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Beef Cattle on California Annual Grasslands: Production Cycle and Economics

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Much of California is annual rangeland. As the term implies, many of the grasses and broadleaf plants on annual rangeland complete their life cycles in one year—that is, they germinate, grow, mature, produce seed, and die. Annual grasslands are green in the spring; when forage dies later in the year, the “golden hills” of California become evident.

These grasslands are generally grazed seasonally (late fall through late spring) when forage quality is best. In summer and fall, cattle that graze less productive annual grassland are typically moved to irrigated pasture, out-of-state pasture, or mountain rangelands. More

productive locations (that is, the Central Coast and North Coast) may be grazed throughout the year.

Segments of beef cattle production

Beef cattle production in the United States can be broken into four distinct segments, or phases. These phases include the cow/calf, stocker (sometimes called yearling), finishing, and harvest phases.

Cow/calf operations

In a cow/calf operation (fig. 1), a herd of breeding cows is maintained and managed. The cows are bred to produce a calf annually. Pure-bred bulls are typically run with the cows for a 2-to-3-month breeding season. Removing the bulls at the end of the season helps to ensure uniformity in calf size and age when the calves



Figure 1. Cow-calf pair. Calves such as the animal on the right, raised alongside their mothers, are generally weaned and sold when they weigh about 600 pounds. *Photo:* Larry Forero.

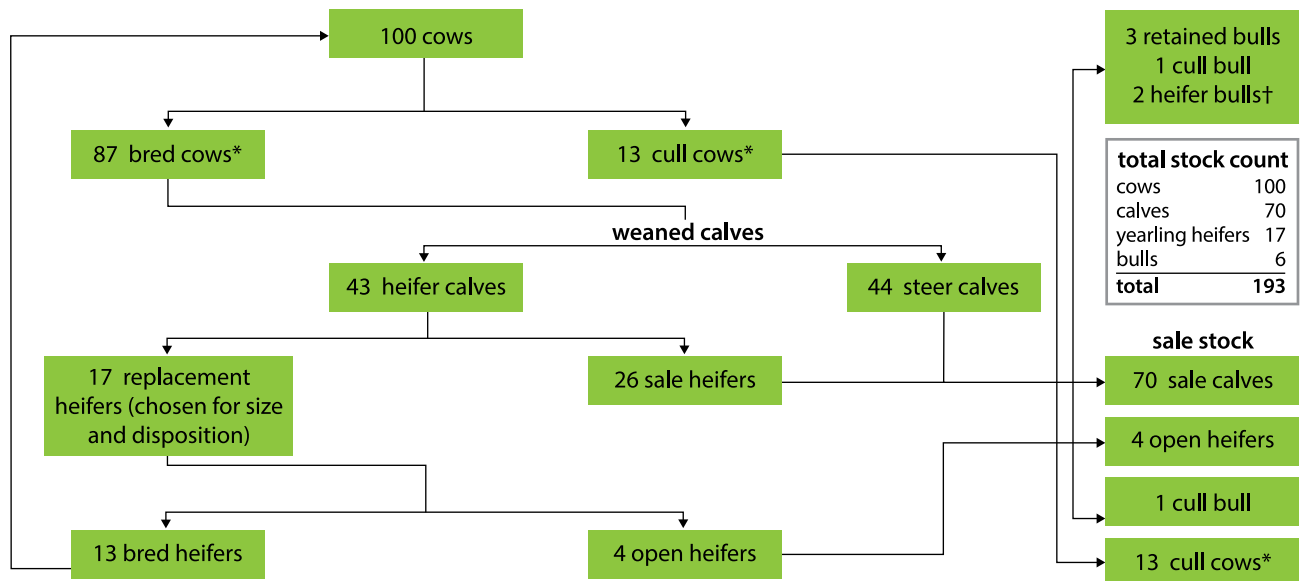
are marketed. Male calves, called bulls, are usually castrated to reduce both aggressive behavior and the possibility of inbreeding. These altered males are called steers. Female calves are called heifers. Typically some heifers from the annual calf crop are retained to replace cows that, no longer reproductively efficient, are culled. Figure 2 outlines the annual stock flows through a 100-head cow herd.

Cattle are gathered several times each year for vaccination, pregnancy checks, and

shipping. Table 1 outlines a typical calendar of operations for a fall-calving herd.

The products sold by cow-calf operations include weaned calves (both steers and heifers), cull cows and cull bulls, and a few yearling heifers. Calves may be sold at an auction market, or by video sale or private contract. Table 2 is an estimate of gross income that might be expected from a 100-head operation.

