AGRICULTURE

NEWSLETTER

DECEMBER 2025

# Mating Decisions and Gene Combination Value
# Build Back Better – Replacement Heifer Series

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Mating decisions made in commercial cow-calf operations determine if (and how much) Gene Combination Value (GCV) we create in the next generation.

In the genetic model: Phenotype = Genotype + Environment. Genotype represents the genetic potential of an animal to reach a level of performance and can be split into two components. The component of Breeding Value (additive genetic merit) was covered last week. The focus of this article is GCV which can also be thought of as the non-additive part. GCV is based on the effect of gene pairs at loci across the genome. It is part of the animal's genotypic value and impacts the animal's performance potential; however, since it is based on gene pairs, it can't be transmitted from parent to offspring. **In commercial cow-calf operations we can create GCV through mating decisions.** The decision to crossbreed is a mating decision.

Crossbreeding provides commercial cattlemen the opportunity to combine desirable characteristics of two or more breeds (breed complementarity) and increase performance due to hybrid vigor (heterosis). Hybrid vigor is the result of GCV.

For example, if we make the mating decision to use a Charolais bull on our Angus cows, we are creating F1 black-nosed smoke calves with 100% level of individual heterosis. Why? Because the F1 generation will have a Charolais gene paired with an Angus gene across all loci.

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*Continue Mating Decisions*

Hybrid vigor is the superiority in the level of crossbred offspring's performance over the average level of the purebred parents involved in the cross. In scientific literature, levels of heterosis are typically expressed as a percentage as shown in the example below:

A Charolais bull with the additive genetic potential for 660 pounds of weaning weight is crossed with a herd of Angus cows with the additive genetic potential for 640 pounds of weaning weight. The resulting F1 crossbred calves weigh 683 pounds at weaning.

- Average of the purebred parents is 650
- The 683 pound weaning weight of calves is 33 pounds more than average of the parents
- (33/650) x 100 = 5% level of heterosis from this cross.

The 5% level of heterosis is not additive, it is the result of the biological phenomenon of hybrid vigor created by crossbreeding resulting in a GCV that is non-additive.

It is noteworthy that if the F1 heifers and bulls resulting from this cross were mated, or if we began a two breed rotation involving an Angus bull mated to the F1 females from this cross, we would lose hybrid vigor (GCV) in the resulting F2 calf crop. Why? Because not all loci would have a Charolais gene paired with an Angus gene. Hence, GCV (based on gene pairs) is NOT transmittable from parents to offspring. It must be created through mating decisions.

Thereby, purebred animals are an essential component for effective crossbreeding programs.

**Final Thoughts for Building GCV**

Each selection and mating decision should be intentional, deliberate and made for a purpose. Selection decisions impact BV. Mating decisions impact GCV. Choose breeds (and breeding stock within those breeds) with high breeding value for traits of economic importance to your operation. Crossbreeding (to increase GCV/hybrid vigor) does not replace additive genetic merit, it builds off of it. Finally, more breeds introduced into a crossbreeding program will result in more heterosis but also increase variation. Performance levels of some traits are influenced more by additive genetic merit, other traits benefit more GCV.

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## IN THIS ISSUE

## *Market News:*

Trade policy uncertainty, geopolitical developments in the Black Sea region, and speculation on weather impacts both domestically and in South America dominated market conversation over the last week. Those factors look to remain in the discussion for the near future. The December WASDE report comes out today. Expectations are for limited changes across most agricultural crops as we wait for final production numbers and the December stocks data in January.

**Wheat Market Outlook:**

The wheat market remains focused on working through the large supply produced around the globe this year. Geopolitical events and weather look to be price drivers over the near term. Hard red wheat prices continue to react to events out of the Black Sea region. Uncertainty around the Russia-Ukraine conflict remains high and a resolution to the conflict seems remote. Discussion around La Nina climate conditions will repeatedly crop up in discussions about not only U.S. wheat production but the crop season in South America over the near term. At present, the forecast is for a very mild La Nina episode.

