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Structure, Management Practices, and Production Costs of U.S. Beef Cow-Calf Farms

Jeffrey Gillespie, Christine Whitt, and Christopher Davis





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Structure, Management Practices, and Production Costs of U.S. Beef Cow-Calf Farms

Jeffrey Gillespie, Christine Whitt, and Christopher Davis

Abstract

The cow-calf segment of the U.S. beef industry is diverse in farm size, structure, and location, with farms located in every State and ranging from very small to very large. Modest structural change has occurred in this segment over the past two decades, resulting in moderately fewer farms that produce more animals and are more specialized in cow-calf production. In this report, cow-calf farms are compared by region, farm size, phases of beef production that are present on the farm, and farm typology using the cow-calf version of the 2018 USDA Agricultural Resource Management Survey. Larger scale cow-calf farms were found in the Northern Plains and West regions, whereas smaller scale farms tended to be located in the southeast and Southern Plains regions. Larger scale cow-calf farms had lower economic costs per cow and tended to adopt advanced technologies, management practices, and production systems at greater rates than smaller farms. Operators of cow-calf farms had a range of motivations that influenced their decisions.

Keywords: Beef cow-calf production, farm income, Agricultural Resource Management Survey, management practices, cow-calf operation structure, advanced technologies.

Acknowledgments

Thanks go to four reviewers for providing in-depth reviews of an earlier draft. Thanks also to Casey Keel, Elaine Symanski, and Grant Wall for editorial services, to David Marquardt for designing the map used in the document, and to Chris Sanguinett for design services. Special thanks go to the beef cow-calf producers who participated in USDA's 2018 Agricultural Resource Management Survey and those who collected the data.

About the Authors: Jeffrey Gillespie, Christine Whitt, and Christopher Davis are economists with USDA, Economic Research Service.

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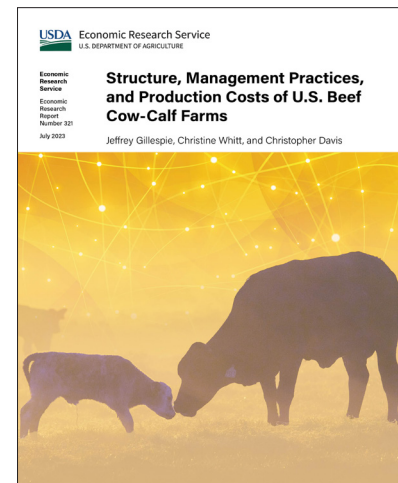


Structure, Management Practices, and Production Costs of U.S. Beef Cow-Calf Farms

Jeffrey Gillespie, Christine Whitt, and Christopher Davis

What Is the Issue?

The U.S. beef cow-calf industry comprises many relatively small operations and some large operations that specialize in producing calves for beef production. Some cow-calf operations sell calves at weaning while others keep them for further weight gain on pasture to be sold as stockers to feedlots at higher weights. Other operations raise animals through the finishing stage to slaughter weight. The U.S. cow-calf industry is present in every State. This report examines the enterprise costs, farm financial measures, and use of advanced technologies, management practices, and production systems across the diversity of size, location, and involvement in various cattle production stages in the cow-calf industry to provide insights into the structure and changes in the industry over the last two decades.



What Did the Study Find?

Using data from the USDA, National Agricultural Statistics Service's (NASS) Census of Agriculture, the Economic Research Service found that from 1997 to 2017 there was a modest decline in the number of U.S. cow-calf operations and some shifts from smaller to larger scale operations. USDA, Agricultural Resource Management Survey (ARMS) data from 1996, 2008, and 2018 showed the following trends among U.S. cow-calf operations:

- Cow-calf production became more specialized from 1996 to 2018.
- Operations increased their use of advanced record-keeping systems during 2008–18, but their use of advanced breeding technologies, production systems, and specialized services such as forage quality testing or regular veterinary services changed little.

In 2018, structural characteristics of U.S. cow-calf operations varied by region:

- The Southeast and Southern Plains regions had higher numbers of cow-calf operations than other regions included in the study.
- Producers in the Northern Plains and West regions tended to operate larger scale operations, use fewer total labor hours per cow, and adopt technology and intensive management practices at greater rates.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

Cow-calf operations involved in either or both of the stocker and finishing segments generally had different structural characteristics than operations specializing only in the cow-calf segment.

- Cow-calf/stocker and cow-calf/finisher operations were more likely than cow-calf only operations to adopt advanced technologies, management practices, and production systems such as artificial insemination, forage quality testing, and utilization of one or more breeding seasons.
- Principal operators of cow-calf only farms worked more hours per cow in the enterprise than operators of cow-calf/finishing or cow-calf/stocker operations.
- Cow-calf only operations tended to be smaller than cow-calf/finishing or cow-calf/stocker operations, measured in terms of cow inventory and farm income.

Farm acreage and percentage of farm production value from cattle increased with larger beef cow inventories. Furthermore:

- Adoption rates of advanced technologies, management practices, and production systems were higher among farms with larger beef cow inventories.
- Total economic cost per cow declined with increased cow inventory.

Cow-calf operations differed by farm typology. Commercial farms (those earning at least \$350,000 in gross cash farm income per year and/or the majority of the farm business is not owned by an operator or individuals related to them) tended to be more diversified across other farm enterprises. Commercial farms were greater adopters of most advanced technologies, management practices, and production systems than rural residence farms (where the operator was retired, or the primary occupation was off-farm employment and gross cash farm income was less than \$350,000) or intermediate farms (where the operator's primary occupation was farming, and the gross cash farm income was less than \$350,000 per year).

How Was the Study Conducted?

This report presents data from 1996, 2008, and 2018 surveys of U.S. beef cow-calf producers. The producers were surveyed as part of USDA's Agricultural Resource Management Survey, which is jointly administered by USDA, Economic Research Service (ERS) and USDA, NASS. For each survey year, each farm was assigned a weight that indicated the unique number of similar farms the farm represents. Therefore, estimates derived from the data were representative of the largest cow-calf producing States, comprising 90 percent of cow-calf production on operations with at least 20 cows. Since the survey targeted cow-calf operations, the sample list frame excluded animal feeding operations that do not breed cows and/or heifers. Surveyed producers were divided into groups by type of operation (i.e., cow-calf only, cow-calf/stocker, or cow-calf/feedlot), region, farm size, and farm typology, which is based on farm sales and the operator's primary occupation. Structural and economic differences among producers in each group were statistically evaluated. This report also uses data from USDA, NASS, including—but not limited to—Census of Agriculture data.

Structure, Management Practices, and Production Costs of U.S. Beef Cow-Calf Farms

Introduction

The cow-calf segment of the U.S. beef industry is located in every State, and cow-calf farms and ranches vary widely in size, structure, and production practices. On cow-calf operations, cows (i.e., female bovine animals that have given birth) give birth to calves, which are generally raised to weights of 400–600 pounds before being weaned. Once weaned, calves may be sold and shipped to feedlots, where they are fed until reaching slaughter weight, or to stocker producers, where they gain additional weight on pasture prior to moving to the feedlot. Alternatively, calves may be retained as backgrounders or stockers,¹ or finished to slaughter weight on the farm. Cow-calf production mostly occurs on pasture with forage grazing as the primary feed source, supplemented with hay and sometimes other feeds. Given the variation in climate and land resources on which cow-calf production occurs, cow-calf operators use various forage species, cattle breeds, and production technologies. Unlike hog, dairy, and poultry production systems, cow-calf production generally does not require an extensive initial investment in production-specific fixed assets such as housing for animals. Thus, cow-calf enterprises range from quite small (less than 20 cows) to very large (more than 1,000 cows). The possibility of grazing cattle on a wide range of different land types and farm sizes makes cow-calf production potentially attractive for various producers, whether for full- or part-time farming. In 2017, of the 2,042,220 farm operations in the United States, 729,046 had at least 1 beef cow in inventory on December 31, roughly one-third of U.S. farms (USDA, National Agricultural Statistics Service (NASS), 2017).

This report examines the cow-calf segment of the U.S. beef industry, focusing on several broad components that describe the segment, including farm size and structure; adoption of technologies, management practices, and production systems; and costs and returns of production. The diversity of U.S. cow-calf production systems is highlighted by comparing these components of cow-calf farms across different U.S. regions, farm sizes, production phases, and farm classifications. Comparisons of these components were conducted over time to examine how production systems have changed over the past three decades.

Data Used for the Study

This report uses data from the USDA, Agricultural Resource Management Survey (ARMS) cow-calf version, USDA, National Agricultural Statistics Service (NASS), Census of Agriculture, and other USDA, NASS sources. USDA's ARMS is conducted annually by USDA, ERS and USDA, NASS. ARMS surveys representative samples of U.S. farms to collect information regarding farm and farm household economic indicators and the production practices used. Each year, targeted ARMS commodity questionnaires are administered to collect and report detailed information on costs and returns and production practices by commodity. For the 12 commodities regularly targeted, surveys are generally conducted on a rotating basis every 4 to 10 years, depending upon the commodity, with 1 to 3 commodities targeted each year. Cow-calf producers

¹ The terms “backgrounder” and “stocker” are sometimes used interchangeably, but there are some differences. Backgrounding generally involves retaining calves past weaning in order to reduce the stress of leaving the farm before moving to a feedlot. Feed is often hauled to backgrounders. Stocker operations generally keep animals to heavier weights than backgrounding operations, and stockers obtain their feed via grazing. For purposes of this report and consistent with McBride and Mathews (2013), cow-calf operations that are also involved in the background and/or stocker segments are treated as one group, cow-calf/stocker.

were targeted in the 1996, 2008, and 2018 ARMS. From these conducted surveys, Short (2001) developed a report on characteristics and production costs of cow-calf farms using the 1996 data, and McBride and Mathews (2011) used the 2008 data for a report on the structure of U.S. cow-calf production. The ARMS cow-calf version surveyed cow-calf producers in 19, 22, and 23 States in 1996, 2008, and 2018, respectively.² The States comprised more than 90 percent of the U.S. beef cow inventory and more than 90 percent of the cow-calf farms with 20 or more beef cows in inventory at some point during the year for the 2008 and 2018 surveys and 10 or more calves weaned for the 1996 survey. Data were weighted so that the estimates were representative of more than 90 percent of U.S. beef cow-calf production on farms with 20 or more beef cows (2008, 2018) and 10 or more calves weaned (1996).

USDA, NASS's Census of Agriculture collects information on farm numbers, characteristics, and production; the latest census for which data are currently available was conducted in 2017. USDA, NASS also routinely collects information on U.S. agricultural production via multiple surveys and publishes the data online. Census of Agriculture and other non-ARMS data from USDA, NASS include farms with less than 20 cows and at least \$1,000 in sales. Of the 729,046 farms with December 31, 2017, beef cow inventory, 393,095 (54 percent) were farms with less than 20 cows.

Various studies have analyzed cow-calf production systems, though most focused on State- or regional-level analyses (Popp et al., 1999; Ward et al., 2008). Two of the most recent studies that focused on cow-calf production decisions at the U.S. level include McBride and Mathews (2011) and Pruitt et al. (2012). Both studies used 2008 ARMS cow-calf data and can be used for comparison of results in the present study.

