

# OATS

*Avena sativa*

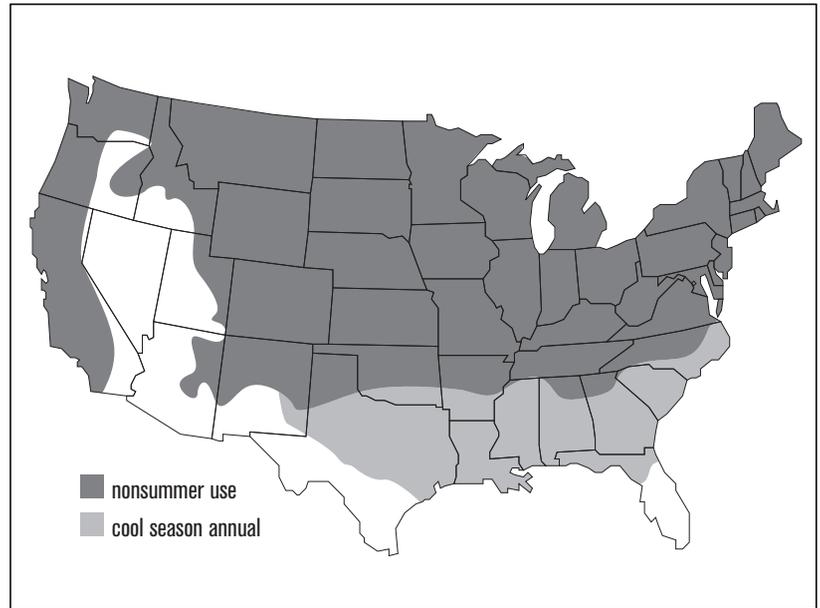
**Also called:** spring oats

**Type:** cool season annual cereal

**Roles:** suppress weeds, prevent erosion, scavenge excess nutrients, add biomass, nurse crop

**Mix with:** clover, pea, vetch, other legumes or other small grains

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



If you need a low-cost, reliable fall cover that winterkills in Hardiness Zone 6 and colder and much of Zone 7, look no further. Oats provide quick, weed-suppressing biomass, take up excess soil nutrients and can improve the productivity of legumes when planted in mixtures. The cover's fibrous root system also holds soil during cool-weather gaps in rotations, and the ground cover provides a mellow mulch before low-till or no-till crops.

An upright, annual grass, oats thrive under cool, moist conditions on well-drained soil. Plants can reach heights in excess of 4 feet. Stands generally fare poorly in hot, dry weather.

## BENEFITS

You can depend on oats as a versatile, quick-growing cover for many benefits:

**Affordable biomass.** With good growing conditions and sound management (including timely planting), expect 2,000 to 4,000 pounds of dry matter per acre from late-summer/early fall-seeded oats and up to 8,000 pounds per acre from spring stands.

**Nutrient catch crop.** Oats take up excess N and small amounts of P and K when planted early

enough. Late-summer plantings can absorb as much as 77 lb. N/A in an eight- to ten-week period, studies in the Northeast and Midwest have shown (313, 329).

Where the plant winterkills, some farmers use oats as a nitrogen catch crop after summer legume plowdowns, to hold some N over winter without needing to kill the cover in spring. Some

**Oats are a reliable, low-cost cover that winterkill in Zone 6 and much of Zone 7.**

of the N in the winterkilled oats may still be lost by spring, either through denitrification into the atmosphere or by leaching from the soil profile. Consider mixing oats with an overwintering legume if your objective is to maximize N contribution to the next crop.

**Smother crop.** Quick to germinate, oats are a great smother crop that outcompetes weeds and also provides allelopathic residue that can hinder germination of many weeds—and some crops (see below)—for a few weeks. Reduce crop suppression concerns by waiting two- to three weeks after killing oats before planting a subsequent crop.

**Fall legume nurse crop.** Oats have few equals as a legume nurse crop or companion crop. They can increase the fertilizer replacement value of legumes. Adding about 35 to 75 lb. oats/A to the seeding mix helps slow-establishing legumes such as hairy vetch, clovers or winter peas, while increasing biomass. It also helps reduce fall weeds. The oats will winterkill in many areas while improving the legume's winter survival.

**Spring green manure or companion crop.** Spring-seeded with a legume, oats can provide hay or grain and excellent straw in the Northern U.S., while the legume remains as a summer—or even later—cover. There's also a haylage option with a fast-growing legume if you harvest when oats are in the dough stage. The oats will increase the dry matter yield and boost the total protein,

but, because of its relatively high nitrogen content, could pose a nitrate-poisoning threat to livestock, especially if you delay harvesting until oats are nearing the flowering stage.

The climbing growth habit of some viny legumes such as vetch can contribute to lodging and make oat grain harvest difficult. If you're growing the legume for seed, the oats can serve as a natural trellis that eases combining.