KC hard red winter wheat prices rose slightly over the last week. The March contract closed at $5.26 on Monday. March HRW futures prices sit in the lower end of the $5.20 - $5.55 range that they have been in since late October. July harvest contract prices closed at $5.50 near the low end of the $5.45 - $5.75 range they have experienced over the same period.

Cash prices in Table 1 reflect the ample stocks on hand in Oklahoma and the narrow band HRW prices in the state have seen over the last month.

**Table 1: Oklahoma cash hard red wheat prices select locations**

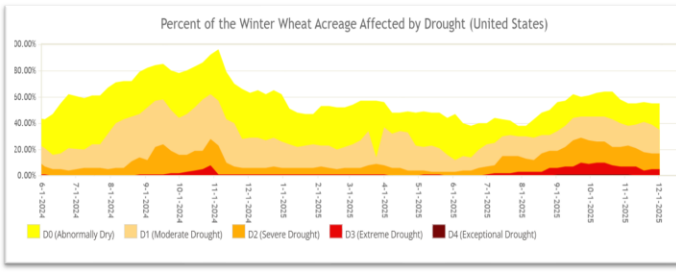
| | *Hooker, OK* | | *Perry, OK* | | *Hobart, OK* | | *Weatherford, OK* | |
|---|---|---|---|---|---|---|---|---|
| | Cash | Basis | Cash | Basis | Cash | Basis | Cash | Basis |
| 14- Nov | $4.30 | -85 | $4.45 | -70 | $4.30 | -85 | $4.35 | -80 |
| 21-Nov | $4.26 | -85 | $4.41 | -70 | $4.26 | -85 | $4.31 | -80 |
| 26-Nov | $4.32 | -85 | $4.47 | -70 | $4.32 | -85 | $4.37 | -80 |
| 5-Dec | $4.41 | -90 | $4.51 | -80 | $4.41 | -90 | $4.46 | -85 |

Data: USDA, AMS (December Basis using March 2026 futures contract)

Export inspections continue to place wheat on track for USDA's forecast this marketing year. Through December 4, wheat export inspections are 501 million bushels, up around 21 percent from last marketing year. Hard red wheat exports sit at 138 million bushels and require 4.9 million bushels per week to hit USDA's 325-million-bushel forecast. The WASDE report due out tomorrow is not expected to have major adjustments to wheat balance sheets, but it still bears monitoring.

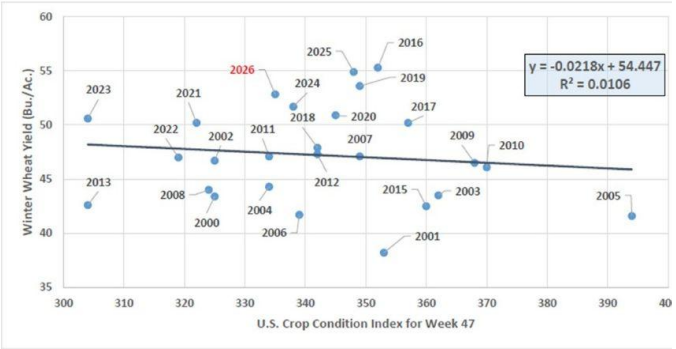
Recent rains and cooler temperatures bring renewed speculation on the winter wheat crop across the Southern Plains. As of December 2, 35 percent of the winter wheat acreage came in with various levels of drought as estimated by the USDA. Figure 1 shows the weekly drought percentages since June 1, 2024, for winter wheat. At the same time last year, 29 percent of the crop had drought conditions after the huge rains in November of 2024. Unlike last year, the level of extreme and severe drought is more prominent this year. Drought conditions combined with the La Nina climate story create the potential for a weather rally given the right conditions.