Recent Structural Change in the Cow-Calf Segment of the U.S. Beef Industry

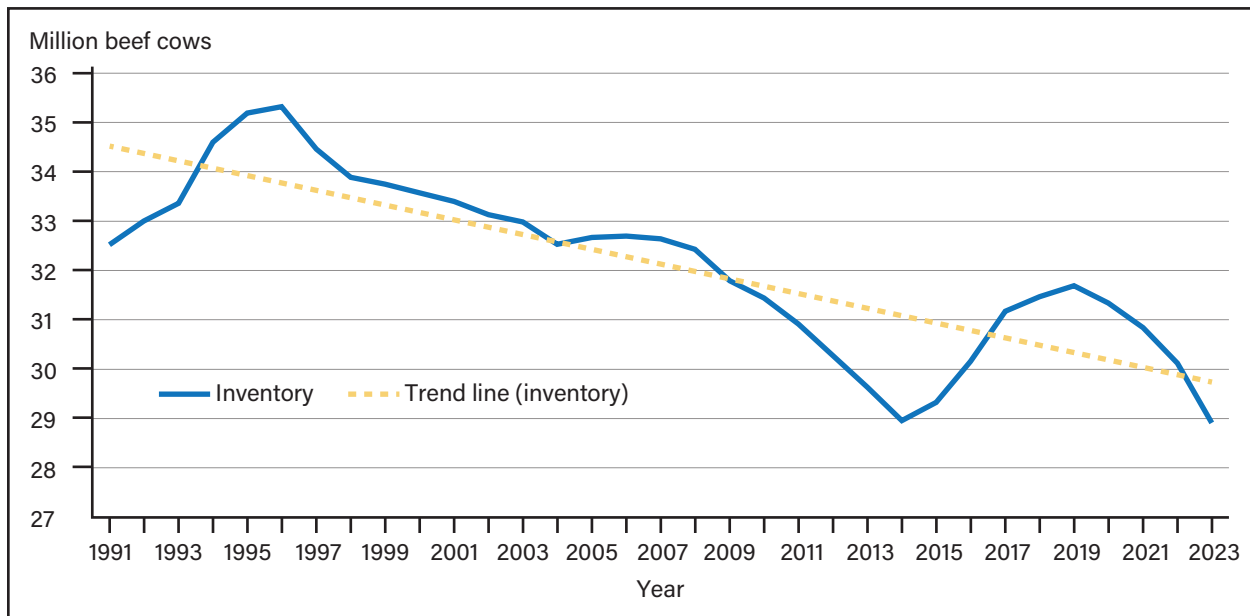
The cow-calf segment of the U.S. beef industry has experienced relatively small changes in inventory and farm numbers over the past 30 years compared with other livestock segments such as poultry and hogs. Figure 1 shows that the January 1 U.S. beef cow inventory changed from 32.5 million cows in 1991 to 28.9 million in 2023, with a high of 35.3 million in 1996 and a low of 29.0 million in 2014. The trend line shows an overall decline in inventory over the period. Note that 1991 was near the beginning of a new cattle cycle, which generally lasts an average of 12.8 years, according to Peel (2021), suggesting relatively low inventories that year. However, the researchers observed a more notable downward trend in the number of operations with beef cow inventory (figure 2). USDA, NASS Census of Agriculture data showed a 19-percent decline from 1997 to 2017 in the number of U.S. farms with at least 1 beef cow in inventory on December 31—from 899,756 to 729,046 farms. The decline, however, was not seen across all category sizes of beef cow-calf operations. Figures 3–5 show the declining operation numbers occurred primarily in the less than 100 cow inventory categories as of December 31 of the year they were surveyed. Beef cow operation numbers increased slightly in the 500–999 December 31 cow inventory category. Overall, shifts from smaller to larger operations are noteworthy, but the shifts experienced in the cow-calf segment have not reached the magnitude experienced by hog and dairy production during recent periods, as shown by McBride and Key (2013) and MacDonald et al. (2020), respectively.

USDA, NASS's ARMS data allow for more detailed examinations of the structural changes in U.S. cow-calf production. Table 1 and figures 6–11 provide information on farm size; structure; adoption of technologies, management practices, and production systems; labor usage; and operator characteristics for U.S. cow-calf production in 2008 and 2018 and for variables where data are available in the 1996 survey responses. When comparing year-over-year numbers, the average number of cows in an operation was nearly constant, with the

² States included in the ARMS cow-calf version in 1996 included California, Colorado, Florida, Idaho, Illinois, Iowa, Kansas, Kentucky, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Tennessee, Texas, and Wyoming. The following States were added in 2008: Alabama, Arkansas, Georgia, Mississippi, and Virginia. Idaho and Illinois were no longer surveyed in 2008. Idaho was added back to the survey in 2018.

maximum number of beef cows in an operation at any point during the year averaging 102 and 100 cows for 2008 and 2018, respectively. However, the average number of acres operated on cow-calf farms declined from 1,340 in 1996 to 1,117 in 2018 (table 1).

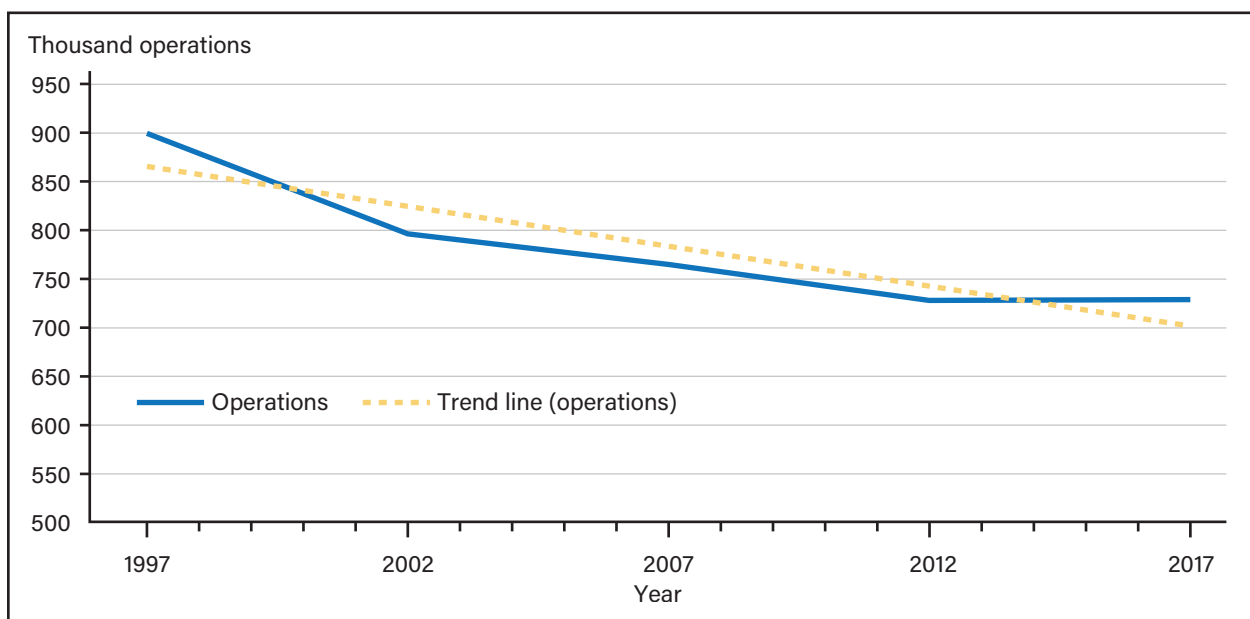
Figure 1
January 1 beef cow inventory on U.S. cow-calf farms, 1991-2023



Note: The trend line for inventory shows overall decline in inventory over the period.

Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service Quickstats data.

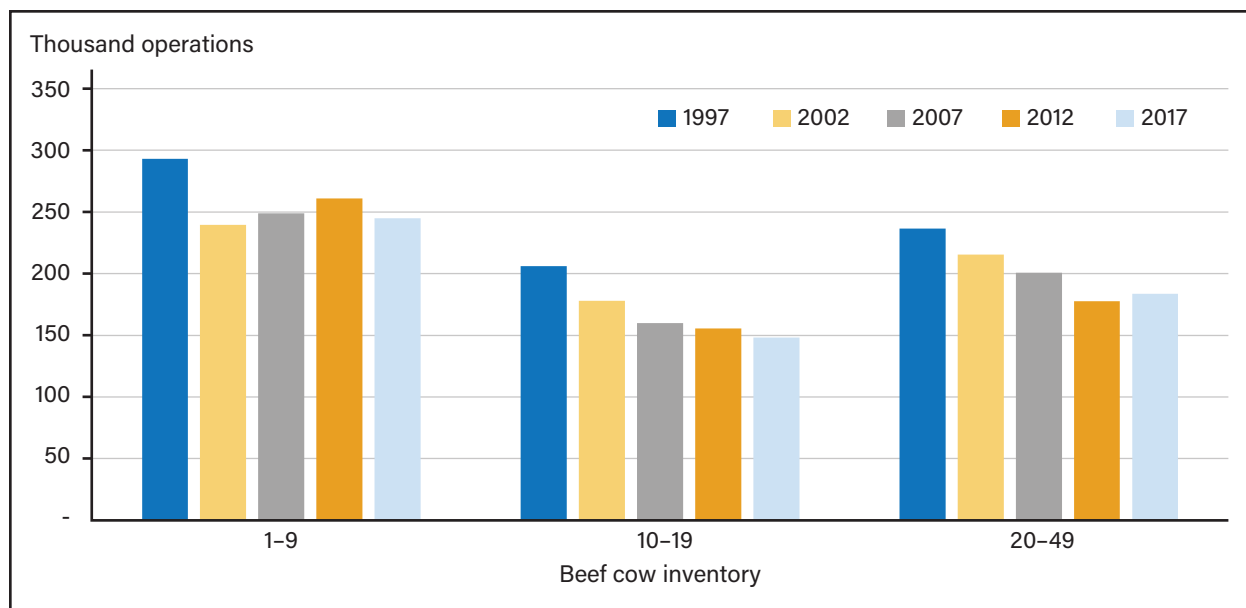
Figure 2
U.S. operations with beef cow inventory, 1997-2017



Note: The trend line for operations shows overall decline in operations over the period.

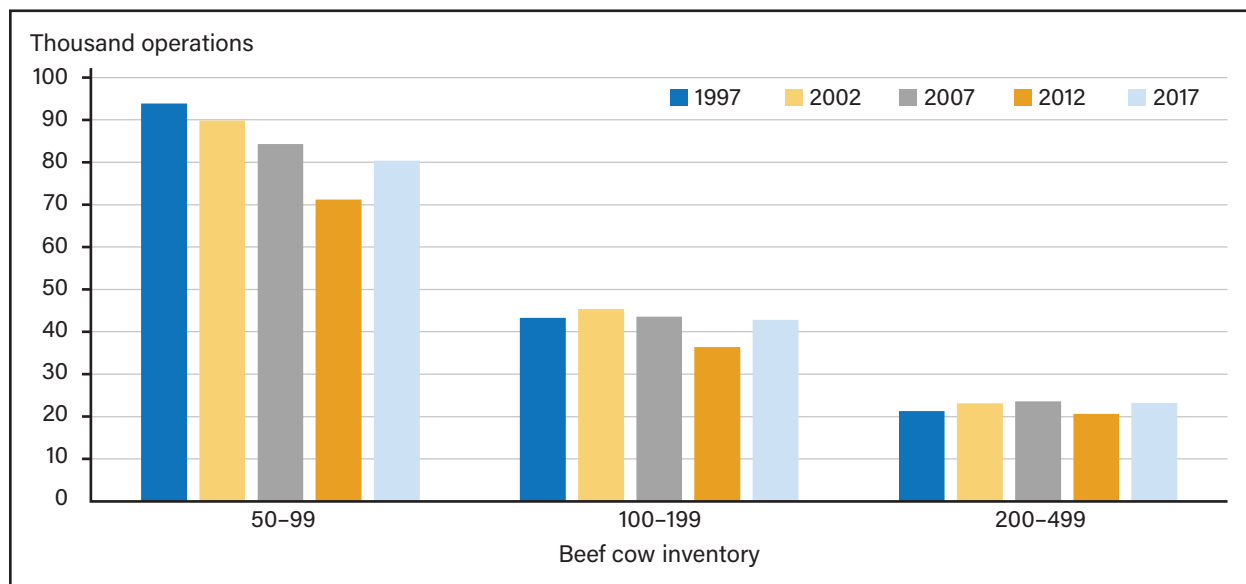
Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 1997, 2002, 2007, 2012, and 2017 Census of Agriculture data.

Figure 3
Number of cow-calf operations with fewer than 50 cows by December 31 beef cow inventory, 1997-2017



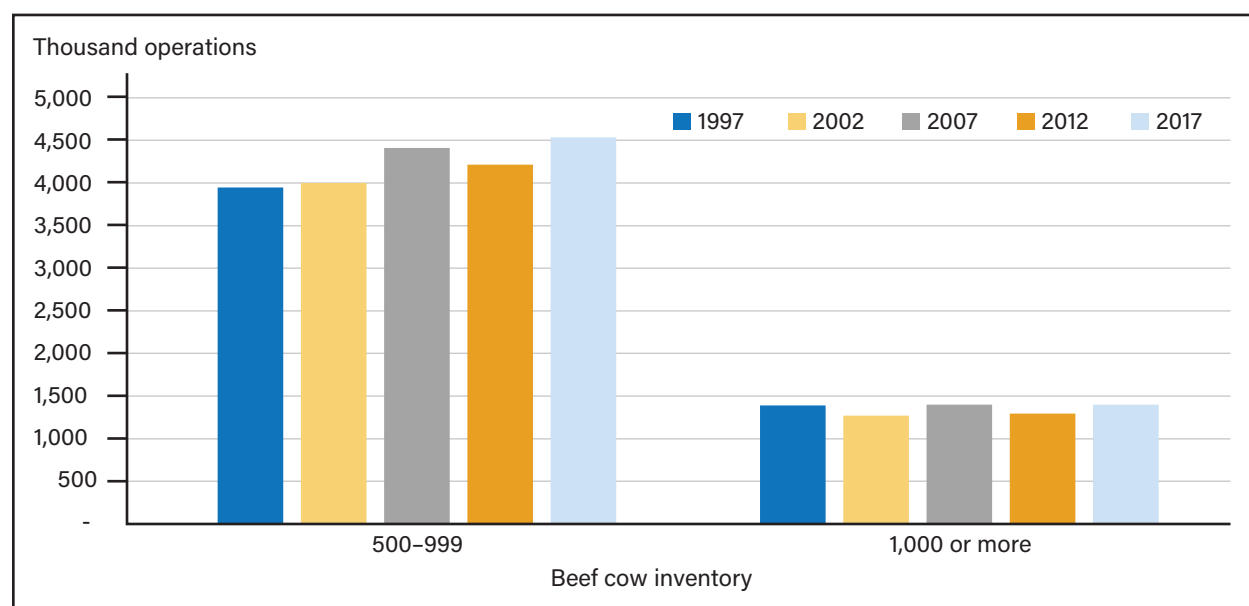
Source: USDA, Economic Research Service using USDA, National Agriculture Statistics Service 1997, 2002, 2007, 2012, and 2017 Census of Agriculture data.