Expenses can include pasture rent, hay, nutritional and mineral supplements, vaccination



*Assumes 87% weaning and 0% death loss.

†Small-stature bulls selected to throw low-birth weight calves and to breed with yearling heifers.

Figure 2. Annual stock flows through a 100-head cow herd.

Table 1. Cow-calf calendar of operations for cows that calve in the fall

Dec.–Feb.	Dec.–Jan.	Jan.–Feb.	Mar.–May	May–July	Aug.–Oct.
Breeding	branding/ vaccinating	selling cows that didn't produce a calf	checking pregnancy; selling cows that aren't pregnant	revaccinating, weaning, and selling calves	calves are born

Table 2. Estimated gross income for a 100-head cow/calf operation

Class of livestock	Number sold	Weight (pounds)	Price per pound*	Gross sale by class
Steer calves	44	650	\$1.54	\$44,044
Heifer calves	26	600	\$1.39	\$21,684
Yearling heifers	4	800	\$1.28	\$4,096
Cull cows	13	1,150	\$0.42	\$6,279
Bulls	1	1,500	\$0.55	\$825
Gross income	—	—	—	\$76,928

*Numbers in this column reflect market prices at the Shasta Livestock Auction Yard in Cottonwood, California on May 25, 2018.

Table 3. Estimated cash expenses for a 100-head cow/calf operation*

Expense	Number	Cost per unit	Total
Pasture (for cows, heifers, and bulls)	123 head (100 cows + 17 heifers + 6 bulls) × 12 months = 1,476 cow months	\$25 per Animal Unit Month†	\$36,900
Hay	0.50 tons per head = 60 tons	\$200 per ton	\$12,000
Veterinary/medical expenses	120 animals	\$50 per head	\$6,000
Mileage‡	10,000 miles	\$0.58 per mile	\$5,800
Bulls§	1	\$3,500	\$3,500
Insurance, bookkeeping, etc.	—	—	\$5,000
Gross expense	—	—	\$69,200

*Interest, capital cost (purchase of equipment, cattle, and so on), and labor are not reflected in this table.

†For the purposes of this publication, an Animal Unit Month is considered the forage requirement for heifers, cows, and bulls for 1 month.

‡Mileage associated with care and management of a 100-head cow/calf operation.

§For an operation of this size, at least one bull would be replaced annually.

Table 4. Estimated return over cash costs for a 100-head cow/calf operation

Item	Amount
Estimated gross income	\$76,928
Estimated cash expenses	\$69,200
Estimated return over cash cost	\$7,728

services, and mileage. Death loss is typically figured at 2 percent. Table 3 outlines an estimate of cash expenses.

An estimate of income can be made by subtracting total costs from total receipts. Table 4 estimates return over cash costs. While the estimated return shown in table 4 doesn't perfectly represent costs and revenue, it does reflect the limited income associated with cow-calf operations.

Stocker operations

Weaned calves are either retained by cow/calf producers or sold to what is known as a stocker operator (fig. 3). Stocker cattle are weaned calves that grow larger as they graze on rangeland and pasture. The stockers that graze on annual rangeland, typically spring-born calves, may be transported to annual rangeland from elsewhere in California or other parts of the United States. Cattle in this segment generally weigh between 500 and 650 pounds when they begin grazing on annual rangeland. Their forage requirements are often considered to be one-half the requirements of a cow-calf pair. Stockers can gain anywhere between 200 and 350 pounds during a 6-month grazing season. Stocker operators develop their budgets based

**Figure 3.** Stocker cattle about to be shipped to a feedlot off of annual range. Photo: Larry Forero.

Table 5. Estimated costs of a winter-grazed 200-head stocker operation

Cost	Unit	Number	Value	Total
Purchase of steer calves	200 head	650 pounds	\$1.50 per pound*	\$195,000
Pasture	100 cow months for 6 months†	600 Animal Unit Months	\$25 per Animal Unit Month	\$15,000
Hay	ton	5 tons	\$200 per ton	\$1,000†
Nutritional supplements	ton	2 tons	\$500 per ton	\$1,000
Veterinary/medical expenses	200 head	\$10 per head	\$2,000	\$2,000
Trucking	mile	3 loads at a distance of 133 miles per load	\$5 per mile	\$1,995
Total cost	—	—		\$215,995‡

*This value reflects the market price at the Shasta Livestock Auction Yard in Cottonwood, California on November 25, 2018.