Figure 1: USDA Winter Wheat Acreage in Drought




Early season weather and crop conditions can impact final yield and abandonment, but the final outcomes are highly dependent on weather early in the subsequent year. Figure 2 shows the relationship between a winter wheat crop condition index during Week 47 and final wheat yield during 2000-2025. The index is a simple weighted calculation of the five categories provided by USDA in the crop conditions report. Week 47 was the last report at the national level for the 2026 crop. Figure 2 shows a shotgun pattern that provides truly little statistical power for forecasting the yield next year. For reference, the 2026 crop condition index is shown at the linear trend yield projection for U.S. winter wheat. Crop condition reports have continued to be provided, particularly in Kansas, which showed improvement since late November.

Figure 2: Winter Wheat Yield and Crop Condition Index for Week 47




Wheat prices look to remain rangebound as we approach the end of the year without a significant development in trade negotiations or a shock from outside markets.

### 2026 Master Gardener Volunteer Training Program

- Volunteers will learn:
- Basic Botany, Entomology, and Plant Pathology
- Soils and Soil Fertility
- Proper care and maintenance of plants
- Fruit, Flowe, Nuts, and Vegetable Gardening
- Pesticide safety and handling
- Herbaceous and Woody Ornamentals

Classes held every Monday Starting February 2nd from 4:30 to 9pm
Texas County OSU Extension Office
Initial Cost $200, Members will receive $75 back upon completing their first year of volunteering.
(Cost includes Background Check, materials, and food during classes)
REGISTRATION DEADLINE IS JANUARY 26, 2025
Call 580-338-7300 to enroll

## *Finding Forage Efficient Heifers*

David Lalman and Bailey Tomson, OSU Department of Animal and Food Sciences

In recent years, substantial progress has been made in understanding biological and genetic sources of variation in feed efficiency of growing cattle consuming energy-dense, mixed diets during the post-weaning phase. In contrast, much less is known about feed efficiency of cattle consuming moderate- to low-quality forage diets. This is important because approximately 74% of the total feed required to produce beef comes from forage. Indeed, the ruminant animal's primary advantage over non-ruminant species is its ability to convert forage—essentially sunlight, water, and carbon dioxide—into a high-quality human food source. With increased heifer retention over the next few years, perhaps now is an opportune time to consider strategies for improving forage use efficiency in replacement females.

Forage utilization efficiency has been a major research focus of our group at Oklahoma State University. Although grazing studies are ultimately the goal, we began this line of work in a controlled pen setting where forage intake can be measured accurately. Each year, we evaluate a contemporary group of weaned replacement heifers and a contemporary group of five-year-old cows. The cows are tested during lactation and again during gestation. During each test period, cattle spend approximately 90 days in our forage intake facility (Fig. 1).

Cattle are fed bermudagrass hay and provided mineral with free-choice access to both. The hay typically contains 12 to 14% crude protein and approximately 57 to 60% total digestible nutrients (TDN). High-quality bermudagrass hay was selected so that protein requirements of growing heifers and lactating cows are met without the need for protein supplementation. Importantly, the hay is fed unprocessed (not ground, chopped, or shredded), allowing us to evaluate intake and performance under conditions similar to many real-world forage systems.

Substantial phenotypic variation is observed within each contemporary group. As an example, forage intake and weight gain for the 2024 weaned replacement heifers are shown in Figure 2. Average daily forage intake ranged from 9 to 19 pounds per day, while average daily gain (ADG) ranged from slight weight loss to gains of 1.6 pounds per day. Notably, heifers with unacceptable weight gain have been observed in every contemporary group, as indicated by the red rectangle in Figure 2. At the same time, many heifers exhibited moderate forage intake coupled with acceptable—or even exceptional—weight gain (green rectangle). Our working hypothesis is that heifers demonstrating moderate forage intake with acceptable growth will ultimately become more forage-efficient cows. Simply put, we define an efficient cow as one that is highly productive without consuming excessive amounts of forage.

In this article, we focus specifically on the forage performance (gain) component of efficiency. Our group, along with several others, has conducted experiments to determine whether cattle that rank high for weight gain when consuming an energy-dense diet (such as a bull-test diet) also rank high for gain when consuming forage. To date, the answer appears to be no. Across seven independent studies, no statistically significant positive correlations have been detected between gain on concentrate-based diets and gain on forage-based diets. In fact, the average correlation across studies is near zero. These results suggest that growth performance on energy-dense diets is largely unrelated to growth performance on moderate-quality forage. Additional research is clearly needed, including larger experiments with sufficient data to estimate genetic correlations.