Figure 4
Number of cow-calf operations with 50 to 499 cows by December 31 beef cow inventory, 1997-2017



Source: USDA, Economic Research Service using USDA, National Agriculture Statistics Service 1997, 2002, 2007, 2012, and 2017 Census of Agriculture data.

Figure 5

Number of cow-calf operations with 500 or more cows by December 31 beef cow inventory, 1997–2017

Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 1997, 2002, 2007, 2012, and 2017 Census of Agriculture data.

Compared with 1996, cow-calf farms were more specialized in cattle production in 2018. The average percentage of total farm production value from cattle increased from 32 percent in 1996 to 60 percent in 2018 (table 1) and smaller percentages of cow-calf farms produced corn, soybeans, small grains, and hay (figure 6). Furthermore, percentages of cow-calf farms producing one, two, or three or more commodities other than beef cattle (e.g., corn, soybeans, wheat, hay, sorghum, tobacco, cotton, rice, peanuts, fruit, vegetables, nursery products, dairy, hogs, and/or poultry) declined from 1996 to 2018, further showing increased specialization in cattle production (figure 7). Increased specialization was also seen in the cow-calf phase of cattle production over time. In 2018, 63 percent of operations specialized in the cow-calf phase of production compared with 47 percent in 2008 (figure 8). The operations that specialized in the cow-calf phase of cattle production opted to not retain calves on the farm or purchase animals for stocking (where animals are kept to heavier weights prior to selling them to a feedlot) or finishing them to slaughter weight in an onfarm feedlot. Over the 1996–2018 period, cow-calf farms had modestly declining farm acreage in addition to greater specialization.

Table 1

Characteristics, labor usage, and operator characteristics of U.S. cow-calf farms, by means, 1996, 2008, and 2018

Item	1996	2008	2018
Farm size measures			
Beef cows—average maximum per farm	NA	102	100
Acres operated	1,340	1,316	1,117
Total farm production value from cattle (percent)	32	39	60
Labor use per cow, cow-calf enterprise			
Operator hours per cow (year)	NA	11.6	13.1
Operator hours per cow (Jan.–Mar.)	NA	2.7	3.0
Operator hours per cow (Apr.–Jun.)	NA	3.1	3.5
Operator hours per cow (Jul.–Sep.)	NA	3.1	3.6
Operator hours per cow (Oct.–Dec.)	NA	2.7	3.1
Unpaid labor hours per cow (year)	NA	2.4	3.6
Unpaid labor hours per cow (Jan.–Mar.)	NA	0.5	0.8
Unpaid labor hours per cow (Apr.–Jun.)	NA	0.7	1.0
Unpaid labor hours per cow (Jul.–Sep.)	NA	0.7	1.0
Unpaid labor hours per cow (Oct.–Dec.)	NA	0.6	0.8
Paid labor hours per cow (year)	NA	3.2	2.5
Total labor hours per cow, paid and unpaid	NA	17.2	19.2
Principal operator characteristics			
Spent ≥50 percent of work time in farming (percent)	65	64	63
Average age (years)	56	60	62
Education, 4-year college graduate (percent)	22	26	29
Female (percent)	NA	4	9
Farm and household financial characteristics (U.S. dollars deflated to 2018 dollars)			
Gross cash farm income	135,345	142,316	118,569
Total variable expense	87,438	86,521	64,166
Total fixed expense	26,771	26,684	21,662
Total expense	114,209	113,205	85,829
Net cash farm income	21,136	29,111	32,741
Net farm income	21,130	22,275	30,513
Operator household off-farm income	NA	84,506	96,231
Operator household total income	NA	90,723	111,153

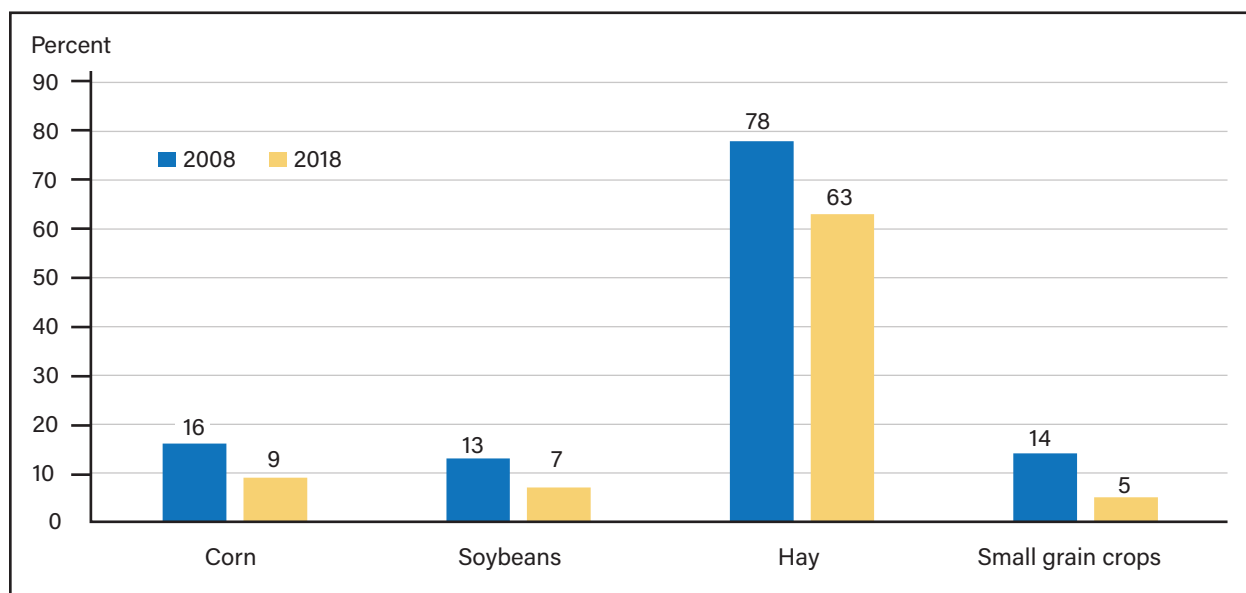
NA = Not available.

Note: Farm and household financial statistics are deflated to 2018 dollars using the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) Gross Domestic Product Price Index (BEA Application Programming Interface series code A191RG).

Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 1996, 2008, and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Figure 6

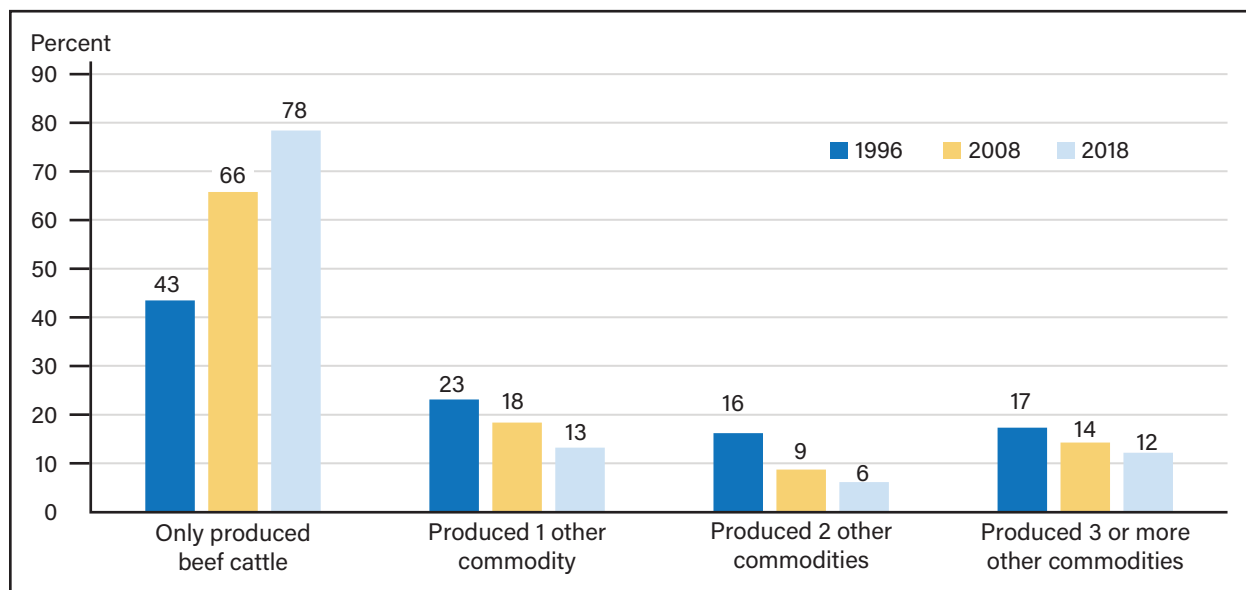
Percent of U.S. cow-calf operators producing selected crops, 2008 and 2018



Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 2008 and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Figure 7

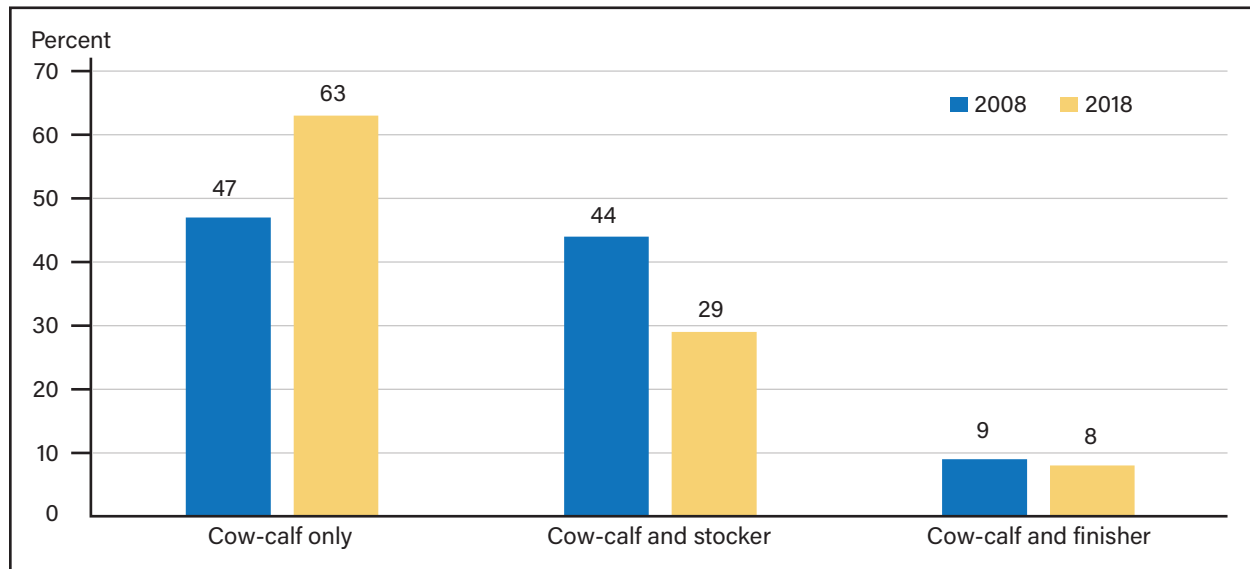
Percent of cow-calf farms categorized by number of commodities produced, 1996, 2008, and 2018



Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 1996, 2008, and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Figure 8

Percentages of U.S. cow-calf producers engaged in three phases of beef cattle production, 2008 and 2018



