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Building a better forage system

Why Pacific Northwest growers are taking a fresh look at annual cereal forages

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Building a Better Forage System

As water supplies become less reliable across the Pacific Northwest, growers are rethinking traditional forage systems. Discover how annual cereal forages like rye, triticale, oats, and barley can help producers build more resilient, flexible operations in the face of drought, heat, and unpredictable weather.

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Between June 22 and 27, northern Oregon experienced weather varying from bright sun and record-breaking heat—97°F, more than 20 degrees above normal—to rain and highs in the low to mid-60s, 10 to 15 degrees below normal. How are farmers supposed to plan their crops when the weather varies so much?

We don't know when the rains will stop: Will it be July or May? asks Shayan Ghajar, an organic pasture and forage extension specialist at Oregon State University. If a farmer is growing a cool-season perennial and a weeklong heat wave hits in May, what happens to that crop? On average, eight months of the year, it's easy to grow cool-season crops in Oregon, he says, but summer is a different beast.

This is true across the Pacific Northwest, where wet and dry seasons experience vast temperature and precipitation swings. Even worse, once-reliable snowpack—which supplies much of the irrigation water used during the growing season—is becoming increasingly unreliable. This year, snowpack in parts of Oregon, Washington, and Idaho fell to near-record lows, leaving growers bracing for reduced irrigation supplies.

As Pacific Northwest growers face tighter water supplies and higher temperatures—and thus more variable forage production—farmers are starting to look for more climate-resilient forage options. Enter small cereal grains like triticale, barley, oats, rye, and wheat. Planted in fall or early spring, these cereals can produce feed

during cooler, wetter parts of the year, make use of winter and spring moisture, and fit into rotations where perennial hay or corn silage alone may be progressively more difficult to sustain due to summer water shortages.

Cereal forages are not a silver bullet. They will not replace alfalfa or other core forage crops. And interest in cereal forages isn't new, but changing water availability is giving growers new reasons to reconsider them and to build more flexible forage systems.

The water challenge

Annual precipitation across the Pacific Northwest ranges from just 6 inches in some high-elevation valleys to more than 100 inches along the coast, reflecting the region's remarkable diversity of production systems. From the cool, wet coastal regions of western Oregon and Washington to the irrigated valleys of the Columbia Basin and Snake River Plain, the dryland wheat country of the Columbia Plateau, and the high-elevation valleys of eastern Oregon and Idaho, growers face vastly different growing conditions. Despite those differences, they share one increasingly common challenge: securing enough water to produce forage. Hotter summers, more variable precipitation, declining snowpack, earlier spring runoff, and growing competition for irrigation water are forcing producers to rethink long-standing forage systems.

For many growers, the challenge is playing out through irrigation. "We typically see cycles of drought and 'less drought,'" says Jared Spackman, the Idaho Barley Commission endowed barley agronomist and extension specialist at the University of Idaho. "This year is a bad year all around for Idaho, Oregon, Washington, Montana." As a result, farmers face tough choices.

Water availability across the Pacific Northwest has become increasing unreliable, making irrigation management decisions difficult. Photo courtesy of Megan Sever.

Questions such as, “Should I stop irrigating after the first cutting? Should I keep applying some water? Or should I irrigate at a reduced rate further into the season?” are becoming more common, says Gordon Jones, an extension agronomist and associate professor in the Department of Crop and Soil Science at Oregon State University. “How would these decisions affect yield and quality?” Some growers are even asking whether they should switch to an entirely different crop. “When do you give up on the system that’s worked for decades?” Jones asks. Those difficult decisions come into sharp focus during drought, when long-standing management practices are no longer a given.

Growers in some parts of Idaho have had to come up with groundwater mitigation plans, Spackman says. They may be allocated a certain amount of water over three or four years and have to decide how to ration it. The first step is “understanding your water—your water rights, your local water management plan, and exactly how much water you're applying.” Growers need to know whether their irrigation systems are actually applying the amount of water they think they are, he says. An outdated pivot package can mean some parts of a field are overwatered while others are underwatered. “Water-use efficiency is going to be huge for agriculture across the state.”

