FIELD PEAS

Pisum sativum subsp. arvense

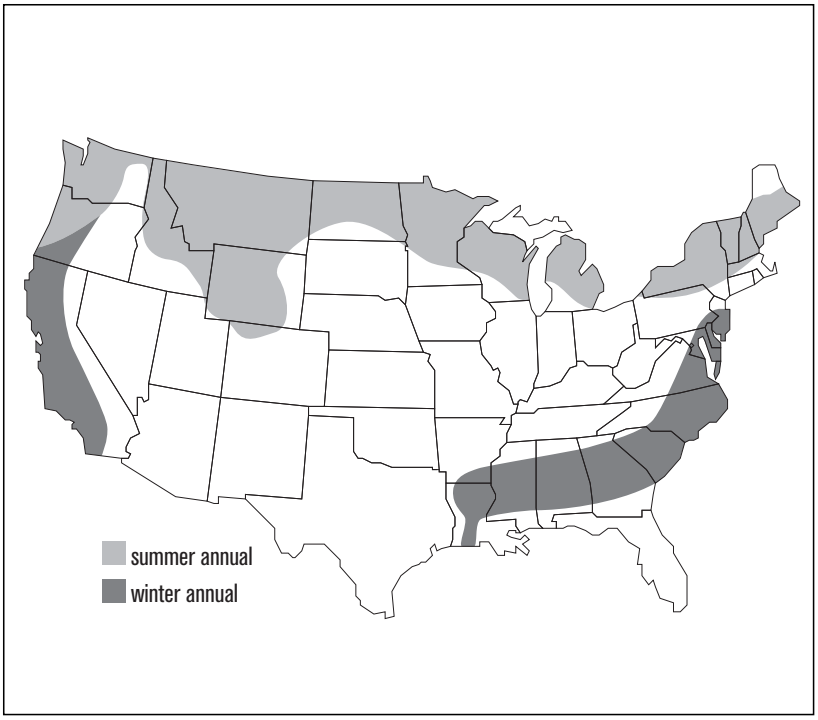
Also called: Austrian winter peas (black peas), Canadian field peas (spring peas)

Type: summer annual and winter annual legume

Roles: plow-down N source, weed suppressor, forage

Mix with: strong-stemmed wheat, rye, triticale or barley for vertical support

See charts, pp. 66 to 72, for ranking and management summary.



High N-fixers, field peas produce abundant vining forage and contribute to short-term soil conditioning. Succulent stems break down easily and are a quick source of available N (361). Field peas grow rapidly in the cool, moist weather they encounter as winter annuals in the South and in parts of Idaho, and as early-sown summer annuals in the Northeast, North Central and Northern Plains areas. Harvest options as high-quality forage and seed increase their value.

Winter-hardy types of field peas, especially **Austrian winter peas**, can withstand temperatures as low as 10° F with only minor injury, but they don't overwinter consistently in areas colder than moderate Hardiness Zone 6. They are sensitive to heat, particularly in combination with humidity. They tend to languish in mid-summer even in the cool Northeast (361), where average summers have fewer than 30 days exceeding 86° F. Temperatures greater than 90° F cause flowers to blast and reduce seed yield. On humus-rich black soils, field peas will produce abundant viny growth with few seed pods.

Use in the East and Southeast is limited by field peas' susceptibility to *Sclerotinia* crown rot, which can destroy whole fields during winter in the mid-Atlantic area. Risk of infection increases if pea crops are grown on the same land in close rotation.

Canadian field peas are a related strain of vining pea. These annual "spring peas" can outgrow *spring*-planted *winter* peas. They often are seeded with triticale or another small grain. Spring peas have larger seeds, so there are fewer seeds per pound and seeding rates are higher, about 100 to 160 lb./A. However, spring pea seed is a bit less expensive than Austrian winter pea seed. TRAPPER is the most common Canadian field pea cultivar.

This section focuses on the widely grown Austrian winter pea. "Field peas" refers to both the winter and spring types.

BENEFITS

Bountiful biomass. Under a long, cool, moist season during their vegetative stages, Austrian winter peas produce more than 5,000 lb. dry matter/A, even when planted in spring in colder climates. Idaho farmers regularly produce 6,000 to 8,000 lb. DM/A from fall-planted Austrian winter peas. Because the residue breaks down quickly, only peas in the high-production areas build up

much long-term organic matter. Peas do not make a good organic mulch for weed control (361).

Nitrogen source. Austrian winter peas are top N producers, yielding from 90 to 150 lb. N/A, and at times up to 300 lb. N/A.