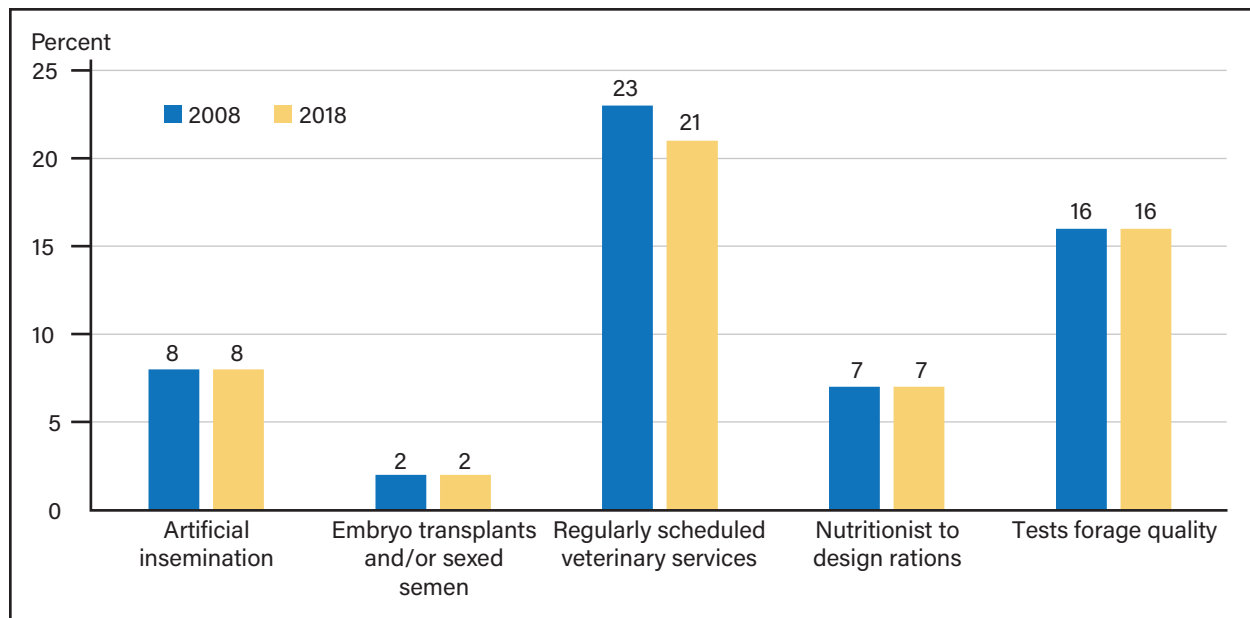
Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 2008 and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Changes in Technology Use, Management Practices, and Production Systems

Cow-calf operators engaged in largely modest changes across technology, management practices, and production systems from 2008 to 2018 (figures 9, 10, and 11). Artificial insemination has been used in livestock and dairy production primarily for genetic advancement and venereal disease prevention (Foote, 1996). Genetic advancement has also been enhanced by embryo transplants (embryo transfer), where embryos of superior genetics are implanted into cows of lower genetic value. Sexed semen is the result of separating female sperm and male sperm for use in artificial insemination allowing producers to select them. In both 2008 and 2018, 8 percent of cow-calf producers reported using artificial insemination and 2 percent used embryo transplants or sexed semen (figure 9). These show flat adoption rates despite advances in genetic testing and other associated production technologies during 2008–18. The 2017 National Animal Health Monitoring System (NAHMS) Beef Cow-Calf Studies, published by USDA, Animal and Plant Health Inspection Service (APHIS), included information on cow-calf operations of all sizes and represented 87 percent of U.S. beef cows. The NAHMS report indicated 12 percent of cow-calf producers used artificial insemination and 3 percent used embryo transfer (USDA, Animal and Plant Health Inspection Service, [APHIS], 2020). USDA's ARMS data³ indicate that 8 percent of cow-calf producers used growth-promoting implants in 2018. Growth-promoting ear implants release hormones into the bloodstream and increase feed efficiency. NAHMS found that 8 percent of calves raised on U.S. cow-calf operations had growth implants in 2018. ARMS and NAHMS results may differ due in part to survey eligibility; ARMS operations have 20 or more beef cows in inventory, whereas NAHMS requires 1 or more beef cow(s).

³ Implant usage was also queried in 1996 and 2008. However, how the question was worded changed each year. The 1996 question read, "How many head (or what percent) of the weaned calves were (or will be) implanted with growth implants?" In 1996, 47 percent of the respondents provided a positive percentage or number of calves. The 2008 question read, "Were the calves weaned in 2008 implanted with growth promoting implants or ionophores?" The 2008 usage rate was 14 percent. The 2018 question read, "Were the calves weaned in 2018 implanted with growth promoting implants?" The 2018 usage rate was 8 percent. Usage rates by year may not be fully comparable due to changes in the question's wording, though it appears that usage rates have declined. The NAHMS surveys found that approximately 19 percent of calves had been implanted in 1996 (USDA, APHIS, 1997), 12 percent of calves had been implanted in 2007–08 (USDA, APHIS, 2008), and 8 percent had been implanted in 2017 (USDA, APHIS, 2020).

Figure 9

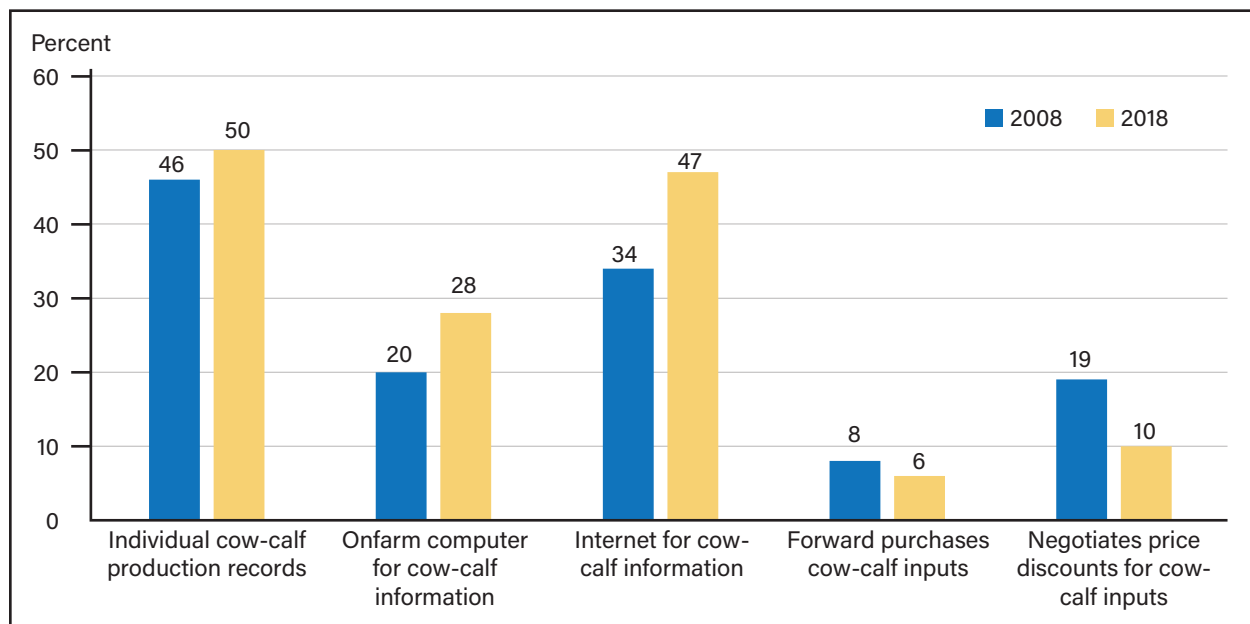
Percentage of U.S. cow-calf producers using breeding technologies and services, 2008 and 2018

Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 2008 and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Figure 9 displays adoption rates for regularly scheduled veterinary services, using a nutritionist to design rations, and testing of forage quality. These services were used by 21 percent, 7 percent, and 16 percent of U.S. cow-calf producers, respectively, in 2018, which were similar to 2008 usage rates. Survey respondents were asked about three record-keeping and information technology management practices in the 2008 and 2018 cow-calf ARMS (figure 10). In 2018, 50 percent of cow-calf producers kept individual cow-calf production records, an increase from 46 percent in 2008. In addition, 28 percent of cow-calf producers used an onfarm computer to manage records in 2018, which is an increase from 20 percent in 2008. In 2018, 47 percent of cow-calf producers used the internet for cow-calf information, an increase from 34 percent in 2008. Cow-calf producers increased use of these management practices coincided with greater access to advanced computer technology and internet service in rural areas over the course of the study period. Cow-calf survey respondents were asked about two management practices used for lower-cost procuring inputs in the 2008 and 2018 cow-calf ARMS (figure 10). In 2018, 6 percent of cow-calf producers reported forward purchasing cow-calf inputs such as animals or feed (or negotiating a price for inputs before delivery at a future date) compared with 8 percent in 2008. Ten percent negotiated price discounts for cow-calf inputs, down from 19 percent in 2008.

Figure 10

Percentage of U.S. cow-calf producers using record keeping, information technology, and input purchasing management practices



Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 2008 and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Adoption rates of three cow-calf production systems were analyzed for 2008 and 2018. Producers who purchase replacement heifers from seedstock producers were more likely to be involved in purebred breeding operations. According to USDA's ARMS, 9 percent of cow-calf producers purchased most of their replacement heifers from seedstock producers in 2018, down from 15 percent in 2008 (figure 11). A defined calving season, which refers to a period of the year when cows are bred to calve, ensures calves are born at a time when they can take advantage of favorable forage conditions, calf loss caused by severe weather can be minimized, and/or groups of uniform-weight animals can be produced for sale on a targeted date. In 2018, 58 percent of cow-calf producers used a defined calving season, which was close to the rates in both 1996 and 2008 (61 percent) (USDA, NASS and USDA, ERS, 1996, 2008, 2018). This contrasts with NAHMS data that indicated 41 percent of cow-calf producers used a breeding season in 2017 (USDA, APHIS, 2020).

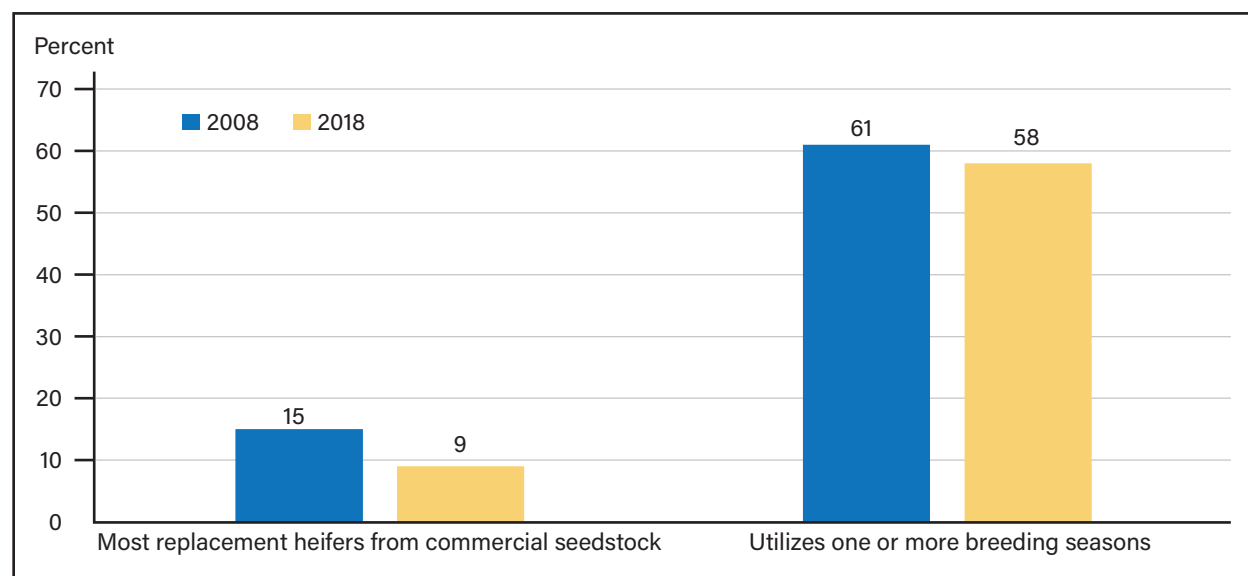
Rotational grazing involves moving cattle among paddocks on a regular basis for efficient forage use and resource conservation. Additional fencing, watering equipment, and labor are generally required for a successful rotational grazing system. According to USDA's ARMS data, 43 percent of cow-calf producers reported using rotational grazing in 2018.⁴ Average weaning weights of calves sold increased modestly from 1996 to 2018, from 502 pounds in both 1996 and 2008 to 516 pounds in 2018 (USDA, NASS and USDA, ERS, 1996, 2008, 2018). Overall, structural change in the cow-calf segment measured in terms of adoption of advanced technology, management practices, and alternative production systems was modest over 2008–18.