“In drought years, a farmer growing perennial crops will consolidate both production and the water they have available onto a smaller number of acres—abandoning older or less productive fields or ones with less secure water rights—to get high yields on the acres they keep,” Jones says.

Those difficult decisions matter because forage crops are among the most valuable agricultural commodities in Oregon, Idaho, and Washington, making improving forage resilience a major economic concern.

Annuals vs. perennials

The most common forages grown in the Pacific Northwest are perennials like alfalfa and cool-season grasses like ryegrass, orchardgrass, and tall fescue. Tall fescue and orchardgrass are fairly resilient to shifts in climate and require less careful management than other perennials, Ghajar says. They aren't the most prized forages as they're less palatable to animals than perennial ryegrass, he says, but tall fescue in particular has excellent energy and protein. Plus, its resilience is raising its importance worldwide, he adds. However, it is far less flexible than many annuals like small cereal grains, and less productive in summertime than dedicated warm-season annual forages like sorghum or pearl millet.

The extremes in Oregon's Mediterranean climate pose a unique challenge for perennial forages, Ghajar says. Too wet too late or too dry too early can reduce pasture and hay productivity and can cost farmers a lot if they have to buy forage materials for summer feedings, he says. "Annuals offer flexibility and high nutritive value in a climate that's so unpredictable, and annual-based systems give you options when you don't know when the rain will stop," he says. Therefore, one increasingly attractive option is incorporating annual cereal forages into traditional perennial forage systems.

Planting a cool-season annual cereal grain like hybrid rye, oats, or triticale in the fall or spring can allow growers to take advantage of cool-season moisture (thus reducing reliance on irrigation), produce early feed (for both human and animal consumption), and fit into double-crop systems. "By having an earlier-maturing crop like a winter hybrid rye,

you're saving one to two irrigations compared to winter wheat if you're harvesting it at boot," Spackman says. "And hybrid rye is a really good option in terms of being able to harvest it, get your field management done, and get the next crop in because you harvest it earlier and still have similar yield and similar feed quality as other small grains grown for forage," he says.

Once the cool-season annuals are harvested, warm-season annuals like corn, cowpeas, or sorghum can be planted (see sidebar). Warm-season annuals produce more pounds of forage per unit of water and tolerate heat that would not be tolerable for perennial ryegrass or even tall fescue, Ghajar says.

Warm-season annuals: filling the summer forage gap

Summer or warm-season annuals, like sorghum, sorghum–sudangrass, millet, teff, crabgrass, and others, show up as tools to fill the Pacific Northwest (PNW) "summer slump" when cool-season perennials stall and as perennial or cool-season forage options wither under heat and drought stress.

One option for figuring out what cereal might grow best is checking out the cereal trials Montana State University runs every year, Spackman says. Researchers there try new varieties of barley, wheat, pea, and other grains each year and grow them in the field under many different conditions to evaluate crop yield, grain quality, and forage performance. They mostly focus on winter and spring varieties, however, so for more information on summer annuals, growers might have more luck turning to their local extension offices.

Oregon State extension offices have been testing several warm-season annuals for decades, Ghajar says. Testing since 1939 has shown that sorghum grows well in Oregon, for example, he says. It's very high producing for a cereal grain, he says. His research team has also tried teff and pearl millet—both annuals —with varying degrees of success. Teff has been "underwhelming," he says, while pearl millet was second to sorghum in terms of production.

The upside is clear: big biomass, good digestibility, and strong drought tolerance from relatively short, targeted planting windows, Ghajar says. But growers do need to manage these crops and soils for everything from prussic acid and nitrate risk to invasive weeds.