Plowed down as green manure, fall-planted legume crops of Austrian winter pea, alfalfa and hairy vetch each produced enough N for the production of high-quality muskmelons under plastic mulch and drip irrigation in a Kansas study. Melon yields produced with the legumes were similar to those receiving synthetic fertilizer at 63 and 90 lb. N/A. The winter peas in the experiment produced 96 lb. N/A the first year and 207 lb. N/A the second (387).

Austrian winter peas harvested as hay then applied as mulch mineralized N at more than double the rate of alfalfa hay. The N contribution was measured the summer after a fall plowdown of the residue. The estimated N recovery of Austrian winter pea material 10 months after incorporation was 77 percent—58 percent through spring wheat and 19 percent in the soil (254).

Austrian winter pea green manure provided the highest spring wheat yield the following year in a Montana trial comparing 10 types of medics, seven clovers, yellow biennial sweet clover and three grains. Crops that produced higher tonnage of green manure usually had a negative effect on the subsequent wheat crop due to moisture deficiency that continued over the winter between the crops (381). Field peas can leave 80 lb. N/A if terminated at mid-season in lieu of summer fallow in dryland areas, or leave more than 30 lb. N/A after pea harvest at season's end (74).

A winter pea green manure consistently resulted in higher malting barley protein content than that following other legumes or fallow in a Montana trial. Annual legumes harvested for seed left less soil N than did plots in fallow. Also tested were fava bean, lentil, chickpea, spring pea, winter pea hay and dry bean (262).

Rotational effects. Pulse crops (grain legumes such as field peas, fava beans and lentils) improved sustainability of dryland crop rotations by providing disease suppression, better tilth and other enhancements to soil quality in a Saskatchewan study. Even at rates of 180 lb. N/A, fertilizer alone was unable to bring yields of barley planted into barley residue to the maximum achieved from these pulse residues (163).

Water thrifty. In a comparison of water use alongside INDIANHEAD lentils and GEORGE black medic, Austrian winter pea was the most moisture-efficient crop in producing biomass. Each crop had used 4 inches of water when Austrian winter pea vines were 16 inches long, the lentils were 6 to 8 inches tall and the black medic central tillers were 4 inches tall (383).

Austrian winter peas grown in a controlled setting at 50° F recorded more than 75 percent of its N_2 fixed per unit of water used by the 63rd day of growth. White clover, crimson clover and hairy vetch reached the same level of water efficiency, but it took 105 days (334).

Quick growing. Rapid spring growth helps peas out compete weeds and make an N contribution in time for summer cash crops in some areas.

Forage booster. Field peas grown with barley, oat, triticale or wheat provide excellent livestock forage. Peas slightly improve forage yield, but significantly boost protein and relative feed value of small grain hay.

Seed crop. Seed production in Montana is about 2,000 lb./A and about 1,500 lb./A in the Pacific Northwest. Demand is growing for field peas as food and livestock feed (74).

Long-term bloomer. The purple and white blossoms of field peas are an early and extended source of nectar for honeybees.

Chill tolerant. Austrian winter pea plants may lose some of their topgrowth during freezes, but can continue growing after temperatures fall as low as 10° F. Their shallow roots and succulent stems limit their overwintering ability, however. Sustained cold below 18° F without snow cover

usually kills Austrian winter pea (202). To maximize winter survival:

- Select the most winter-hardy cultivars available—GRANGER, MELROSE and COMMON WINTER.
- Seed early enough so that plants are 6 to 8 inches tall before soil freezes, because peas are shallow rooted and susceptible to heaving. Try to plant from mid-August to mid-September in Zone 5.
- Plant into grain stubble or a rough seedbed, or interseed into a winter grain. These environments protect young pea roots by suppressing soil heaving during freezing and thawing. Trapped snow insulates plants, as well.

Marianne Sarrantonio

FIELD PEAS (Pisum sativum subsp. *arvense)*

MANAGEMENT

Establishment & Fieldwork

Peas prefer well-limed, well-drained clay or heavy loam soils, near-neutral pH or above and moderate fertility. They also do well on loamy sands in North Carolina. Field peas usually are drilled 1 to 3 inches deep to ensure contact with moist soil and good anchoring for plants.

If you broadcast peas, incorporation will greatly improve stands, as seed left exposed on the surface generally does not germinate well. Long-vined plants that are shallow-seeded at low seeding rates tend to fall over (lodge), lay against the soil and rot. Combat this tendency by planting with a small grain nurse crop such as oats, wheat, barley, rye or triticale. Reduce the pea seeding rate by about one quarter—and grain by about one third—when planting a pea/grain mix.