Table 1 shows the average labor use per cow for 2008 and 2018. Operator and unpaid labor are estimated from ARMS questions that ask for the respondents' best estimates of the time spent doing work for the beef cattle enterprise by the operator and by unpaid labor, which is typically family labor. For paid labor, the

⁴ Rotational grazing usage was also queried in 2008. Question wording changed from 2008 to 2018. The 2008 question read, "For the beef cow enterprise in 2008, did this operation practice rotational grazing on beef cow pastures?" The 2018 question read, "Does this operation use rotational grazing for beef cattle?" followed by several questions to further characterize the rotational grazing system. The 2008 usage rate of 60 percent may not be comparable to the 2018 usage rate of 43 percent due to changes in question wording.

respondent was asked how much was spent on hired and contract labor. Paid labor hours are estimated by dividing that expenditure by the average State wage rate for agricultural labor. Both unpaid and paid labor measures exclude labor devoted to feedlot cattle. In both 2008 and 2018, most labor was provided by the principal operator (the individual most responsible for decisions on the operation, henceforth referred to as the operator): 11.6 hours per cow or 67 percent of labor hours in 2008 and 13.1 hours per cow or 68 percent of labor hours in 2018. The remaining labor was roughly evenly divided between unpaid and hired labor. Unlike increases in labor efficiency over time found for hog production by McBride and Key (2013), numerical increases in hours used per cow did not suggest increases in labor efficiency for cow-calf production over time. Operator and unpaid labor hours per cow were also presented by quarter, with slightly more labor conducted during April–September than October–March.

Figure 11
Percentages of U.S. cow-calf producers using selected production systems, 2008 and 2018



Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service 2008 and 2018 cow-calf versions of Agricultural Resource Management Survey data.

Changes in Cow-Calf Operator Demographics and Farm Finances

The mean operator age was 56 years in 1996 and 62 years in 2018, consistent with the trend of increased age of principal operators for farming in general, as found in Censuses of Agriculture since 2007 (table 1). In 1996, 22 percent of operators held 4-year college degrees and 29 percent in 2018. In 2008 and 2018, 4 and 9 percent, respectively, of cow-calf operations had a female principal operator. In 1996, 65 percent of operators devoted at least half of their work time to farming, and 63 percent of operators devoted at least half of their time to their operations in 2018.

Although real (i.e., inflation-adjusted) gross cash farm income and all expense categories were lower in 2018 than in 1996, net cash farm income and net farm income⁵ increased during the period (table 1). According to USDA, ERS's Commodity Costs and Returns data, the increases in farm profitability were consistent with increases in the value of production minus operating costs per cow for cow-calf farms for 1996, 2008, and

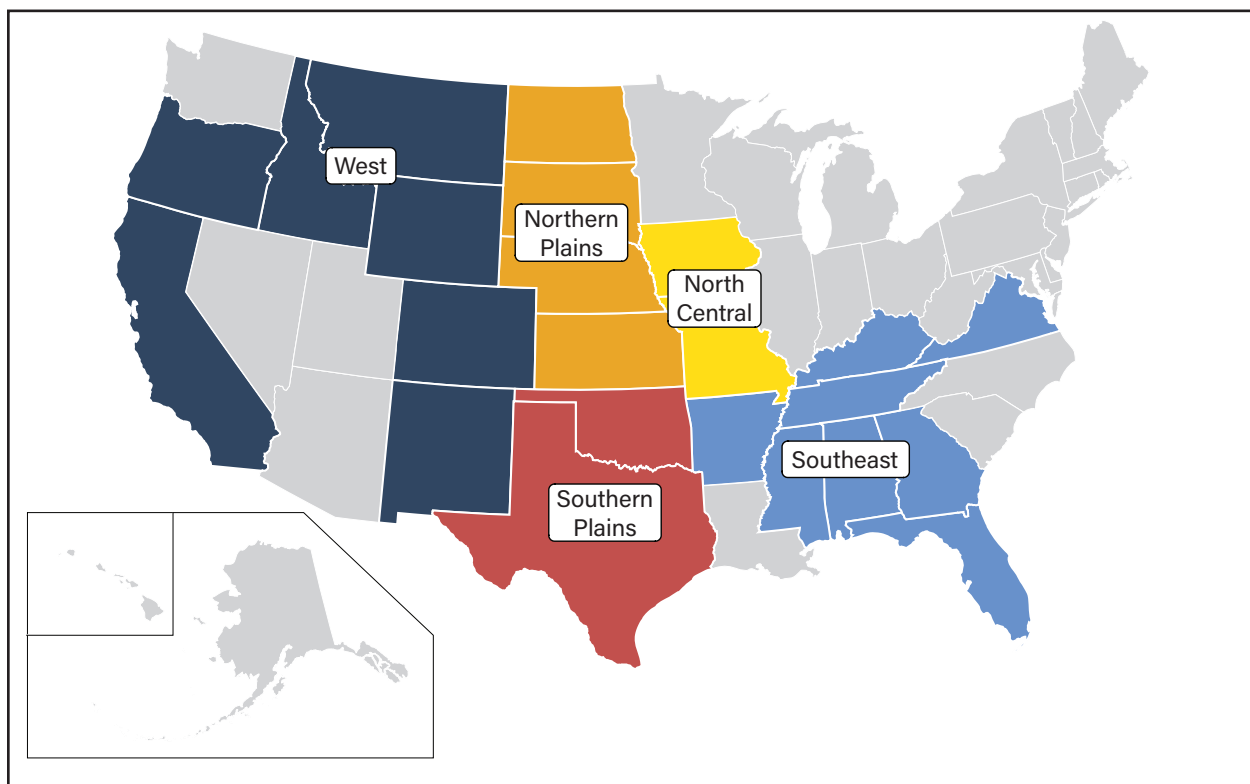
⁵ Net cash farm income is gross cash farm income less cash expenses. Net farm income is net cash farm income adjusted for the value of noncash benefits for hired labor, depreciation, nonmonetary income, and the value of commodity inventory changes.

2018. However, these 3 years do not necessarily indicate a trend when considering all 23 years during the period. Off-farm income comprised a substantial share of total income for the operator's household. Ninety-three percent of the household income was from off-farm employment in 2008 and 87 percent in 2018, indicating consistent dependence on off-farm income for many U.S. cow-calf operations.

Cow-Calf Operations Differ by U.S. Region

U.S. cow-calf operations are present in every State, with production occurring in a wide range of conditions. Some operations in the south experience warmer winters that allow for year-round grazing, and the Northern Plains region can experience colder climates that may require providing supplemental feed such as hay or corn silage during winter months. Animal breeds and available forage species vary with climate and land resources. Furthermore, forage resources vary as higher rainfall in eastern States allows for higher stocking rates than in much of the western States. Farm structure (i.e., farm size and enterprise mix) varies by region, depending upon climate and land as well as other crop and livestock enterprises suited to the region. Five major U.S. regions of cow-calf production (North Central, Southeast, Northern Plains, Southern Plains, and West, as used by McBride and Mathews [2011]), are mapped in figure 12. This map also shows the States that were surveyed for the ARMS cow-calf version in 2018.

Figure 12
U.S. beef cow-calf production regions surveyed in 2018 Agricultural Resource Management Survey (ARMS)



Note: States in gray were not surveyed for the cow-calf ARMS in 2018. Alaska and Hawaii are not shown to the same scale as the contiguous United States.

Source: USDA, Economic Research Service (ERS) using USDA, ERS and USDA, National Agricultural Statistics Service 2018 ARMS cow-calf data.

The Southeast had the largest share of cow-calf farms (32 percent), but the Southern Plains region had the highest share of the 2018 beef cow inventory (24 percent) (table 2). The largest cow-calf operations were in the Northern Plains and West regions.⁶ The Northern Plains and West had an average maximum number of beef cows per farm of 156 and 164 beef cows, respectively, at any point during the year in 2018 (figure 13). These regions also had the most total operated acres per farm (figure 14). Average percentages of owned acres ranged from 64 percent to 75 percent of total acres operated across the five regions. Northern Plains farms had the greatest total value of farm production, as indicated by their larger cow inventories, greater crop diversification, and greater diversification of other phases of cattle production. The Southern Plains farms produced the lowest total farm production value.

Table 2

Structure of U.S. cow-calf farms, by region and means, unless otherwise noted, 2018

Item	North Central (a)	Southeast (b)	Northern Plains (c)	Southern Plains (d)	West (e)
Percent of farms	14	32	14	27	13
Percent of beef cows	11	23	22	24	20
Farm size measures (number)					
Beef cows (average maximum)	72 ^{ce}	76 ^{ce}	156 ^{abd}	81 ^{ce}	164 ^{abd}
Beef cows (average inventory per farm)	54 ^{ce}	51 ^{cde}	109 ^{abd}	63 ^{bce}	103 ^{abd}
Acres operated	397 ^{cde}	353 ^{cde}	1,771 ^{abde}	975 ^{abce}	3,298 ^{abcd}
Acres owned	300 ^{cde}	255 ^{cde}	1,129 ^{abde}	633 ^{abce}	2,137 ^{abcd}
Total farm production value (U.S. dollars)	119,187 ^{bcd}	77,009 ^{acde}	240,994 ^{abde}	51,254 ^{abce}	133,202 ^{bcd}
Percent of farm production value from cattle	41 ^{cde}	53 ^{de}	61 ^{ade}	78 ^{abc}	75 ^{abc}
Percent of farms producing the following crops					
Corn	28 ^{be}	4 ^{ac}	25 ^{be}	<2	3 ^{ac}
Soybeans	23 ^{bd}	2 ^{ac}	21 ^{bd}	1 ^{ac}	<2
Hay	74 ^{de}	73 ^{de}	79 ^{de}	45 ^{abc}	45 ^{abc}
Small grain crops	4 ^{bc}	1 ^{ac}	18 ^{abde}	2 ^c	7 ^c
Phases of production (percent of farms)					
Cow-calf only	56 ^d	63 ^{cd}	46 ^{bd}	80 ^{abce}	58 ^d
Cow-calf/stocker	34 ^d	31 ^{cd}	42 ^{bd}	16 ^{abce}	31 ^d
Cow-calf/finishing	11	6	12	4	12

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service, and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

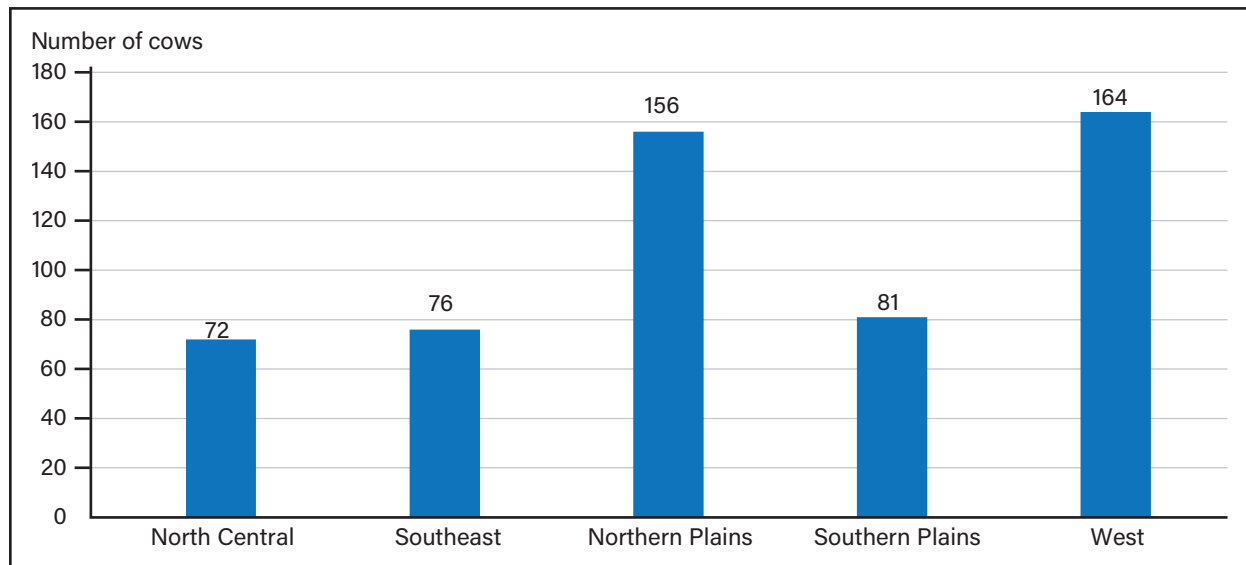
Farms in the Southern Plains region had the lowest total value of farm production, partially explained by their greater specialization in cow-calf production, with an average 78 percent of farm production coming from cattle. In addition, smaller percentages of Southern Plains cow-calf farms produced soybeans, hay, or small grain crops than cow-calf farms in other regions. The Southern Plains had the lowest percentage of

⁶ Note the lettered superscripts throughout the table. To provide an example of how these superscripts are interpreted, for the number of beef cows in the third line of the table, the "ce" superscript in the North Central region indicates that the column value, 72 beef cows, is significantly statistically different from the values for the Northern Plains (156 beef cows in column c) and West (164 beef cows in column e) at the 95-percent level of confidence.

cow-calf farms engaged in additional stocker or finishing phases (figure 15). North Central farms had the greatest diversification into other enterprises. Only 41 percent of total farm production on cow-calf farms was from cattle in the North Central region; the region had among the highest percentages of farms also producing corn, soybeans, and hay.