## MANAGEMENT

### Establishment & Fieldwork

Time seeding to allow at least six to 10 weeks of cool-season growth. Moderately fertile soil gives the best stands.

**Late-summer/early-fall planting.** For a winterkilled cover, spring oats usually are seeded in late summer or early fall in Zone 7 or colder. Broadcasting or overseeding will give the best results for the least cost, unless seeding into heavy residue. Cleaned, bin-run seed will suffice.

If broadcasting and you want a thick winterkilled mulch, seed at the highest locally recommended rate (probably 3 to 4 bushels per acre) at least 40 to 60 days before your area's first killing frost. Assuming adequate moisture for quick germination, the stand should provide some soil-protecting, weed-suppressing mulch.

Disk lightly to incorporate. In many regions, you'll have the option of letting it winterkill or sending in cattle for some fall grazing.

If seeding oats as a fall nurse crop for a legume, a low rate (1 to 2 bushels per acre) works well.

If drilling oats, seed at 2 to 3 bushels per acre  $\frac{1}{2}$  to 1 inch deep, or  $1\frac{1}{2}$  inches when growing grain you plan to harrow for weed control.

Shallow seeding in moist soil provides rapid emergence and reduces incidence of root rot disease.

Timing is critical when you want plenty of biomass or a thick ground cover. As a winter cover following soybeans in the Northeast or Midwest, overseeding spring oats at the leaf-yellowing or early leaf-drop stage (and with little residue present) can give a combined ground cover as high as 80 percent through early winter (200). If you

wait until closer to or after soybean harvest, however, you'll obtain much less oat biomass to help retain bean residue, Iowa and Pennsylvania studies have shown.

Delaying planting by as little as two weeks in late summer also can reduce the cover's effectiveness as a spring weed fighter, a study in upstate New York showed. By spring, oat plots that had been planted on August 25 had 39 percent fewer weed plants and one-seventh the weed biomass of control plots with no oat cover, while oats planted two weeks later had just 10 percent fewer weed plants in spring and 81 percent of the weed biomass of control plots (329, 330).

**No-hassle fieldwork.** As a winterkilled cover, just light disking in spring will break up the brittle oat residue. That exposes enough soil for warming and timely planting. Or, no-till directly into the mulch, as the residue will decompose readily early in the season.

**Winter planting.** As a fall or winter cover crop in Zone 8 or warmer, seed oats at low to medium rates. You can kill winter-planted oats with spring plowing, or with herbicides in reduced-tillage systems.

**Spring planting.** Seeding rate depends on your intended use: medium to high rates for a spring green manure and weed suppressor, low rates for mixtures or as a legume companion crop. Higher rates may be needed for wet soils or thicker ground cover. Excessive fertility can encourage lodging, but if you're growing oats just for its cover value, that can be an added benefit for weed suppression and moisture conservation.

**Easy to kill.** Oats will winterkill in most of zone 7 or colder. Otherwise, kill by mowing or spraying soon after the vegetative stage, such as the milk or soft dough stage. In no-till systems, rolling/crimping will also work (best at dough stage or later). See *Cover Crop Roller Design Holds Promise For No-Tillers*, p. 146. If speed of spring soil-warming is not an issue, you can spray or mow the oats and leave on the soil surface for mulch.



Marianne Sarrantonio

OATS (*Avena sativa*)

If you want to incorporate the stand, allow at least two to three weeks before planting the next crop.

Killing too early reduces the biomass potential and you could see some regrowth if killing mechanically. But waiting too long could make tillage of the heavier growth more difficult in a conventional tillage system and could deplete soil moisture needed for the next crop. Timely killing also is important because mature oat stands can tie up nitrogen.

### Pest Management

**Allelopathic** (naturally occurring herbicidal) compounds in oat roots and residue can hinder weed growth for a few weeks. These compounds also can slow germination or root growth of some subsequent crops, such as lettuce, cress, timothy, rice, wheat and peas. Minimize this effect by waiting three weeks after oat killing before seeding a susceptible crop, or by following with an alternate crop. Rotary hoeing or other pre-emerge mechanical weeding of solo-seeded oats can improve annual broadleaf control.

Oats are **less prone to insect problems** than wheat or barley. If you're growing oats for grain or forage, armyworms, various grain aphids and mites, wireworms, cutworms, thrips, leafhoppers, grubs and billbugs could present occasional problems.

## Oats, Rye Feed Soil in Corn/Bean Rotation

Bryan and Donna Davis like what cover crops have done for their corn/soybean rotation. They use less grass herbicide, have applied insecticides only once in the last six years, and they have seen organic matter content almost double from less than 2% to almost 4%.