Planted at 60 to 80 lb./A in Minnesota, Austrian winter peas make a good nurse crop for alfalfa.

Field pea seed has a short shelf life compared with other crops. Run a germination test if seed is more than two years old and adjust seeding rate accordingly. If you haven't grown peas in the seeded area for several years, inoculate immediately before seeding.

West. In mild winter areas of California and Idaho, fall-plant for maximum yield. In those areas, you can expect *spring-planted* winter peas to produce about half the biomass as those that are fall-planted. Seed by September 15 in Zone 5 of the Inter-Mountain region in protected valleys where you'd expect mild winter weather and good, long-term snow cover. October-planted Austrian winter pea in the Zone 9 Sacramento Valley of California thrive on cool, moist conditions and can contribute 150 lb. N/A by early April.

The general rule for other parts of the semi-arid West where snow cover is dependable is to plant peas in the fall after grain harvest. In these dry regions of Montana and Idaho, overseed peas at 90 to 100 lb./A by "frostseeding" any time soils have become too cold for pea germination. Be sure residue cover is not too dense to allow seed to work into the soil through freeze/thaw cycles as the soil warms (383).

In the low-rainfall Northern Plains, broadcast clear stands of peas in early spring at a similar rate for the "Flexible Green Manure" cropping system (below). Seeding at about 100 lb./A compensates somewhat for the lack of incorporation and provides strong early competition with weeds (383). Plant as soon as soil in the top inch reaches 40° F to make the most of spring moisture (74).

A mixture of Austrian winter peas and a small grain is suitable for dryland forage production because it traps snow and uses spring moisture to produce high yields earlier than spring-seeded annual forages (74). With sufficient moisture, spring peas typically produce higher forage yields than Austrian winter peas.

East. Planted as a companion crop in early spring in the Northeast, Austrian winter peas may provide appreciable N for summer crops by Memorial Day (361). In the mid-Atlantic, Austrian winter peas and hairy vetch planted October 1 and killed May 1 produced about the same total N and corn yields (108).

Southeast. Seed by October 1 in the inland Zone 8 areas of the South so that root crowns can become established to resist heaving. Peas produce more biomass in the cooler areas of the South than where temperatures rise quickly in spring (74, 361). Peas planted in late October in South Carolina's Zone 8 and terminated in mid- to late April produce 2,700 to 4,000 lb. dry matter/A (23).

Killing

Peas are easily killed any time with herbicides, or by disking or mowing after full bloom, the stage of maturity that provides the optimum N contribution. Disk lightly to preserve the tender residue for some short-term erosion control.

Winter pea residue breaks down and releases N quickly.

The downside to the quick breakdown of pea vines is their slimy condition in spring if they winterkill, especially in dense, pure stands. Planting with a winter grain provides some protection from winterkill and reduces matting of dead pea vegetation.

Pest Management

Winter peas break crop disease cycles, Ben Burkett of Petal, Miss., has found. *Septoria* leaf spot problems on his cash crops are reduced when he plants Austrian winter pea in fall after snap beans and ahead of collards and mustard greens the next summer. Between October 15 and November 15, Burkett broadcasts just 50 lb./A then incorporates the seed with a shallow pass of his field cultivator. They grow 3 to 6 inches tall before going dormant in late December in his Zone 8 location about 75 miles north of the Gulf of Mexico. Quick regrowth starts about the third week in January. He kills them in mid-April by disking, then shallow plows to incorporate the heavy residue (202).

Farmers and researchers note several IPM cautions, because Austrian winter peas:

- Host some races of nematodes
- Are susceptible to winter *Sclerotinia* crown rot, *Fusarium* root rot as well as seed rot and blights of the stem, leaf or pod
- Are variably susceptible to the *Ascochyta* blight (MELROSE cultivar has some resistance)
- Host the pathogen *Sclerotinia* minor. There was a higher incidence of leaf drop in California lettuce planted after Austrian winter peas in one year of a two-year test (232).

Austrian winter peas were heavily damaged by *Sclerotinia trifoliorum* Eriks in several years of a four-year study in Maryland, but the crop still produced from 2,600 to 5,000 lb. dry matter/A per year in four out of five years. One year DM production was only 730 lb./A. Mean N contribution despite the disease was 134 lb. N/A. Overall, Austrian winter peas were rated as being more suited for Maryland Coastal Plain use than in the Piedmont, due to harsher winters in the latter location (204).

To combat disease, rotate cover crops to avoid growing peas in the same field in successive years. To minimize disease risk, waiting several years is best. To minimize risk of losing cover crop benefits to *Sclerotinia* disease in any given season, mix with another cover crop such as cereal rye.