Figure 13

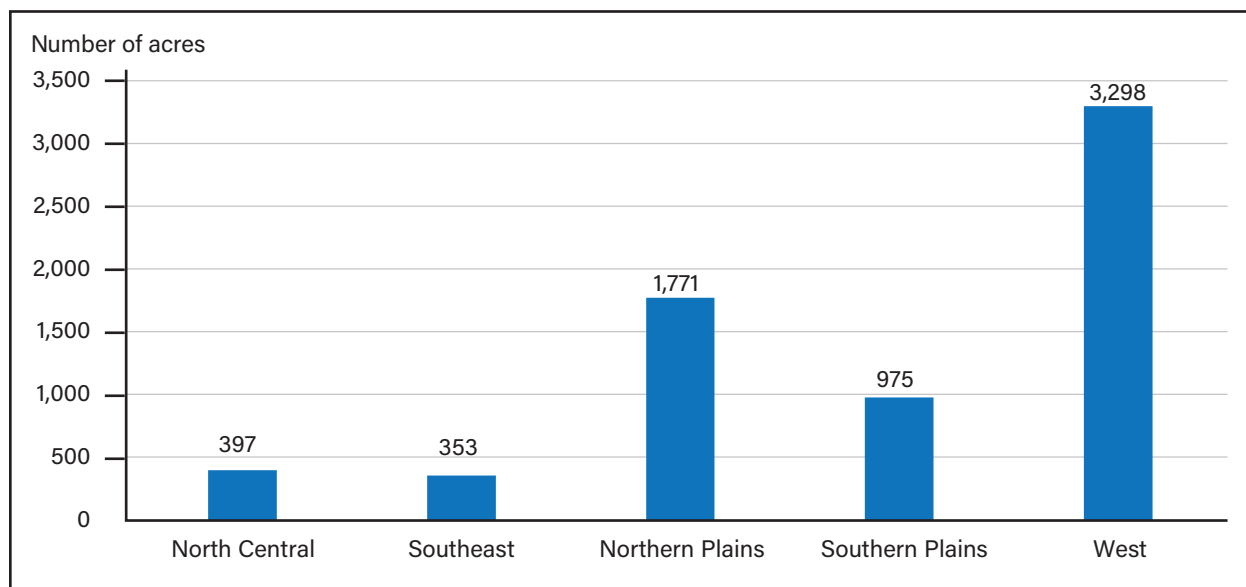
Average maximum number of beef cows per cow-calf farm by region, 2018



Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey.

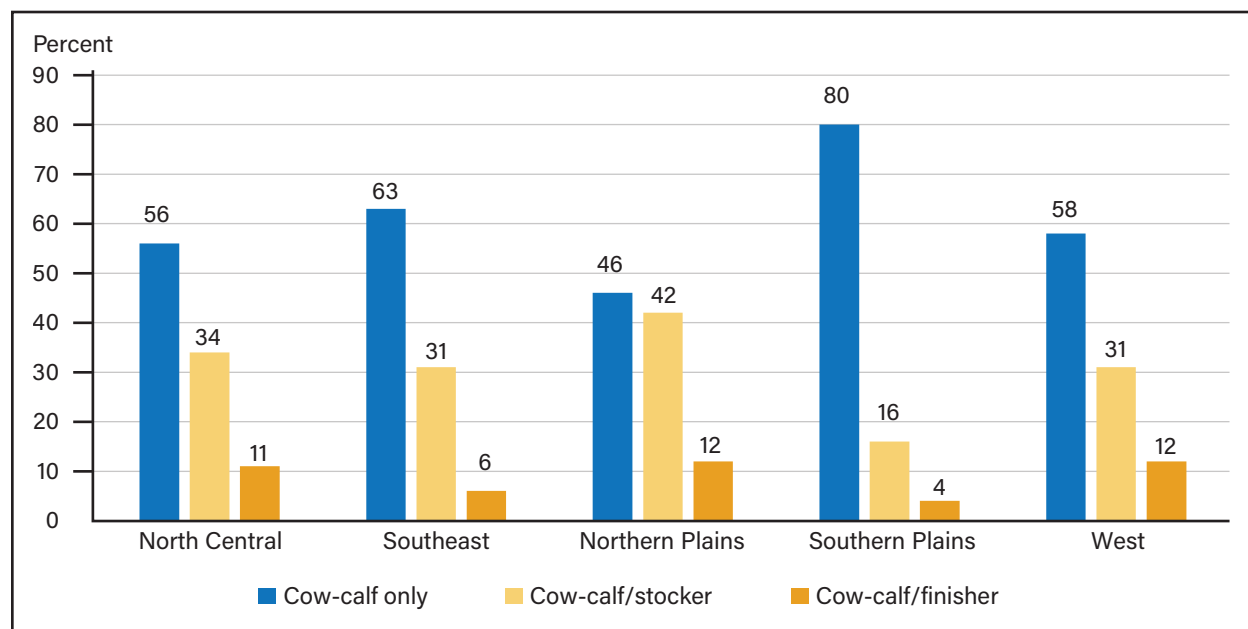
Figure 14

Average acres operated per cow-calf farm by region, 2018



Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey.

Figure 15

Percentage of cow-calf operations engaged in additional cattle production phases by region, 2018

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey.

Adoption of Technologies, Management Practices, and Production Systems by Region

Producers in the Northern Plains and West regions were more likely to adopt advanced technologies, management practices, and production systems, including artificial insemination and regularly scheduled veterinary services, and most likely to use a calving season (table 3). In addition, producers in the Northern Plains used calf implants more than three other regions, and nutritionists to design rations and forage quality testing at greater rates than all other regions. This region also had a higher percentage of operations purchasing most of their replacement heifers from seedstock producers and was among the larger scale cow-calf farms in terms of cattle and acreage. Farms in the West were more likely to use an onfarm computer to manage records, use the internet for cow-calf information, forward purchase cow-calf inputs, and negotiate price discounts for inputs than farms in two or more other regions. Farms in the West were also more likely to graze cattle on public land, which was largely available in the region. Consistent with McBride and Mathews (2011), we found average calf weaning weights were highest in the Northern Plains and West regions at 546 and 557 pounds, respectively. Labor use per cow varied by region, with the lowest numbers of hours spent per cow in the Northern Plains and West, both regions with the largest farms and ranches.

Table 3

Usage of technologies, management practices, production systems, and labor by region and means, unless otherwise noted, 2018

Item	North Central (a)	Southeast (b)	Northern Plains (c)	Southern Plains (d)	West (e)
Production practices used (percent of farms)					
Artificial insemination	7	6 ^c	13 ^{bd}	5 ^{ce}	13 ^d
Embryo transplants or sexed semen	2	2	2	3	2
Weaned calves implanted	18 ^{bde}	4 ^{ac}	19 ^{bde}	3 ^{ace}	7 ^{acd}
Regularly-scheduled veterinary services	19 ^{ce}	13 ^{ce}	40 ^{abd}	15 ^{ce}	36 ^{abd}
Nutritionist to design rations	12 ^{bcd}	2 ^{ac}	22 ^{abde}	3 ^{ac}	7 ^c
Tests forage quality	16 ^c	11 ^c	38 ^{abde}	9 ^c	16 ^c
Keeps individual cow-calf production records	57	48	57	44	52
Onfarm computer to manage records	29	23 ^e	31	24 ^e	41 ^{bd}
Internet for cow-calf information	43 ^e	42 ^e	51	42 ^e	64 ^{abd}
Forward purchases cow-calf inputs	4 ^e	4 ^e	9 ^d	3 ^{ce}	14 ^{abd}
Negotiates price discounts for inputs	7 ^e	7 ^e	12	8 ^e	20 ^{abd}
Most replacement heifers from seedstock producers	5 ^c	8	15 ^a	9	11
Utilizes ≥1 breeding season	65 ^{bde}	46 ^{ace}	89 ^{abd}	38 ^{ace}	91 ^{abd}
Rotational grazing	55 ^d	45 ^d	47 ^d	31 ^{abce}	48 ^d
Grazes cattle on public land	<2	<2	10 ^e	<2	25 ^c
Weaning weight of calves	511 ^{ce}	495 ^{ce}	546 ^{abd}	505 ^{ce}	557 ^{abd}
Labor use per cow per year, cow-calf enterprise					
Operator hours	19.0 ^{ce}	15.3 ^{ce}	10.0 ^{abd}	15.3 ^{ce}	9.0 ^{abd}
Unpaid labor hours	3.3	4.0	3.0	3.9	3.6
Paid labor hours	1.3	2.6	1.6	2.7	3.5
Total labor hours	23.6 ^{ce}	21.9 ^{ce}	14.6 ^{abd}	21.9 ^{ce}	16.1 ^{abd}

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service, and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

Cow-Calf Operator Demographics and Farm Finances by Region

Cow-calf operations had significantly different principal operator characteristics by region (table 4). Higher percentages of Northern Plains operators spent more than 50 percent of their work time in farming, consistent with the larger scale cow-calf farms in that region, and they were on average younger than Southeast and Southern Plains producers. Lower percentages of North Central operators held 4-year college degrees than Southern Plains and West operators. The region with the highest percentage of female operators was the West, significantly higher than the Northern Plains.

Northern Plains cow-calf farms had on average the highest gross cash farm income, followed by those in the North Central and West, and finally the Southeast and Southern Plains. Similar patterns were found for total variable and fixed expenses, and total expense. These patterns generally followed expectations based on farm size and enterprise diversification findings relative to table 2. Net cash farm income was highest for the

Northern Plains, though not statistically higher than the West. Southeast and Southern Plains farms had the lowest net cash farm income, consistent with their smaller production scale compared with the Northern Plains and West regions.

Table 4

Operator characteristics and farm financial measures of U.S. cow-calf farms, by region and means, unless otherwise noted, 2018

Item	North Central (a)	Southeast (b)	Northern Plains (c)	Southern Plains (d)	West (e)
Principal operator characteristics					
Spent ≥50 percent of work time in farming, percent	67	59 ^c	79 ^{bd}	57 ^c	66
Average age (years)	61	63 ^c	59 ^{bd}	63 ^c	61
Education, 4-year college grad (percent)	17 ^{de}	29	24	34 ^a	33 ^a
Female (percent)	6	10	5 ^e	8	14 ^c
Farm finances (U.S. dollars)					
Gross cash farm income	135,285 ^{bcd}	68,272 ^{ace}	269,746 ^{abde}	60,211 ^{ace}	173,709 ^{bcd}
Total variable expense	70,465 ^{bcd}	40,076 ^{ace}	143,965 ^{abde}	37,448 ^{ace}	81,955 ^{bcd}
Total fixed expense	26,015 ^{bcd}	10,913 ^{ace}	55,157 ^{abde}	10,165 ^{ace}	29,366 ^{bcd}
Total expense	96,480 ^{bcd}	50,988 ^{ace}	199,122 ^{abde}	47,613 ^{ace}	111,322 ^{bcd}
Net cash farm income	38,805 ^{bcd}	17,283 ^{ace}	70,624 ^{abd}	12,598 ^{ace}	62,387 ^{bd}
Net farm income	32,819 ^{ce}	17,050 ^{ce}	64,995 ^{abd}	10,845 ^{ce}	62,199 ^{abd}
Operator household off-farm income	87,172	98,413	80,543	101,858	106,821
Operator household total income	105,150	105,525 ^e	116,775	103,222	141,358 ^b
Debt-to-asset ratio (percent)	8 ^{de}	6 ^{cde}	10 ^{bde}	2 ^{abc}	3 ^{abc}

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service, and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

We found the highest average net farm incomes were in the Northern Plains and West. Households in all regions depended on off-farm income. The ratio of off-farm household income to total household income ranged from 69 percent in the Northern Plains to 99 percent in the Southern Plains. Farms in the North Central, Southeast, and Northern Plains regions tended to be more highly leveraged financially than Southern Plains and West farms.

Involvement in Additional Phases of Cattle Production

All cow-calf operations are involved in the production of beef calves from birth to weaning, but some operations opt to retain onfarm calves after weaning or purchase weaned animals to place additional weight on them before sale. Operations may also opt to retain calves onfarm or purchase additional animals for finishing to slaughter weight. For this report, these operations are referred to as cow-calf only, cow-calf/stocker, and cow-calf/finishing, respectively. Cow-calf/stocker operations generally background animals and/or stock them on pasture. They sometimes supplement feeding with grain, allowing calves to gain additional weight prior to selling to feedlots. Though the terms backgrounder and stocker are often used interchangeably, backgrounding generally involves retaining calves for a shorter time than stocking, with feed brought to the backgrounders and stockers that are fed primarily via grazing. Cow-calf/finishing operations generally finish animals in onfarm feedlots, though some grass-fed operations finish them on pasture. Some cow-calf producers retain ownership of cattle in off-farm feedlots and/or continue to own stocker cattle that are placed on a different operation. However, since these cattle are not physically present in the operation as surveyed, the authors classified such operations as cow-calf only rather than cow-calf/stocker or cow-calf/finishing.

