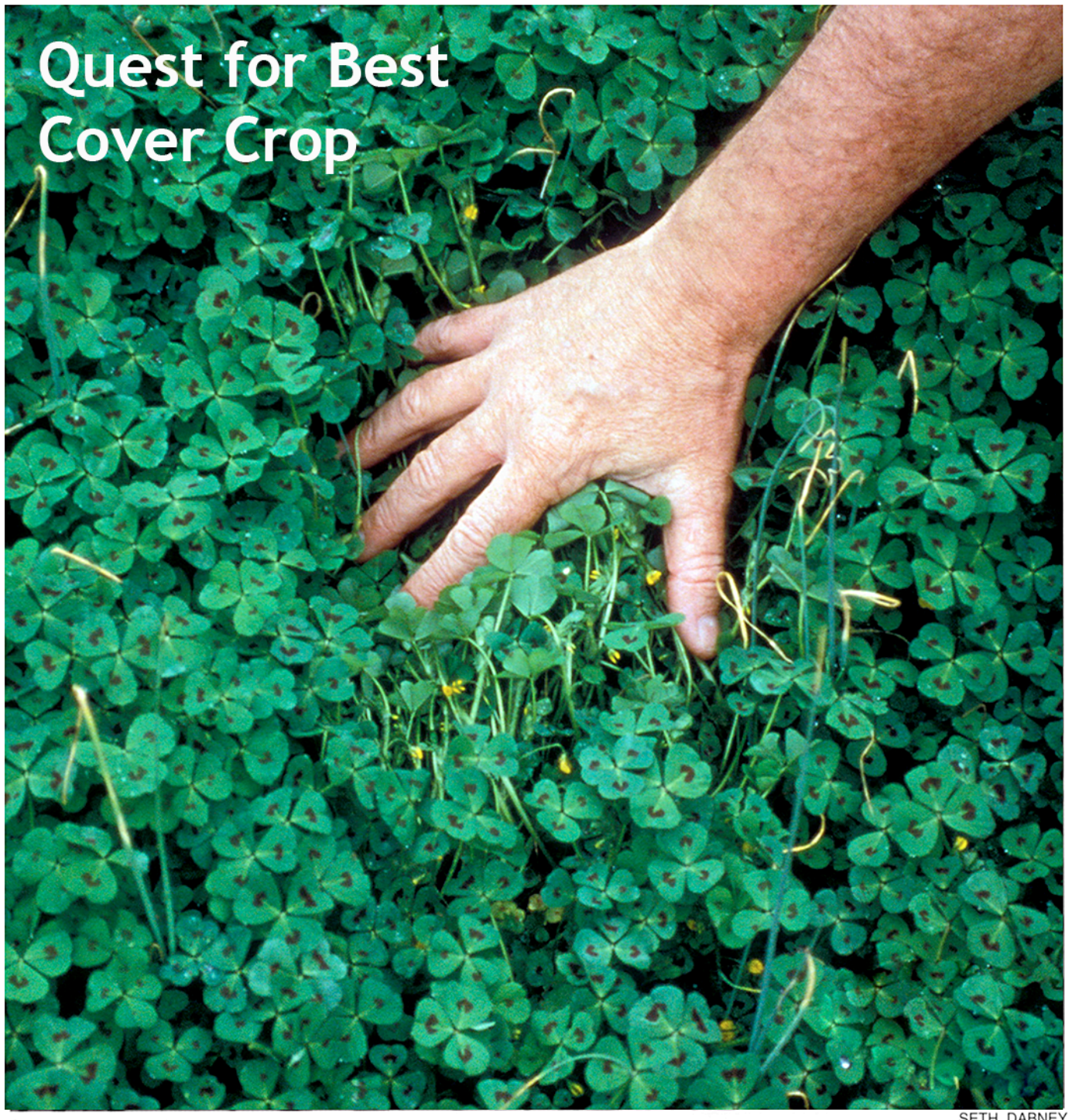
Quest for Best Cover Crop



Spotted bur clover. SETH DABNEY

For more than 6 years, ARS agronomist Seth M. Dabney has been searching for the ideal winter cover crop—one that makes no-till farming more economical and productive in southern areas.

The problem with most cover crops is that their seed is expensive, and they're often difficult to kill with one spraying of herbicide. In late spring, when they make their most growth and are about to set seed, farmers are getting ready to plant.

And trying to plant a primary crop, like cotton, while cover crops are still dying often subjects the new seedlings to diseases, says Dabney, who works at the ARS National Sedimentation Laboratory in Oxford, Mississippi.

Dabney's goal is to protect fragile topsoils in areas where crop residue from cotton and soybeans gets easily decomposed, leaving the soil vulnerable to erosion by heavy rains. During the cool period, which is more than half the year, the South gets half its annual rainfall and a good portion of its solar radiation.