Crop Systems

Northern Plains. Austrian winter peas (and other grain legumes) are increasingly used instead of fallow in dryland cereal rotations. The legumes help prevent saline seeps by using excess soil moisture between cereal crops. They also add N to the system. The legume>cereal sequence starts with a spring- or fall-planted grain legume (instead of fallow), followed by a small grain.

Peas work well in this system because they are shallow-rooted and therefore do not extract deep soil moisture. The pea crop is managed according

to soil moisture conditions. Depending on growing season precipitation, the peas can be grazed, terminated or grown to grain harvest. Growers terminate the crop when about 4 inches of plant-available water remains in the soil, as follows:

- **Below-normal rainfall**—terminate the grain legume early.
- **Adequate rainfall**—terminate the grain legume when about 4 inches of soil water remains. Residue is maintained for green manure, moisture retention and erosion prevention.
- **Above-average rainfall**—grow the crop to maturity for grain harvest.

In conventional fallow systems, fields are left unplanted to accumulate soil moisture for the cash crop. Weeds are controlled using tillage or herbicides.

Grain legumes provide a soil-protecting alternative to fallow that can be managed to ensure adequate moisture for the cereal crop. Legumes provide long-term benefits by producing N for the subsequent crop, disrupting disease, insect and weed cycles and building soil.

Austrian winter peas work in these rotations where there is at least 18 inches of rain per year. INDIANHEAD lentils (*Lens culinaris* Medik), a specialty lentil for cover crop use, are also widely used in this system.

Montana research shows that when soil moisture is replenished by winter precipitation, annual legumes can substitute for fallow without significantly reducing the yield of the next barley crop. Montana rainfall averages 12-16 inches, so peas are planted but can only be taken to grain harvest in above-normal rainfall years. The legume can generate income from harvest of its hay or grain or through fertilizer N savings from the legume's contribution to the small grain crop (136).

In Idaho, fall-seeded Austrian winter peas harvested for seed provided income, residual N from the pea straw and soil disease suppression in a study of efficient uses of the legume cover. A crop rotation of Austrian winter pea (for grain)>winter wheat>spring barley produced similar wheat yields as did using the peas as green manure or leaving the field fallow in the first year. While neither Austrian winter pea green manure nor fallow produced income, the green manure improved soil organic matter and added more N for wheat than did summer fallow. Fallow caused a net soil capacity loss by "mining" finite soil organic matter reserves (253).

In a northern Alberta comparison of conventional (tilled), chemical (herbicide) and green (field pea) fallow systems, spring-planted field peas provided 72 lb. N/A, significantly more than the other systems. The field pea system was also more profitable when all inputs were considered, providing higher yield for two subsequent cash crops, higher income and improvement of soil quality (12).

In the Northeast, spring-planted peas can be incorporated by Memorial Day.

Southeast. Fall-seeded Austrian winter peas outproduced hairy vetch by about 18 percent in both dry matter and N production in a three-year test in the Coastal Plain of North Carolina. When legumes were grown with rye, wheat or spring oats, Austrian winter pea mixtures also had the highest dry matter yields. Over the three years, Austrian winter peas ranked the highest (dry-matter and N) in the legume-only trials and as the legume component of the legume/grain mixtures. In descending order after the peas were hairy vetch, common vetch and crimson clover. The peas were sown at 54 lb./A in the pure seedings and 41 lb./A in mixtures (344).

In the year of greatest N fixation, soil N in the Austrian winter pea mixture treatments was 50 percent greater than the average of all other treatments. Researchers noted that the bottom leaves of pea vines were more decomposed than other legumes, giving the crop an earlier start in N contribution. Further, soil N in the upper 6 inches of soil under the Austrian winter peas held 30 to 50 percent of the total soil inorganic N in the winter pea treatments, compared with levels of less than

Peas Do Double Duty for Kansas Farmer

PARTRIDGE, Kan.—Jim French figures Austrian winter peas provide free grazing, free nitrogen, or both. The vining legume produces just as much N for the following grain sorghum crop even if he lets his registered Gelbvieh herd eat all they want of the winter annual's spring growth.

French farms on flat, well-drained sandy loam soil near Partridge, Kan. He manages about 640 acres each of cash crops (winter wheat and grain sorghum) and forages (alfalfa, sudangrass, winter peas and cowpeas, and an equal area in grass pasture). Peas follow wheat in the three-year crop rotation on his south-central Kansas farm. He chisel plows the wheat stubble twice about 7 inches deep, disks once to seal the surface, then controls weeds as necessary with a light field cultivator.

