the host insect, these nematodes feed and mass produce, and in a week or two, a new generation of nematodes emerges to continue the cycle.

The beneficial nematodes, naturally contained inside the cadaver of the host, can be applied to the soil by simply applying the cadavers to the soil, but the process is not without its problems. The cadavers sometimes stick together or fall apart. Sandwiching the cadavers between masking tape solves the problem, however, and makes for an easy way to

protect, transport, and apply the cadavers to the soil. See story on page 12.

Peach growers in the Southeast would like a preplant cover crop to reduce their need to fumigate to control root-knot nematodes and ring nematodes. ARS researchers in Beltsville, Maryland, and Byron, Georgia, tested four tall fescue varieties for their ability to combat the soil pests. They found one that makes it impossible for some nematodes to reproduce. The results so far are limited to greenhouse studies, and field trials are ongoing. See story on page 14.

The safety of our food is another concern. Foodborne pathogens are found naturally in the digestive tracts of farm animals, and reducing the number of those pathogens without antibiotics would be a critical step in improving food safety. ARS researchers at College Station, Texas, have found that orange peels fed to cows can help. The peels contain compounds that, in the cow's intestinal tract, reduce populations of potentially harmful *E. coli* and *Salmonella*. See story on page 10.

These efforts address issues that should be a concern not just to growers and those who care about the environment, but to anyone who shares in the fruits of our agricultural bounty. Together we can meet these challenges by producing the agricultural commodities we need in ways that allow us to be stewards of the land.

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