Rye and oats are the cover crop mainstays on the nearly 1,000 acres they farm near Grinnell, Iowa. Bryan and Donna purchased the farm—in the family since 1929—in 1987 and almost immediately put most of the operation under 100% no-till, a system they had experimented with over the years. They now till some acres and are also in the process of transitioning 300 acres to organic.

Moving  $\frac{1}{3}$  of their acreage toward organic seems the logical culmination of the Davis' makeover of their farm that started with a desire to “get away from the chemicals.” That was what motivated them to start using cover crops to feed the soil and help manage pests.

“We were trying to get away from the idea that every bug and weed must be exterminated. Rather, we need to ‘manage’ the system and tolerate some weed and insect pressure. It should be more of a balance,” says Bryan.

Bryan and Donna are practitioners and proponents of “biological farming,” a systems approach based on such principles as feeding the soil to keep it biologically active, reducing chemical inputs and paying attention to trace elements or micronutrients in order to maintain balance in the system. Cover crops play an integral role in this system.

They seed oats at 2-3 bu/A in spring or fall, depending on time and labor availability. Donna does most of the combining and planting, but even with a lot of acres for two people to manage, cover crops are a high priority on their schedule. Fall-seeded oats are planted after soybean harvest and “need rain on them soon after planting to get them started.” They'll put on about a foot of growth before winterkilling, usually in December in their south-central Iowa conditions.

Spring oats are broadcast in mid or late March with a fertilizer cart and then rotary harrowed. If going back to corn, they seed at a heavier, 3.5 bu rate, expecting only about 5 or 6 weeks of growth before they work down the cover crop with a soil finisher and plant corn in early May. For soybeans, they either kill chemically and no-till the beans, or work down and seed conventionally.

They have managed rye in different ways over the years depending on its place in the rotation, but prefer to seed into killed or tilled rye rather than a living cover crop. They figure that they get about 35 lb. N from oats and up to 60 lb. from rye.

On their organic transition acres they are applying chicken manure (2 tons/A), and cover crops are crucial to sopping up excess nutrients and crowding out the weeds that crop up in response to the extra nutrients. They feel that their efforts to balance nutrients are also helping with weed control, because weeds feed on nutrient imbalances.

In addition to the increase in soil organic matter, attributed to cover crops and no-tillage, they've also seen improvements in soil moisture and infiltration. Fields that used to pond after heavy rains no longer do. Soybeans are weathering drought better, and corn stays green longer during a “more natural” drying down process.

“Our system takes more time and is more labor intensive, but if you look at the whole budget, we are doing much better now. We have cut our chemical costs dramatically, and have reduced fertility costs—in some fields—by  $\frac{1}{3}$  to  $\frac{1}{2}$ ,” says Bryan. “With energy costs these days, you can't afford not to do this.”

Davis is careful to note that this is not just about adding one component such as cover crops. “You need to address the whole system, not just one piece of the pie. To be able to have a sustaining system, you must work with the living system. Feed the soil and give it a roof over its head.” Cover crops play a crucial role in that system.

—Andy Clark

**Resistant oat varieties** can minimize rusts, smuts and blights if they are a concern in your area or for your cropping system. Cover crops such as oats help reduce root-knot nematodes and vegetable crop diseases caused by *Rhizoctonia*, results of a producer study in South Carolina show (448), although brassicas are better. To reduce harmful nematodes that oats could encourage, avoid planting oats two years in a row or after nematode-susceptible small grains such as wheat, rye or triticale (71).

### Other Options

There are many low-cost, regionally adapted and widely available oat varieties, so you have **hay, straw, forage or grain options**. Select for cultural and local considerations that best fit your intended uses. Day-length, stalk height, resistance to disease, dry matter yield, grain test weight and other traits may be important considerations. In the Deep South, fast-growing black oats (*Avena strigosa*) look promising as a weed-suppressive cover for soybeans. See *Up-and-Coming Cover Crops* (p. 191).

Aside from their value as a cover crop, oats are a great feed supplement, says grain and hog farmer Carmen Fernholz, Madison, Minn. A niche

market for organic oats also could exist in your area, he observes.

Oats are more palatable than rye and easily overgrazed. If using controlled grazing in oat stands, watch for high protein levels, which can vary from 12 to 25 percent (434). The potassium level of oat hay also is sometimes very high and could cause metabolic problems in milking cows if it's the primary forage. Underseeding a legume enhances the forage option for oats by increasing the biomass (compared with solo-cropped oats) and providing nitrogen for a subsequent crop.

### COMPARATIVE NOTES

- Fall brassicas grow faster, accumulate more N and may suppress weeds, nematodes and disease better than oats.
- Rye grows more in fall and early spring, absorbs more N and matures faster, but is harder to establish, to kill and to till than oats.
- As a legume companion/nurse crop, oats outperform most varieties of other cereal grains.
- Oats are more tolerant of wet soil than is barley, but require more moisture.

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