†Pasture needs for stocker cattle are calculated at one-half a cow month.

‡Does not include interest, labor, or costs associated with cattle purchase or equipment.

Table 6. Estimated gross income from a 200-head stocker operation

Class of livestock	Number	Ending weight	Value	Gross income
Stocker steers	196*	925 pounds	\$1.21†	\$219,373

* Reflects 2% death loss.

† This value reflects the market price at the Shasta Livestock Auction Yard in Cottonwood, California on May 25, 2018.

Table 7. Estimated return over cash cost from a 200-head stocker operation

Item	Amount
Estimated gross income	\$219,373
Estimated cash expense	\$218,096
Estimated return over cash cost	\$1,277



Figure 4. Cattle in a feedlot. Photo: Larry Forero.

on cattle acquisition costs, projected sale value, and operational costs. A simplified example of costs is shown in table 5.

The return on stocker cattle is based upon both market conditions (including purchase price and eventual sale price) and the cattle’s weight gain during the grazing season. Table 6 estimates gross income on a set of stocker cattle. The per-pound value of the cattle sold is less than the per-pound value of the same cattle when they were purchased. As cattle get bigger, their per-pound sale price drops—a phenomenon, normal in the beef cattle business, known as an inverse price/weight relationship. Even so, heavier cattle are more valuable on a per-head basis than are lighter cattle.

When costs are subtracted from gross income, profitability can be estimated. Table 7 depicts return over cash costs.

While this estimated return doesn’t perfectly represent costs and revenue, it does reflect the limited income that stocker operations produce. Meanwhile, risks in stocker operations are significant. Weight gain, which is associated with rainfall, and future market prices are both largely out of the control of the operator— yet both are crucial factors in profitability.

Finishing and harvest

Stocker cattle are generally sold at the end of the green forage season. It is not unusual for these cattle to approach 1,000 pounds in weight at the end of the stocker phase. These cattle are typically shipped to an out-of-state feedlot and are fed concentrates (grain) for the next 120 days (fig. 4). During the finishing phase, they frequently gain between 3 and 4 pounds per day, reaching a finished weight of 1,300 to 1,400 pounds. As with stocker cattle, profit is the difference between the cost of cattle acquisition and feeding and the price received for cattle when they are sold. Cattle are generally harvested at a point when they will provide a good eating experience for consumers. Beef is differentiated in the consumer marketplace based upon quality grade. Quality grade is determined by a U.S. Department of Agriculture (USDA) grader who considers the maturity of the animal and the texture, color, and amount of intermuscular fat in the ribeye

in determining grade. Quality grades include standard, select, choice, and prime—with standard having very little intermuscular fat and prime having the highest level.

In the United States, when cattle are harvested and made available for human consumption—but prior to grading—they are inspected by Food Safety Inspection Services, part of the USDA, to ensure that the harvest process was conducted in such a way that consumption of the product is safe. Inspection of every carcass is required.

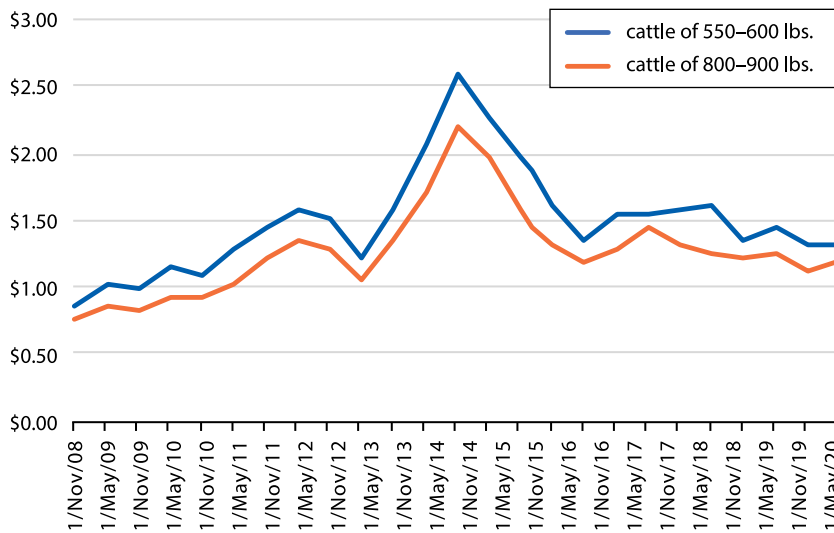


Figure 5. Average price per pound for steer calves and stockers, 2008–2019.

