Austrian Winter Peas for Dryland Grazing with Lambs

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B-1128
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A winter wheat-fallow cropping system is commonly used in the western Great Plains. The primary objective of a fallow interval is to store water in a soil profile. Unfortunately, such a system is difficult to sustain if fallowing techniques leave insufficient surface residue which, in turn, may expose soil to wind and water erosion and organic matter loss. A fallow period is a rather inefficient means of storing water (Greb et al. 1967). The grazing of annual legume crops within wheat production systems in Australia has improved gross margins (Warner et al. 1998). Use of a legume crop incorporated as a grazing resource to partially replace fallow is an alternative on the Great Plains. Agronomic studies to investigate the potential benefits, growth culture, and effects on wheat yields of Austrian winter field pea (*Pisum sativus* subsp. *arvense*) were conducted between 1994 and 2001 in southeastern Wyoming. This winter annual legume has the potential for providing a grazing resource in the winter wheat-fallow cropping system. The benefits, culture, varieties, animal performance, and effects of the growth of Austrian winter field peas on wheat yield are summarized below.

Potential Benefits of Grazing peas

1. Nitrogen source: The legume crop will provide nitrogen for subsequent wheat crops through the breakdown of foliage, root residue, and animal manure and urine.

2. Soil organic matter: The summer fallow-winter wheat cropping system drastically reduces soil organic matter. Conversely, over the long term, grazed peas would be expected to increase the soil organic matter that improves soil water-holding capacity, soluble soil nutrient levels, soil structure, and beneficial soil microorganisms.

3. Soil erosion: The standard 14-month black fallow period subjects soils to intense wind and water erosion, especially when associated with conventional tillage. Peas can provide soil cover for 10 to 12 of the 14 months.

4. Field water-use efficiency: Summer fallow only saves 20 to 40 percent of precipitation with potential nutrient leaching beyond the wheat root zone (Greb et al. 1967; Sooby 1994). Peas will use water otherwise lost to runoff, soil evaporation, and movement beyond the root zone (Table 1).

Table 1. Winter wheat production and plant-available soil water after fallow, grazed peas, and winter wheat over time (1995-2001) at Archer, Wyoming.

Rotation	Yield	Test weight	Protein	Available soil water 0 to 2 ft.[1]	Available soil water 0 to 3 ft.[1]
	bu. / acre	lbs. / bu.	%	in.	in.
Fallow wheat	33.5	58.1	12.4	2.5	2.8
Grazed peas wheat	30.6	57.5	14.1	1.9	2.1
Continuous wheat	17.9	58.0	12.4	1.9	2.2
DRS[2]	4.9	1.5	1.1	0.5	0.7

[1] Soil water measured preceding the wheat crop for which yields are reported.

[2] Unless the difference in yield of two entries is greater than the difference required for significance (DRS) shown in the table, little confidence can be placed in the superiority of the one entry over the other.

Table 2. Profitability of conventional fallow (f) every other year (WfWf) versus grazed-pea fallow (p) every four years (WpWf).

Items	WfWf				
Returns	Wheat	Fallow	Wheat	Fallow	Avg.
• Yield (bu. / acre)[1]	33.5	—	33.5	—	—
• Price ($ / bu.)[2]	3.37	—	3.37	—	—
Total ($ / acre)	113	—	113	—	57
Costs					
• Inputs / applic.[3]	20	9	20	9	
• Tillage	—	28	—	28	
• Harvest / grazing	21	—	21	—	
• Overhead[4]	16	5	16	5	
Total ($ / acre)	57	42	57	42	50
Net return ($ / acre)	56	-42	56	-42	7
Rate of return[5]	—	—	—	—	2.8%
Items	**WpWf**				
Returns	Wheat	Pea[6]	Wheat	Fallow	Avg.
• Yield (bu. / acre)[1]	33.5	—	30.6	—	—
• Price ($ / bu.)[2]	3.37	—	3.60	—	—
Total ($ / acre)	113	40	110	—	66
Costs					
• Inputs / applic.[3]	20	35	20	9	
• Tillage	—	7	—	28	
• Harvest / grazing	21	8	21	—	
• Overhead[4]	16	6	16	5	
Total ($ / acre)	57	56	57	42	53
Net return ($ / acre)	56	-16	53	-42	13
Rate of return[5]	—	—	—	—	5.2%

[1] Average wheat yields at the Research and Extension Center at Archer, Wyoming (1995-2001).

[2] Wheat price with conventional fallow ($3.37 / bu.) is an average Wyoming July price (1988-2001). A higher price for wheat following grazed peas ($3.60) reflects an average protein premium ($0.23 / bu.) between Kansas City ordinary and 13% protein wheat (1988-2001).