Warm-season forages may seem like a new idea, but they fit most naturally into farming systems that already rely on annual crops, Ghajar says. In annual grain rotations, growers can often add a summer forage with relatively little disruption by building it into the existing crop sequence. For producers with perennial cool-season pastures, however, adopting warm-season annuals usually means taking land out of perennial production and reestablishing those fields. Even so, Ghajar says, the four-month summer slump in perennial pasture growth can take a significant toll on both livestock nutrition and farm profitability, making dedicated summer forage acres a worthwhile investment for some operations.

Choosing the right cereal

There is no single "best" cereal. Each species offers a different balance of yield, forage quality, drought tolerance, maturity, water and nutrient requirements, and management flexibility. Some also provide additional revenue opportunities. For example, growers may harvest the grain for human or livestock consumption—or, in

some cases, specialty seed—while using the remaining biomass for hay or silage. As a result, choosing which cereal to grow and when to harvest it depends not only on water use but also on the value of the crop. “In some cases, it becomes as much a question about the value of the resulting crop as it does the water use of that crop,” Jones says.

Table 1. Choosing the right cereal forage.

Cereal	Key strengths	Best uses	Potential trade-offs
Barley	Early maturity; relatively drought tolerant; high forage quality; tolerates marginal ground; awnless varieties allow for harvest at soft dough for increased forage yield	Hay, silage, grazing, livestock feed, malting, grain	Produces less biomass than hybrid rye or triticale; can mature quickly, narrowing the harvest window; less tolerant of cold than wheat, hybrid rye, or triticale
Oats	Excellent forage quality; highly palatable; familiar to growers	Hay, silage, grain, cover crop	Less tolerant of drought and winter cold than rye or triticale
Rye	Exceptional winter hardiness; earliest spring growth; performs well in water-limited systems	Grazing, cover crop, forage	Forage quality declines rapidly after heading; less palatable at maturity; hybrid rye has early and vigorous maturity but need to control it so feral rye does not spread

Cereal	Key strengths	Best uses	Potential trade-offs
Triticale	High biomass production; good drought resilience; excellent silage quality	Silage, haylage, grazing	Earlier maturity to boot but later maturity for grain than barley; management is important to optimize forage quality
Wheat	Flexible; fits grain-forage or dual-purpose systems; widely adapted, awnless varieties allow for harvest at soft dough for increased forage yield	Dual-purpose grazing and grain, silage, hay	Typically produces less forage than triticale and may offer lower forage quality than barley or oats

Even farms that are only a few miles apart may need different strategies, Jones says. Their soils, water supplies, cropping systems, and markets are all different, so the opportunities—and the challenges—are different too. That's why there isn't a one-size-fits-all approach to building a more drought- and climate-resilient future, he says.

Management matters

Decisions about when and what to plant, how and when to harvest, what to feed, and which markets to target all have to align. In wet springs, growers may wait for fields to dry enough to support equipment even as optimal planting windows and crop insurance deadlines pass. Delayed planting can reduce growth, increase heat and drought stress, and complicate decisions about whether to harvest for forage or grain. Fall planting avoids some of those challenges but introduces others. “Whatever you're growing should be something that handles waterlogging, diseases, and pathogens,” Ghajar says.

Harvest timing is just as strategic. Cutting cereals at boot stage improves forage quality and can save one or two irrigations on early-maturing crops like hybrid rye, Spackman says, but taking the crop to soft dough produces a lot more tonnage, though it sacrifices some quality. When to harvest can matter just as much as what to grow.

Market requirements also shape management decisions. The highest-value forage in irrigated regions often goes to dairies, export hay markets, or premium small-bale buyers, all of which demand specific quality traits rather than maximum biomass. Those expectations should determine which cereal to plant, how to fertilize it, and when to harvest it. "A grower has to know their market before even seeding," Jones says.

When cut at boot stage, early-maturing hybrid ryes like triticale can save one or two irrigations. Photo courtesy of Adobe Stock/Anselm.

Annual systems raise the management bar even further, Ghajar says. Instead of planting a perennial field and managing it for years, growers may be planting two to three times a year, with different warm- and cool-season annuals, which multiplies passes across the field, seed costs, and risk, he says.