In 2018, 63 percent of beef cow-calf farms were cow-calf only, holding 55 percent of the average 2018 beef cow inventory (table 5). Twenty-nine percent were cow-calf/stocker farms, holding 35 percent of the beef cow inventory, and 8 percent were cow-calf/finisher farms, holding 10 percent of the beef cow inventory. Although cow-calf only farms made up the largest percentage of operations, they generally were smaller than the other two farm types, with fewer beef cows, fewer acres operated, and lower farm production value. Smaller percentages of cow-calf only farms also produced corn, soybeans, or small grain crops than the other two farm types.

Cow-calf only operations were generally least likely to adopt advanced technologies, management practices, or production systems (table 6). Cow-calf/stocker and cow-calf/finisher operations used artificial insemination, regularly scheduled veterinary services, rations designed by a nutritionist, forage quality testing, and a calving season at higher rates than cow-calf only operations. In addition, cow-calf/finisher operations used calf implants, an onfarm computer to manage records, and the internet for cow-calf information at higher rates than cow-calf only operations. A lower percentage of cow-calf/finisher operations purchased most of their replacement heifers from seedstock producers compared with cow-calf only operations. Overall, cow-calf only operations used most of the available advanced technologies, management practices, and production systems at lower rates than other cow-calf operations.

Table 5

Structure of U.S. cow-calf farms, by production phase and means, unless otherwise noted, 2018

Item	Cow-calf only (a)	Cow-calf/stocker (b)	Cow-calf/finisher (c)
Percent of farms	63	29	8
Percent of beef cows	55	35	10
Farm size measures (number)			
Beef cows—average maximum per farm	87 ^{bc}	120 ^a	125 ^a
Beef cows—average inventory per farm	61 ^b	84 ^a	87
Acres operated	937 ^b	1,367 ^a	1,652
Acres owned	611	931	1,030
Total farm production value (U.S. dollars)	80,863 ^{bc}	137,358 ^a	207,419 ^a
Percent total farm production value from cattle	59	60	67
Percent of farms producing the following:			
Corn	4 ^{bc}	17 ^a	19 ^a
Soybeans	4 ^{bc}	11 ^a	17 ^a
Hay	62	66	55
Small grain crops	3 ^{bc}	7 ^a	16 ^a

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

In some cases, this may be due to the added benefits associated with advanced technologies for operations that are more diversified among the cattle production phases. For example, operations using a breeding season could provide greater assurance of consistently sized animals moving through the stocker and feedlot production phases. However, lower usage by cow-calf only operations may also be related to the smaller sizes of these operations, as smaller operations have been lower adopters of advanced technologies (Pruitt et al., 2012). Despite the fact that cow-calf only operations were not involved in additional phases of cattle production, operator labor hours per cow were higher for cow-calf only than either of the other two production systems. These results are likely explained by labor efficiencies gained with larger farm sizes.

Table 6

Usage of technology, management practices, production systems, and labor by U.S. cow-calf farms, by production phase and means, unless otherwise noted, 2018

Item	Cow-calf only (a)	Cow-calf/stocker (b)	Cow-calf/finisher (c)
Production practices used (percent of farms)			
Artificial insemination	5 ^{bc}	12 ^a	15 ^a
Embryo transplants or sexed semen	2	2	4
Weaned calves implanted	6 ^c	13	12 ^a
Regularly scheduled veterinary services	17 ^{bc}	28 ^a	34 ^a
Nutritionist to design rations	4 ^{bc}	11 ^a	17 ^a
Tests forage quality	10 ^{bc}	25 ^a	24 ^a
Individual cow-calf production records	47	53	66
Onfarm computer to manage records	25 ^c	29	45 ^a
Internet for cow-calf information	42 ^c	53	61 ^a
Forward purchases cow-calf inputs	5	7	12
Negotiates price discounts for cow-calf inputs	8	12	16
Most replacement heifers from seedstock producers	10 ^c	10	5 ^a
Utilizes one or more breeding seasons	52 ^{bc}	67 ^a	73 ^a
Rotational grazing	40	49	47
Grazes cattle on public land	5	5	7
Weaning weight of calves (average pounds)	520	513	491
Labor use per cow per year, cow-calf enterprise			
Operator hours per cow	14.5 ^{bc}	11.5 ^a	10.5 ^a
Unpaid labor hours per cow	4.0	3.1	3.5
Paid labor hours per cow	2.0	2.7	4.5
Total labor hours per cow	20.5^b	17.3^a	18.5

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

Consistent with larger farm sizes and greater diversification into other enterprises, cow-calf/stocker and cow-calf/finisher operators were more likely to spend the majority of their working time on the farm, and they had higher farm income than cow-calf only operations (table 7). About 72 percent of cow-calf/stocker and 78 percent of cow-calf/finisher operators spent 50 percent or more of their work time in farming, compared with 58 percent of cow-calf only operators. All average income and expense categories were higher on cow-calf/stocker and cow-calf/finisher farms than on cow-calf only farms, which is consistent with their larger average farm sizes. Net cash farm income was higher on cow-calf/stocker than cow-calf only farms. Despite the fact that the majority of producers of all three cow-calf operation types spent the majority of their work time on farming, operator household off-farm income accounted, on average, for more than 81 percent of operator total household income for all three. This underscores the importance of off-farm income for the average cow-calf producer regardless of involvement in any additional phase of cattle production.

Table 7

Operator characteristics and farm finances of U.S. cow-calf farms, by production phase and means, unless otherwise noted, 2018

Item	Cow-calf only (a)	Cow-calf/stocker (b)	Cow-calf/finisher (c)
Principal operator characteristics			
Spent ≥50 percent of work time in farming (percent)	58 ^{bc}	72 ^a	78 ^a
Average age (years)	62	61	61
Education, 4-year college graduate (percent)	27	31	34
Female (percent)	7	12	10
Farm finances (U.S. dollars)			
Gross cash farm income	86,821 ^{bc}	156,418 ^a	234,446 ^a
Total variable expense	44,481 ^{bc}	85,556 ^a	143,690 ^a
Total fixed expense	16,270 ^{bc}	27,546 ^a	43,351 ^a
Total expense	60,751 ^{bc}	113,101 ^a	187,041 ^a
Net cash farm income	26,070 ^b	43,317 ^a	47,405
Net farm income	25,803	38,566	38,708
Operator household off-farm income	103,943	84,294	77,126
Operator household total income	117,034	103,904	89,496
Debt-to-asset ratio (percent)	4	6	6

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

Characteristics of Cow-Calf Farms by Size

Unlike many livestock, dairy, and poultry enterprises, cow-calf production does not require intensive management practices and costly housing facilities that are specific to the production of a particular commodity. As a result, economies of size in cow-calf production are not as extensive as in some other livestock enterprises. A wide range of farm sizes can be found in cow-calf production (figures 3–5). Farm structure, technology adoption, and cost of production are explored for five different size categories of cow-calf operations based upon the maximum number of beef cows that were in the operation at any time during 2018: 20–49 cows, 50–99 cows, 100–249 cows, 250–499 cows, and ≥500 cows.

Of the farms surveyed via ARMS, which must have had 20 or more beef cows at some time in 2018 to qualify for surveying, 48 percent had 20–49 cows at some time during 2018 and accounted for 16 percent of the average 2018 beef cow inventory (table 8). Only 2 percent had 500 or more cows at some time during 2018, but those farms accounted for 18 percent of the average 2018 beef cow inventory. As expected, operations with more beef cows had farms with more acreage. The average percentage of operated acres owned by the farm ranged from 58 percent for the 250–499 cow category to 89 percent for the 20–49 category. The largest farms with 500 or more beef cows at some time during 2018 earned the highest percentage of total farm value from cattle. Medium sized operations (100–499 cows) tended to produce more corn and soybeans;

smaller operations (20–49 cows) tended to produce less hay; and larger operations (100 or more cows) tended to produce more small grains. Note the positive relationship between the number of beef cows and involvement in other phases of cattle production besides cow-calf only.

Table 8

Structure of U.S. cow-calf farms, by beef cow inventory, means, unless otherwise noted, 2018

Item	20–49 cows (a)	50–99 cows (b)	100–249 cows (c)	250–499 cows (d)	≥500 cows (e)
Percent of farms	48	27	18	6	2
Percent of beef cows	16	19	27	20	18
Farm size measures					
Beef cows—average maximum per farm	32 ^{bcde}	68 ^{acde}	148 ^{abde}	336 ^{abce}	1,007 ^{abcd}
Beef cows—average inventory per farm	24 ^{bcde}	48 ^{acde}	107 ^{abde}	245 ^{abce}	600 ^{abcd}
Acres operated	268 ^{bcde}	704 ^{acde}	1,499 ^{abde}	4,521 ^{abce}	13,310 ^{abcd}
Acres owned	239 ^{bcde}	472 ^{acde}	906 ^{abde}	2,637 ^{abce}	8,856 ^{abcd}
Total farm production value (U.S. dollars)	31,929 ^{bcde}	68,778 ^{acde}	177,047 ^{abde}	383,136 ^{abce}	974,895 ^{abcd}
Percent of farm production value from cattle	53 ^e	53 ^e	50 ^{de}	65 ^{ce}	82 ^{abcd}
Percentage of farms producing					
Corn	6 ^{cd}	8 ^{cd}	19 ^{abe}	17 ^{ab}	12 ^c
Soybeans	4 ^{cd}	6 ^c	14 ^{abe}	10 ^{ae}	4 ^{cd}
Hay	56 ^{cde}	67	71 ^a	74 ^a	69 ^a
Small grain crops	2 ^{cde}	5 ^d	10 ^a	12 ^{ab}	7 ^a
Phases of production (percent of farms)					
Cow-calf only	69 ^{cde}	65 ^{cde}	52 ^{ab}	50 ^{ab}	43 ^{ab}
Cow-calf/stocker	25 ^{cde}	26 ^{cde}	38 ^{ab}	42 ^{ab}	42 ^{ab}
Cow-calf/finisher	6	9	10	8	16

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

Operations with more beef cows were more likely to adopt the following practices: artificial insemination; embryo transplants or sexed semen; calf implants; regularly scheduled veterinary services; a nutritionist to design rations; forage quality testing; an onfarm computer to manage records; the internet for cow-calf information; forward purchasing of cow-calf inputs; negotiating price discounts for inputs; a calving season; and purchasing most replacement heifers from seedstock producers (table 9). Higher percentages of cow-calf operations with 250 or more cows grazed animals on public land. Operations with more beef cows tended to wean calves at heavier weights. Operator and unpaid labor hours per cow decreased as enterprise size increased, leading to significantly lower labor hours per cow for each progressively larger size category. These results suggest that most advanced technologies, management practices, and production systems were more heavily used by larger scale cow-calf operations, which are consistent with results found by McBride and Key (2013) and Pruitt et al. (2012). Furthermore, larger scale enterprises realized significant labor usage efficiencies.

In 2018, 95 percent of cow-calf operators with 500 or more beef cows spent more than 50 percent of their work time in farming. This was the highest percentage among the farm size categories (table 10). Cow-calf operations with 20–99 cows had the lowest percentage, 53 percent, of beef cow operators spending the majority of their work time in farming. These results were consistent with expectations that work requirements of large-scale operations leave less time for off-farm work. Operator education and gender did not differ significantly across size groups, and there were relatively minor age differences.