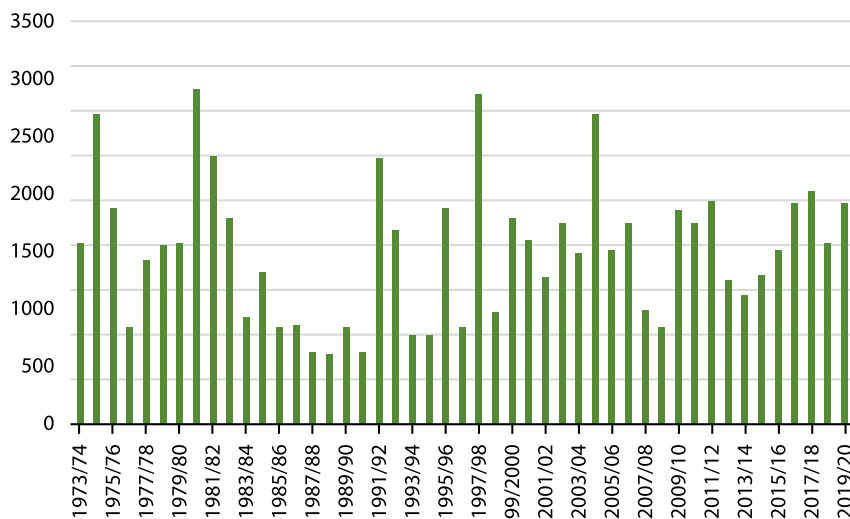


Figure 6. Per-acre forage production near Redding, California.

Risk

In any given year, beef cattle ranchers assume substantial market, production, and climatic risks that could result in a net financial loss.

Market risk

The market for live cattle, inherently volatile, is characterized by large fluctuations in price. Figure 5 shows average prices for calves (feeder steers of 550 to 600 lbs) and stockers (feeder steers of 800 to 900 lbs) from November 2008 to October 2020. During this period of roughly 12 years, prices for calves ranged from \$0.86 to \$2.60 per pound. Similar volatility exists in the market for stockers, although these larger cattle sell at a lower price per pound. Some of this volatility is influenced by the fluctuating availability of other sources of cattle (dairy cattle and imported cattle). Prices are also influenced by the availability and price of cattle feed. In general, feedlots pay higher prices for feeder cattle when corn prices are lower.

Production risk

Higher-than-usual death losses and lower-than-usual breeding rates in cows can also be costly to cattle producers. Death loss is typically estimated at 2 percent—but predation and disease can lead to much higher losses. Similarly, a small calf crop due to predation, disease, or unexpected infertility can be costly (producers generally expect 85 percent of their cows to wean a calf each year). Since overhead costs remain the same regardless of production, death and breeding problems are devastating to financial solvency.

Climatic risk

Climate risks can affect both grass production and animal performance. Figure 6 shows forage per acre, by year, near Redding, California. It illustrates that, while average annual forage production is about 1,500 pounds per acre, across 47 years it has ranged from about 600 to nearly 3,000 pounds per acre. Below-average forage years reduce animal performance (weight gain) and can require that increased amounts of hay be fed.

A dry fall and winter mean that cows, with their fall-born calves, may not have enough new green forage to provide nutrients sufficient

for daily requirements. A year of drought may also mean that water sources such as springs and stock ponds do not adequately replenish, making some forage locations unusable to live-stock because nearby drinking water is limited. When ranchers can't fully feed cows and calves from pasture, and must supplement pasture- or range-based feed with hay and other supplements (protein and energy), ranchers' costs increase.

Ranchers may seek to offset the risks of cattle ranching by diversifying their operations—raising other livestock, operating hunting enterprises, or—most commonly—engaging in off-farm work.

Conclusion

California's annual grasslands support cow-calf and stocker cattle operations. At the end of the forage growing season, typically in May or June, declining forage quality forces cow-calf and stocker producers to move weaned calves to the stocker phase or move stocker cattle to the finishing phase. Expected revenue from cow-calf and stocker operations is limited due to high costs and low market prices, with producers receiving net income of \$5 to \$90 per head in favorable years. Cattle market volatility, especially for stocker producers, creates significant risk—but producers also face risk associated with animal production (reproduction, disease, and mortality) and climate (drought). Though operating a ranch is challenging due to economic and climatic variability, numerous amenity values keep ranchers on the land producing food. These values can include living a rural lifestyle, working on the land, and producing a marketable product.

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