Between mid-September and mid-October he inoculates about 30 lb./A of the peas and drills them with an old John Deere double-run disk drill in 8-inch rows. Establishment is usually good, with his only anxiety coming during freeze-thaw cycles in spring. "Each time the peas break dormancy, start to grow, then get zapped with cold again they lose some of their root reserves and don't have quite the resistance to freezing they did. They'll sprout back even if there's vegetative freeze damage as long as their food reserves hold out," French reports.

Ironically, this spring freezing is less of a problem further north where fields stay frozen longer before a slower thaw. This works as long as snow cover protects the peas from the colder early and mid-winter temperatures. In most years, he sets up temporary fence and turns his cattle into the peas about April 1 at the stocking rate of two animal units per acre. During the best years of mild weather and adequate moisture, "the cattle have a hard time keeping up," says French. Depending on his need for forage or organic matter, he leaves the cattle in until he incorporates the pea stubble, or gives it time to regrow.

One reason he gets about the same 90 to 120 lb. N/A contribution with or without grazing is that the winter pea plants apparently continue N fixation and root growth while being grazed. Soil tests show that 25 to 30 lb. N/A are available in the nitrate form at incorporation in late spring, with the balance in an organic form that mineralizes over the summer. Grazing the peas helps to contain cheatgrass, which tends to tie up N if it's incorporated just ahead of his sorghum crop.

French is sold on winter peas ahead of his grain sorghum because it provides N while reducing weed pressure from cheatgrass and pigweed and decreasing lodging from charcoal root rot. The option to use the peas as forage—while still achieving adequate sorghum yield—lets him buy less processed feed, improves livestock health and accelerates conversion of the peas' organic material into available soil nutrients.

"Winter peas work best where you integrate crops and livestock," says French. "They give you so many benefits."

30 percent in the top soil layer for all other treatments. In situations where the early-summer N release from peas could be excessive, mixing Austrian winter peas with a grain can moderate the N contribution and slow down its release into the soil (344).

The carbon to nitrogen (C:N) ratio of plant matter is an indication of how rapidly vegetation will break down. Mixtures of small grains with Austrian winter peas and the vetches had C:N values from 13 to 34, but were generally under 25 to 30, the accepted threshold for avoiding net immobilization of N (344).

Austrian winter peas and crimson clover can provide adequate N for conventionally planted cotton in South Carolina. In a three-year trial, fertilizer

rates of up to 150 lb. N/A made no improvement to cotton yield on the pea plots. The evaluation showed that soil nitrate under Austrian winter peas peaked about nine weeks after incorporation (22).

Austrian winter peas achieved 50 to 60 percent groundcover when they were overseeded at about 75 lb./A into soybeans at leaf yellowing in southeastern Pennsylvania, where they can survive some winters. The peas produced nearly 2 tons of dry matter and 130 lb. N/A by May 20 in this test (191). Overseeding peas into corn at last cultivation is not recommended due to poor shade tolerance.

Austrian winter peas, like other hollow-stemmed succulent covers such as vetch and fava beans, do not respond well to mowing or cutting after they begin to bloom. In their earlier stages, Austrian winter peas will regrow even when grazed several times. See *Peas Do Double Duty for Kansas Farmer* (p. 140).

After three years of moisture testing, Kansas farmer Jim French can explain why he sees more soil moisture after spring grazing than when the peas are left to grow undisturbed. "There's decreasing overall transpiration because there's less leaf area to move moisture out of the soil into the air. Yet the root mass is about the same." Ungrazed peas pump more water as they keep growing.

Other Options.

Harvest field peas for hay when most of the pods are well formed. Use a mower with lifting guards and a windrow attachment to handle the sprawling vines.

COMPARATIVE NOTES

Field peas won't tolerate field traffic due to succulent stems (191). When selecting types, remember that long-vined varieties are better for weed control than short-vined types.

In dryland systems, winter peas produce abundant biomass with limited moisture.

Cultivars. MELROSE, known for its winter-hardiness, is a cultivar of the Austrian winter pea type. Planted the first week of September in Idaho, MELROSE peas yielded 300 lb. N/A and 6 tons of dry matter the next June. Planted in mid-April, the cultivar yielded "just" 175 lb. N/A and 3.5 T dry matter/A (202).

GRANGER is an improved winter pea that has fewer leaves and more tendrils, which are stiffer than standard cultivars. It is more upright and its pods dry more quickly than other winter pea types. MAGNUS field peas have out-produced Austrian winter peas in California and bloom up to 60 days earlier.

Seed sources. See *Seed Suppliers* (p. 195).