The encouraging news is that measuring forage-based growth performance is neither difficult nor expensive. Producers need only a reliable scale and a 70- to 100-day period during which heifers are grazing moderate-quality forage (or consuming hay) with little or no supplementation. In practice, some producers may already be selecting for forage performance—perhaps unintentionally. For example, low-input heifer development programs, short breeding seasons, and retaining only heifers that conceive early may naturally favor females that perform and reproduce efficiently on forage-based systems.

Considerable variation exists among heifers in their ability to gain weight on moderate-quality forage, and this variation appears largely independent of performance on energy-dense diets. Simple measurements of forage-based weight gain, or well-designed development programs intended to challenge heifers to perform (with minimal or no concentrate feed), and become pregnant early in the breeding season may help identify heifers that are better suited for efficient, forage-based cow-calf production systems.

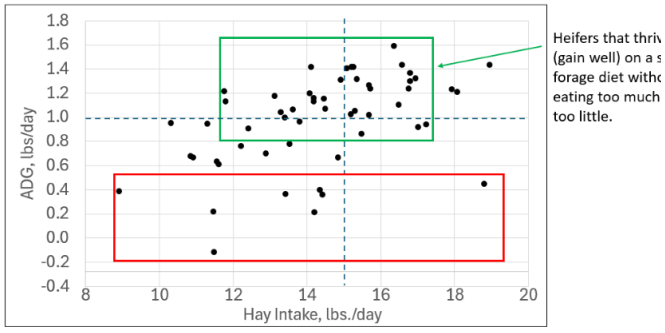



Figure 2. Hay intake and average daily gain for heifers consuming bermudagrass hay.

Fig. 1

Forage intake facility at the Range Cow Research Center near Stillwater, OK.

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## *CALENDAR*

Dec 24-25---Extension Office Closed  Jan 1---Extension Office Closed  Feb 2---Master Gardener Volunteer Training

### Get Ready for Spring!!
### Soil Sampling Tips for Producers and Gardeners

As spring approaches, now is the perfect time for both agricultural producers and home gardeners across Oklahoma to start planning their soil sampling. Whether you're preparing fields for planting or getting ready to revive your garden beds, soil testing is one of the most cost-effective tools for improving soil health, fertilizer efficiency, and overall crop or plant performance.

Why Spring Sampling Matters??

With Oklahoma's variable winter conditions—ranging from heavy rainfall to extended dry spells—nutrient availability can shift significantly. Spring soil testing helps you:

**For Producers:**

· Adjust fertilizer plans before planting, especially nitrate testing if applicable
· Evaluate winter nutrient losses or nitrate carryover, such as residues crops and cover crops
· Improve nutrient-use efficiency and support 4R nutrient stewardship
· Improve your maximum yield potential by adjusting the soil pH for wheat, pasture, row crops, and hay production

**For Gardeners:**

· Determine what your lawn, flower beds, or vegetable gardens actually need
· Avoid over-fertilizing, which can harm plants and waste money
· Correct pH issues before planting, especially important for tomatoes, berries, and ornamentals  Helpful OSU Fact Sheets for Producers & Gardeners

• How to Get a Good Soil Sample (PSS-2207)
https://extension.okstate.edu/fact-sheets/how-to-get-a-good-soil-sample.html
• Soil Test Interpretation for Oklahoma Soils (PSS-2225)
https://extension.okstate.edu/fact-sheets/soil-test-interpretation-for-oklahoma-soils.html
• Soil pH and Its Effects on Plant Growth (PSS-2228)
https://extension.okstate.edu/fact-sheets/soil-ph-and-its-effects-on-plant-growth.html
• Understanding your lawn and garden soil test (HLA-6468 )
https://extension.okstate.edu/fact-sheets/understanding-your-lawn-and-garden-soil-test.html