Integrating annual legumes in grain-livestock farming systems

Summary: Montana State University research and demonstration studies explore integrating legumes in grain and livestock production systems.

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To: News-dailies, News-weeklies, AgMedia, News-local, News-tv, News-radio, MSU-All-News, News-internal, NatResourcesNonmedia, Producers, Web. From Sara Adlington, 994-4602 or sara@montana.edu. Filename: **WSAREIegumesStudy2011**

Web: Ag/people
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From MSU News Service

BOZEMAN - Small grain and livestock production are important in Montana. In a 2006 survey of Montana farmers and ranchers, about 43% of the respondents had both grain and livestock on their farms. The survey by Chengci Chen, Associate Professor at MSU's Central Agricultural Research Center, also indicated these growers are continuously seeking economically and environmentally sustainable practices for their integrated grain-livestock production systems.

"Annual legumes may play an important role in these systems," said Clain Jones, Extension soil fertility specialist in the Department of Land Resources and Environmental Sciences at MSU. Rotating annual legume forage or pasture with cereal crops can increase wheat yield and provide forage for livestock. The legumes help improve soil fertility and pest management, both of which benefit crop yields.

Studies of legume adaptability and rotations were conducted on conventional and organic fields in eastern and central Montana as part of a USDA-Western Sustainable Agriculture Research & Education funded study. In these trials, spring germinating black medic did not provide enough biomass for a good green manure or forage crop. Fall-seeded lentil and winter pea appeared better adapted to the region as green manure or forage crops than medic. According to Chen, "winter pea can provide adequate forage for livestock grazing in late spring, or harvested as hay and fed to livestock with wheat straw."

On the conventionally managed fields at the Central Agricultural Research Center at Moccasin, Mont., winter wheat grain yield following the winter pea grown for hay or lentil green manure compared favorably to winter wheat following summer fallow. However, lentil grown for grain followed by winter wheat produced the highest net return, three times that of winter wheat-fallow, primarily due to exceptionally high prices for lentil.

On the organic farm near Stanford, winter wheat grain yield was the same when grown after winter pea grazed by cattle or lentil green manure. It averaged 8 bu/acre more than winter wheat grown after oat or after winter pea grown for seed. Although winter wheat grain yield was the same following grazed winter pea or lentil green manure, the net return was higher from the

rotation with grazed winter pea. Chen explained that “the forage value of winter pea for cattle grazing was higher than the value of the nitrogen credit from the lentil green manure.” However, he added that “the long-term benefits of green manure to soil quality improvement and subsequent returns were not estimated.” Net returns were lowest from the oat-wheat rotation, being 2.8 times lower than the grazed winter pea-wheat rotation.

The compatibility or competition of pea and lentil with wheat were also evaluated for those conditions when wheat would grow in a mixture with annual legume volunteers, such as in organic production. On sites without additional synthetic nitrogen, winter pea and lentil inter-planted with winter wheat had yields half of that when they were planted alone. However, the presence of these legumes did not decrease winter wheat yield.

In contrast, when 60 pounds nitrogen per acre were applied, wheat yields were around 25% higher when grown alone than when grown with the legumes. The added nitrogen gave the wheat an advantage over the legumes which caused the legumes to yield up to 25% less than when grown alone.

“The bottom line, though, is total yield per acre,” said Chen. The total yields of intercrops were greater than the sole wheat crop without nitrogen input, which could be attractive to organic farmers. In years of high pea or lentil prices, the additional crop could add to net return per acre, depending on the feasibility of harvesting a mixed crop. When legume prices are low, the volunteer legume can be incorporated into the soil as a nitrogen source to benefit future crops, at no cost to the intercropped wheat harvest. The benefit of intercropping is less pronounced in fields receiving additional nitrogen in the form of commercial fertilizer or manure. Crop rotation with legumes is likely a better option than intercropping on conventional farms. “In conventional fields, winter pea and lentil volunteers can serve as a cover crop to provide ground cover in the winter and be sprayed out in the spring with a broadleaf herbicide to avoid the crop competition with wheat,” Chen added.

A copy of the complete report is available at http://landresources.montana.edu/soilfertility/reports.html.