Nutrient management also requires more attention, Spackman notes. Residual nutrients from crops such as potatoes and sugar beets can significantly reduce fertilizer needs for the following cereal crop, Spackman says, meaning blanket fertilizer programs can waste money and increase nutrient losses.

In addition, Ghajar says, the system must match a grower's equipment and timing reality. A program built on tight windows—early-harvest hybrid rye, quick-turn annuals, and multiple plantings, for example—requires equipment that can move quickly between fields and that can handle softer conditions without doing damage. If growers don't have the tools to get into the field when that narrow "right now" window opens, they lose the water-use and quality advantages that made annual cereal systems attractive.

Cereal forages are not a cure-all for forage or water challenges. Rather than replacing alfalfa, grass hay, or corn silage, they provide another tool for building more resilient forage systems. The key is generating the data needed to evaluate each crop's water use, production costs, forage quality, and return on investment.

Planning for the future

Many of those answers will come from on-farm experimentation. Ghajar encourages growers to start small—plant a few garden-sized test plots, compare different species over multiple years, and gradually expand what works. Because weather varies so much from year to year across the Pacific Northwest, repeated on-farm trials often provide the most valuable insights.

Researchers and extension specialists have an important role to play as well. Beyond testing new forage species, Jones says, the next advances will come from helping growers make better use of the tools they already have. Soil moisture sensors, weather networks, and satellite- or drone-based evapotranspiration estimates all have the potential to become practical decision-support tools for timing planting, nutrient requirements, irrigation, and harvest. Researchers also need to identify where water can safely be reduced without sacrificing yield, forage quality, or profitability.

No single forage or management strategy will solve the Pacific Northwest's water challenges. But by combining on-farm experimentation with better research and decision-support tools, growers can build more resilient forage systems tailored to their own soils, water supplies, equipment, and markets.

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1. What is one advantage of planting cool-season annual cereal grains mentioned in the article?

a. They reduce reliance on irrigation during the growing season.

b. They eliminate fertilizer requirements.

c. They produce the highest forage yields in summer.

d. They replace perennial forages in most systems.

2. Which perennial forage does Shayan Ghajar describe as particularly resilient to climate shifts?

a. Perennial ryegrass.

b. Tall fescue.

c. Alfalfa.

d. Timothy grass.

3. According to Jared Spackman, what is the first step in managing limited irrigation water?

a. Evaluating the forage quality of current crops.

b. Installing new soil moisture sensors throughout the farm.

c. Understanding water rights and water use.

d. Assessing whether irrigation systems are applying water accurately.

4. Which cereal forage is noted for exceptional winter hardiness and early spring growth?

a. Oats.

b. Wheat.

c. Rye.

d. Barley.

5. What is a key strength of triticale?

a. Earliest maturity among cereals.

b. High biomass production.

c. Highest grain quality.

d. Lowest nutrient requirement.

6. Harvesting cereal forages at the boot stage generally

a. improves forage quality.

b. maximizes grain yield.

c. eliminates irrigation needs.

d. reduces drought tolerance.

7. Why do annual forage systems often require more management than perennial systems?

a. They need daily irrigation.

b. They cannot be harvested mechanically.

c. They have no established production practices.

d. They may require multiple plantings each year.

8. Which crop is mentioned as a warm-season annual forage option?

a. Orchardgrass.

b. Triticale.

c. Wheat.

d. Sorghum.

9. According to Ghajar, what has Oregon State research shown about sorghum?

a. It struggles in Oregon's climate.

b. It is highly productive.

c. It requires more water than corn.

d. It performs poorly as forage.

10. What strategy does Ghajar recommend for growers interested in trying new forage systems?

a. Start with small test plots and evaluate results over time.

b. Plant several forage species on a small scale and compare their performance over multiple years.

c. Adopt a double-cropping system across the entire farm in the first year.

d. Focus on the cereal species with the highest biomass production regardless of local conditions.

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