[3] Cost of seed, fertilizer, pesticide, and application.

[4] Interest on operating costs, taxes, insurance, and management.

[5] Net return ($ / acre) divided by farmland value ($250 / acre).

[6] Pea-grazing income ($40 / acre) is based on a wheat grower receiving 35% of the value of a 140 lb. lamb gain (49 lb. times $0.81 / lb.). The wheat grower provides water and fencing for grazing ($8 / acre).

5. Seed protein from the wheat crop after peas are grazed should be higher compared to wheat after fallow. Wheat grain yield after peas are grazed compared to wheat yield after fallow could not be separated statistically. However, wheat production after peas are grazed will dramatically exceed the seed protein and yield of continuous wheat (Table 1).

6. With profits from grazing, the rate of return goes from 2.8% for wheat fallow to 5.2% for wheat / grazed pea-fallow (Table 2).

Peas are Easy to Grow

Pea culture

1. Pea seed must be inoculated with the proper rhizobium species (*Rhizobium leguminosarium*) prior to planting to ensure proper symbiotic nitrogen fixation and plant growth.

2. Winter pea seeding rate (pounds / acre) depends on seed size, intended use of the crop, plant growth habit, and available soil water during the growing season. At Archer, Wyoming, Austrian winter pea (4,500 seeds / lb.) planted at 70-80 lbs. / acre in the fall has established stands of four to six plants per square foot in the spring, which appears to be adequate for this environment for a pasture forage.

3. Peas require fertility levels of phosphorous (P) and potassium (K) similar to annual cereals and are very sensitive to salt, requiring proper fertilizer placement (Cash et al. 1995). Fertilizer application rates should be based on a soil test.

4. Several Austrian winter pea varieties are available on the market with a wide range in price depending on the seed source and variety. "Melrose," "Fenn," and "Common" varieties have expressed good winter hardiness and growth at Archer (Sooby et al. 1997).

5. Direct seeding of peas into wheat stubble at a depth of 2 to 2.5 inches in late August and early September has been very successful at Archer. The snow-catching ability of wheat stubble appears to protect the peas from winterkill. A deep furrow drill can also assist in winter survival. Excessive winter kill has occasionally been observed when peas are planted in tilled soil at some locations in southeast Wyoming. April and May planting has been successful, but fall planting has several advantages such as increased growth in spring and early summer, the beginning of nitrogen fixation in the fall, greater time to increase beneficial soil microorganisms associated with the legume, and earlier obtaining of the desired quantity of biomass.

6. The need for chemical weed control varies depending on weed population levels and weather.

In general, our experience at Archer has shown: a) no herbicide is required with fall plantings, b) a nonselective herbicide may be required before fall or spring no-till planting if downy brome (*Bromus tectorum* L.) has been established before planting peas, and c) a selective herbicide should be applied in the spring if temperature and moisture conditions have favored weed growth more than pea growth.

Sheep Grazing and Residue Management

At Archer we used an electric fence and began the grazing of Austrian winter peas by the second week of June when peas were approaching bloom. Lambs weighing 60-90 pounds were used at an average stocking rate of 14 lambs per acre. We strove to terminate grazing by the first week of July because previous research (Sooby et al. 1997) with Austrian winter peas indicated that termination of peas by this date resulted in the highest probability of adequately storing soil moisture for fall wheat establishment while producing reasonable forage production. By the end of the three-week grazing period, lambs consumed 2,300 pounds per acre of dry matter pea forage, resulting in lamb daily gains of 0.5 pounds. At this time remaining pea residue was incorporated by tillage to stop soil moisture consumption and control weeds. This approach resulted in 140 pounds of lamb gain per acre. An option, which is yet to be researched, may be to use a nonselective herbicide to terminate peas and control weeds in place of tillage in the hope of further conserving soil moisture.

Disease management

During the third wheat-pea grazing cycle (sixth year), the common pea disease ascochyta / mycosphaerella blight complex (*Ascochyta pisi and Mycosphaerell pinodes*), which can be devastating to peas, appeared. To reduce problems, one should plant disease-free seed and extend the time between peas in the rotation.

Summary

Partial fallow replacement with grazed Austrian winter peas resulted in 140 pounds of lamb gain per acre and higher winter wheat protein with yields comparable to those obtained after fallow. This meant close to double the rate of return of income over the return of income of wheat fallow. When using peas, it is important to follow practices that help to avoid Ascochyta / mycosphaerella blight.

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Senior Editor: Vicki Hamende, College of Agriculture, Office of Communications and Technology

Graphic Designer: Tana Stith, College of Agriculture, Office of Communications and Technology

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Glen Whipple, Director, Cooperative Extension Service, University of Wyoming, Laramie, Wyoming 82071.