"We're trying to increase the amount of organic residues returned in the cool period and, if possible, add a legume that fixes nitrogen and recycles nutrients in soil," he says.

Dabney thinks the ideal cover crop is one that reseeds itself before it needs to be killed. Such a crop doesn't have to be planted each year and yet builds more organic matter than native weeds like chickweed and annual bluegrass do.

Last year, Dabney received funding from USDA's Sustainable Agricultural Research and Education Program for a 3-year cooperative research project on cover crops. Its purpose: to integrate cover crops into southern cropping systems by reducing seeding and weed control costs.

To this end, he and ARS research technician Calvin Vick at the Oxford lab have been evaluating several soil-building legumes for winter hardiness and their ability to reseed earlier than traditional cover crops like crimson clover. This work is being done on small plots managed by cooperators at 10 locations across the South.

"Early growth and winter hardiness are generally negatively correlated, so finding a legume with both features is difficult," Dabney says. "We're looking for hard-seededness to the extent that, if a seed crop is left to mature, it will come back for more than 1 year.

"Sometimes, in the Midsouth, a cold snap will kill these legumes.

"A burclover we collected locally in 1991 has the best combination we have found so far for some upland sites," says Dabney. "It's called southern spotted burclover and belongs to the genus *Medicago* that also includes alfalfa, buttonclover, black medic, and other leguminous cover crops.

"This burclover, *Medicago arabica,* has an interesting history in the Mississippi Delta, where it was one of the most widely grown cover crops in the 1950's, rivaling hairy vetch."

He adds, "Burclovers are generally hard-seeded but have little cold tolerance. This one has better winter hardiness than any of the commercially available annual medics we have evaluated. The fact that it now grows wild here shows it can persist."

Another way to cut cover crop costs is to use them to save on weed control. According to Dabney, one system that

shows promise is to quickly kill a rye cover crop by mowing, then plant no-till cotton soon after, using tined-wheel row cleaners to sweep aside dense residues.

The heavy mulch from the mowed cover crops suppresses weeds, thus reducing herbicide needs. It also helps control erosion, increases organic matter, and insulates the soil to keep cotton seedlings thriving when the temperature turns cold.

"With this system, weed control in no-till cotton requires no more herbicide than is used in conventional tillage systems," he says.

This type of alternative no-till management is being tested on farms in Tiptonville, Tennessee; Denwood, Arkansas; and Yazoo City, Mississippi.

Finding the Right Combo

Since 1983, Dabney and agronomist Wayne Reeves at the National Soil Dynamics Laboratory in Auburn, Alabama, have been working together on winter cover and main crop combinations.

One that looks promising is crimson clover, *Trifollum incarnatum* L., as a winter cover for tropical corn. Tropical corn varieties are bred and adapted to tropical and semitropical climatic zones, but they can be grown in southern states.

Four years of field tests at two locations in Alabama showed that the tropical corn allowed for later planting in spring, which enabled the clover to naturally reseed every year in a no-till system.

"With the reseeded clover, corn yields with just 45 pounds per acre of nitrogen fertilizer equaled those achieved with 180 pounds of fertilizer without the clover," Reeves says.

After growing clover for five seasons and 36 to 44 months without tillage, Reeves studied the effect of

BOB BJORK

Crimson clover. (K5972-1)

the winter clover and maize combination on the physical and chemical properties of two soils—Hartsells sandy loam and Norfolk loamy sand.

"Results showed that such a system can also improve the soil chemical properties in a relatively short time. The clover increased soil carbon and nitrogen on the Hartsells soil and potassium to the 2-1/2-inch depth on both soils.

WAYNE REEVES

White lupin.

Calcium and magnesium concentrations were increased in the surface inch of soil under clover, compared with winter fallow.

Several soil properties like water-stable soil aggregates, hydraulic conductivity, and bulk density were also improved.

Since 1987, in tests near Auburn, Reeves has been studying another cover crop—white lupin, *Lupinus albus* L.—for its potential as a dual-use cover/cash crop in sustainable cropping systems. White lupin produces seeds with protein similar to soybeans, so they can also be grown as a grain crop. Lupin varieties tested included Tifwhite-78 and Tifblue-78 (*L. angustifolius* L.); both were developed in Georgia by ARS.

"In more than 12 tests over 6 years, white lupin produced 30 bushels of grain per acre. The grain-sorghum crop that followed required no additional nitrogen and produced top yields," Reeves says.

His tests showed that white lupin will produce up to 360 pounds of nitrogen per acre if it is grown to maturity. "It produces 100 to 120 pounds per acre if growth is halted in mid-April to early May. Studies in Minnesota and Australia show that when harvested for grain, lupin plant residue provides about 60 pounds of nitrogen per acre," he adds.

Reeves cautions that lupin is susceptible to several fungal diseases and should only be grown in well-drained soils.—By **Hank Becker,** ARS.

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