

# Palouse Revolution in the Making

A 3-year crop rotation with IPM challenges traditional farming in eastern Washington and Idaho.

**N**ine years ago, ARS research agronomist Frank Young and colleagues set a challenging goal. They would design a farming system to control erosion, crop diseases, and weeds while maximizing profits and reducing risk.

They came up with a 3-year crop rotation for farmers in the Palouse area of eastern Washington and Idaho. It relies on reduced tillage and intensive weed management.

Today, such integrated pest management (IPM) plans are part of the national agricultural agenda. But when the project started, some people were skeptical.

“Many farmers believed their yields would drop if they didn’t plow. But for the past 8 years—under a rotation of winter wheat, spring barley, and spring peas—we had equal or higher yields for all three crops with conservation tillage, compared with conventional tillage,” says Young, who coordinated the IPM project. He works in the ARS Nonirrigated Agriculture Weed Science Research Unit in Pullman, Washington.

Over a dozen scientists from ARS, Washington State University in Pullman, the University of Idaho in Moscow, and Clemson University in Clemson, South Carolina, contributed to the study, which ended last year.

Their experiment compared traditional crop rotations with conventional tillage to 3-year rotations with conservation tillage. Use of large plots and standard farming equipment ensured the results would apply to local farms, like those in Whitman County, where Young is located.

Palouse farmers may use one of three farming practices: winter wheat every year, or as often as possible; wheat one year and lentils or peas the next; or wheat or barley followed by nothing—called fallow—the second.

Fallowing allows rainfall to be stored in the soil for the next year’s crop.

One of the most popular tillage methods is the moldboard plow, which turns the soil deeply and buries weed seeds and residue, the dead stems and leaves of the harvested crop. While effective for pest control, this method leaves the soil exposed to wind and water erosion.

The best strategy from the Pullman study—a 3-year rotation with no tillage for winter wheat and a chisel plow for barley and peas—challenged traditional practices.

60 percent of his 2,500-acre farm near Genesee to this IPM system. The rest of his land is still in continuous winter wheat or a 2-year rotation of wheat and peas.

“My winter wheat yields in the 3-year rotation are at least as good as, or better than, what I get with the other rotations,” Zenner says.

“My pea and lentil yields have improved, and I’ve actually gone beyond the requirements for residue compliance.”

Farm legislation was passed in 1985 and 1990 to encourage farmers to conserve soil on highly erodible

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Just a light infestation of downy brome showed up in no-till winter wheat that followed spring dry peas in the 3-year-crop-rotation, conservation-tillage farming system developed especially for the Palouse.

“The crop rotation breaks up the life cycles of diseases like Cephalosporium stripe and of grassy weeds like jointed goatgrass and downy brome. The minimal tillage leaves enough residue to conserve moisture for next year’s crop and to hold the soil in place,” Young says.

Idaho farmer Russ Zenner took the study to heart. So far, he’s converted

lands. USDA’s Natural Resources Conservation Service (NRCS; formerly the Soil Conservation Service) provided leadership to help farmers develop conservation compliance plans.

In the Palouse, such plans generally require 23 to 30 percent residue coverage after seeding. Farmers who do not meet these requirements may

not be eligible for participation in certain farm programs.

The only drawback, Zenner says, is that the residue holds so much moisture that he often has to delay planting his spring crop following the winter wheat.

"I'm still doing a little moldboard plowing so the ground will dry out sooner. But overall, I'm satisfied with it. I've slowly switched to the 3-year rotation because it works," he adds.

For Dennis Roe, the NRCS' district conservationist for Whitman County, the greatest benefit of the IPM project is erosion control. "In

"More than 100 farmers have switched to no-till for their wheat, representing about 10 percent of the 1.1 million acres of cropland in the county," he says.

An unexpected benefit of no-till showed up in the cold winter of 1990-91. Winds blew off most of the snow cover, and almost two-thirds of the Palouse wheat crop was lost.

"On our conventionally tilled plots, the freezing temperatures injured or killed about 30 percent of the winter wheat. In the no-till plots, less than 10 percent of the crop suffered," Young says.

had no diseases of economic significance," Young says.

The last years of the project also revealed the benefits of hands-on weed management.

During the first 6 years, each of the 144 study plots was designated to receive either a minimum, moderate, or maximum level of herbicides—amounting to 50, 70, and 90 percent of the label rates. For the last 3 years, applications were tailored to match the weed species and densities on each plot.

Areas treated early on with moderate or maximum levels needed much less herbicide later.

"If we declare all-out warfare on our major weeds, we can eventually reduce the amount of chemicals we use," Young says. "For example, we were able to reduce wild oat herbicide in the small grains by 60 percent in plots where we'd kept the weed controlled the previous 6 years."

Young's next task will be to incorporate his field results into a computer program being developed by Douglas L. Young, an agricultural economist at Washington State University, who kept track of the dollars and cents during the study to ensure the IPM program would not be too costly to use.

"The new computer program should help farmers reduce herbicide use while maintaining their yields," Frank Young says.

It will apply variables such as the crop rotation, tillage system, weed densities, and soil characteristics to recommend optimal herbicide applications, but it is still a few years away from on-farm use.—By **Kathryn Barry Stelljes, ARS.**

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Downy brome chokes this winter wheat in a plot that has been planted to wheat for several years.

the past, summer fallow contributed to severe soil erosion. Having crops or residue all year has reduced erosion by 90 percent."

Up to a third of the 600 farmers in the county attended field days held by the scientists every other year to explain the project. Roe estimates that at least half the farmers are now using some aspect of IPM.

The IPM results also stood out in a drought. During the last 3 years of the study, the Palouse received only three-quarters of its normal rainfall.

Yet, compared with conventional tillage, "Our yields increased 22 percent for winter wheat, 11 percent for barley, and 12 percent for peas, with conservation tillage. And we