Table 9

Use of technology, management practices, production systems, and labor by U.S. cow-calf farms, by beef cow inventory and means, unless otherwise noted, 2018

Item	20-49 cows (a)	50-99 cows (b)	100-249 cows (c)	250-499 cows (d)	≥500 cows (e)
Production practices used (percent of farms)					
Artificial insemination	4 ^{cde}	8 ^{de}	13 ^{ae}	19 ^{ab}	25 ^{abc}
Embryo transplants or sexed semen	<2	3	2 ^d	7 ^c	6
Weaned calves implanted	4 ^{bcde}	9 ^{ade}	12 ^a	19 ^{ab}	21 ^{ab}
Regularly-scheduled vet services	12 ^{bcde}	23 ^{acde}	35 ^{ab}	41 ^{ab}	37 ^{ab}
Nutritionist to design rations	3 ^{cde}	7 ^{cde}	14 ^{ab}	24 ^{ab}	21 ^{ab}
Tests forage quality	7 ^{bcde}	16 ^{acde}	30 ^{ab}	36 ^{ab}	34 ^{ab}
Individual cow-calf production records	45 ^d	55	54	59 ^a	45
Onfarm computer to manage records	25 ^{de}	25 ^{de}	33	44 ^{ab}	43 ^{ab}
Internet for cow-calf information	46 ^{de}	39 ^{cde}	52 ^{bd}	67 ^{abc}	65 ^{ab}
Forward purchases cow-calf inputs	2 ^{cde}	5 ^{de}	11 ^{ae}	19 ^{ab}	30 ^{abc}
Negotiates price discounts for inputs	5 ^{cde}	7 ^{cde}	18 ^{abe}	24 ^{ab}	35 ^{abc}
Utilizes one or more breeding seasons	50 ^{cde}	55 ^{cde}	75 ^{abe}	81 ^{ab}	87 ^{abc}
Most replacement heifers from seedstock producers	6 ^e	12	11	12	17 ^a
Rotational grazing	41	47	40 ^d	52 ^c	47
Grazes cattle on public land	2 ^{cde}	3 ^{cde}	9 ^{abde}	19 ^{abc}	26 ^{abc}
Weaning weight of calves (average pounds)	502 ^{cde}	520	533 ^a	544 ^a	546 ^a
Labor use per cow per year, cow-calf enterprise					
Operator hours per cow	34.2 ^{bcde}	18.6 ^{acde}	10.7 ^{abde}	6.3 ^{abce}	2.3 ^{abcd}
Unpaid labor hours per cow, year	8.3 ^{bcde}	5.5 ^{acde}	3.0 ^{abe}	2.2 ^{abe}	0.6 ^{abcd}
Paid labor hours per cow	1.2	2.2	1.6	3.0	4.3
Total labor hours per cow	43.7^{bcde}	26.3^{acde}	15.3^{abde}	11.5^{abce}	7.2^{abcd}

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

Table 10

Operator characteristics, costs and returns associated with cow-calf production, and farm finances of U.S. cow-calf farms, by beef cow inventory and means, unless otherwise noted, 2018

Item	20-49 cows (a)	50-99 cows (b)	100-249 cows (c)	250-499 cows (d)	≥500 cows (e)
Principal operator characteristics					
Spent ≥50 percent of work time in farming (percent)	53 ^{cde}	63 ^{cde}	81 ^{abe}	85 ^{abe}	95 ^{abcd}
Average age (years)	62 ^e	62	61	59	59 ^a
Education, 4-year college graduate (percent)	27	30	27	35	36
Female (percent)	10	9	7	5	8
Costs and returns associated with the cow-calf enterprise (U.S. dollars/cow)					
Gross value of production	542	534 ^d	593	647 ^b	698
Feed cost	376	387	432	413	366
Total operating cost	563	552	586	615	584
Total operating and owner-ship cost	970	903	864	860	802
Total cost	2,099^{bcde}	1,543^{acde}	1,254^{abe}	1,112^{ab}	910^{abc}
Farm finances (U.S. dollars)					
Gross cash farm income	35,242 ^{bcde}	77,314 ^{acde}	196,733 ^{abde}	414,962 ^{abce}	1,080,000 ^{abcd}
Total variable expense	24,096 ^{bcde}	42,170 ^{acde}	94,939 ^{abde}	214,559 ^{abce}	591,069 ^{abcd}
Total fixed expense	7,630 ^{bcde}	15,559 ^{acde}	37,957 ^{abde}	65,134 ^{abce}	163,956 ^{abcd}
Total expense	31,725^{bcde}	57,729^{acde}	132,896^{abde}	279,693^{abce}	755,025^{abcd}
Net cash farm income	3,517 ^{bcde}	19,585 ^{acde}	63,837 ^{abde}	135,270 ^{abce}	326,753 ^{abcd}
Net farm income	5,897 ^{bcde}	18,957 ^{acde}	49,987 ^{abde}	129,514 ^{abce}	306,959 ^{abcd}
Operator household off-farm income	89,658	110,001	87,404	117,560	85,157
Operator household total income	87,919 ^{cde}	118,735 ^{de}	120,086 ^{ade}	203,233 ^{abc}	238,011 ^{abc}
Debt-to-asset ratio (percent)	4	4 ^c	7 ^{be}	5	4 ^c

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

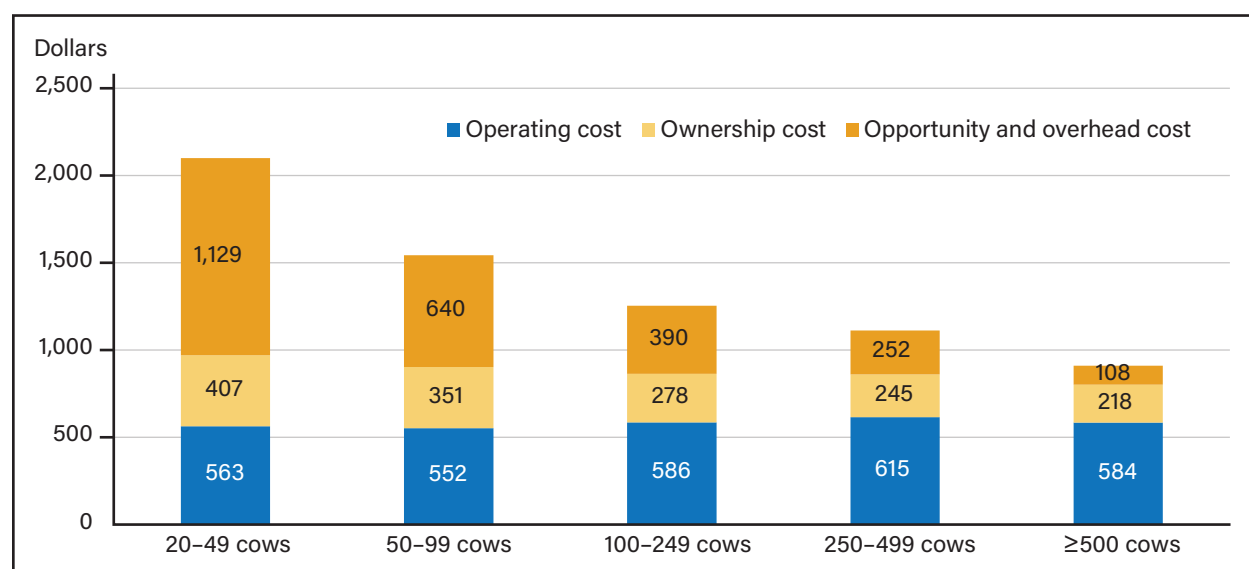
Operation Size and Cow-Calf Farm Economics

We examined the costs and returns associated with cow-calf farms using two types of estimates. We presented costs and returns of the cow-calf enterprise on a per-cow basis as well as total whole-farm costs and returns. For the cow-calf enterprise, the gross value of production includes the value of calves and stockers produced, as well as the value of cull cattle and breeding stock sales. Feed costs include purchased feeds, homegrown feeds (feeds harvested on the farm valued at their market value), and grazed feed (the rental value of pasture). Operating costs include total feed cost plus costs of cattle for backgrounding; veterinary and medicine; bedding; marketing; custom services; fuel, lube, and electricity; repairs; hired labor; and interest on operating capital. Ownership costs include capital recovery of machinery and equipment, as well as taxes

and insurance. Opportunity and overhead costs include unpaid labor, land, and general farm overhead. Total costs are the sum of operating costs, ownership costs, and opportunity and overhead costs. More detailed definitions and estimation methods are found in USDA, ERS's Commodity Costs and Returns data.

The higher gross value of production per cow with increased size is primarily explained by larger operations selling more stockers versus weaned calves—stockers are heavier, so they have a higher value than weaned calves—and more breeding animals, which are higher value. Feed costs, total operating costs, and total operating and ownership costs per cow did not differ significantly among size groups. Opportunity and overhead costs (e.g., unpaid labor, land, and general farm overhead) decreased with farm size primarily due to reductions in the opportunity costs of operator and unpaid labor per cow. Note the lower hours of operator and unpaid labor usage per cow for larger scale cow-calf operations in table 9. Table 10 and figure 16 show major sources of scale economies in U.S. cow-calf production are in opportunity and overhead costs. The opportunity costs of operator and unpaid labor are the primary contributors. We found statistically significant differences among each of the size groups for ownership costs and opportunity and overhead costs, but we did not find significant differences among size groups for operating costs.

Figure 16
Cost of cow-calf production per cow by size category, 2018



Source: USDA, Economic Research Service (ERS) and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data; and USDA, ERS 2018 Commodity Costs and Returns data.

As expected, as farm size increased, gross cash farm income and expense categories rose. Average net cash farm income increased from \$3,517 for the 20–49 cow size category to \$326,753 for the 500 or more cow size category. The average net farm income increased from \$5,897 for the 20–49 cow size category to \$306,959 for the 500 or more cow size category. The ratio of principal operator household off-farm income to total household income decreased as farm size increased, from 1.02 for the 20–49 cow category to 0.36 for the 500 or more cow category. A ratio greater than 1 for the 20–49 cow category implies negative farm household income for the principal operator because household off-farm income exceeded total household income. This finding suggests that for the principal operator's household, farm expenses exceeded gross farm income, and the operator did not earn a wage or salary from the farm or farm business dividends. These results suggest that, as expected, the households of larger scale operations were less dependent on off-farm income than those of smaller scale cow-calf operations. The farm size category with the highest debt-to-asset ratio was the 100–249 cow category at 7 percent.

Cow-Calf Operations Are Dispersed Among Various Farm Types

With limited scale economies in cow-calf production, particularly for operating and ownership costs, small scale cow-calf production can be an attractive option for operators. This particularly applies if the land is owned with no mortgage, opportunity costs of land and operator and unpaid labor are not fully considered, and older, fully depreciated machinery is used beyond its assumed useful life. This was likely the case for some cow-calf farms, particularly those where the operator was retired or received the majority of income from off-farm sources. Gillespie and Mishra (2011) found that among beef, dairy, crop, hog, and broiler producers, those who had entered farming for reasons of living in a rural area or for outdoor activity relative to developing a business to generate additional income were more likely to receive higher portions of farm income from cattle production. This highlights the lifestyle motivations that are sometimes associated with cow-calf production. USDA, ERS categorized farms into eight types as developed by Hoppe and MacDonald (2013). The eight types are commonly aggregated into three major categories that account for farms operated by retirees and those for which the majority of income is from off-farm sources. The major farm type categories analyzed include rural residence farms, intermediate farms, and commercial farms.

Rural residence farms include two types of small family farms: retirement farms, where the principal operators report they are “retired” although they continue to farm on a small scale and their gross cash farm income is less than \$350,000; and off-farm occupation farms, where the operator’s primary occupation is off-farm, and their gross cash farm income is less than \$350,000. Intermediate farms include two types of small family farms: low sales farms, where the operator’s primary occupation is farming, and the gross cash farm income is less than \$150,000, and moderate sales farms, where the operator’s primary occupation is farming, and their gross cash farm income is \$150,000–\$349,999. Commercial farms include four types: midsize family farms, where gross cash farm income is \$350,000–\$999,999; large family farms, where gross cash farm income is \$1 million to \$5 million; very large family farms, where gross cash farm income is more than \$5 million; and nonfamily farms, where the majority (more than 50 percent) of the farm business is not owned by an operator or individuals related to them.

In 2018, 39 percent of cow-calf farms were rural residence farms, but they only accounted for 23 percent of the U.S. average 2018 beef cow inventory (table 11). The majority of these rural residence cow-calf farms were off-farm occupation farms; 35 percent were off-farm occupation farms, and 5 percent were retirement farms. Fifty-two percent of all beef cow-calf farms were intermediate farms, and those held 49 percent of the U.S. beef cow inventory. Only 8 percent of cow-calf farms were commercial farms, but those held 28 percent of the U.S. beef cow inventory. Commercial farms were the largest on average, followed by intermediate farms, and finally by rural residence farms for all farm size measures, including the number of cows, acres operated, and total farm production value. In addition to larger size measures, commercial farms were also the most diversified, followed by intermediate farms, finally followed by rural residence farms for measures such as the percent of total farm production value from cattle, percent of farms producing other crops, and involvement in additional phases of beef cattle production. Off-farm occupation rural residence farms were the least likely to be involved in the stocker or finishing segments.

Table 11

Structure of U.S. beef cow-calf farms, by farm typology and means, unless otherwise noted, 2018

Item	Rural residence farms (a)	Intermediate farms (b)	Commercial farms (c)
Percent of farms	39	52	8
Percent of beef cows	23	49	28
Farm size measures			
Beef cows (average maximum per farm)	58 ^{bc}	93 ^{ac}	346 ^{ab}
Beef cows (average inventory per farm)	41 ^{bc}	65 ^{ac}	243 ^{ab}
Acres operated	388 ^{bc}	993 ^{ac}	5,471 ^{ab}
Acres owned	305 ^{bc}	643 ^{ac}	3,432 ^{ab}
Total farm production value (U.S. dollars)	32,030 ^{bc}	60,536 ^{ac}	774,112 ^{ab}
Percent total farm production value from cattle	87 ^c	79 ^c	46 ^{ab}
Percent of farms producing the following:			
Corn	3 ^{bc}	9 ^{ac}	41 ^{ab}
Soybeans	2 ^{bc}	6 ^{ac}	34 ^{ab}
Hay	55 ^{bc}	67 ^a	73 ^a
Small grain crops	2 ^{bc}	5 ^{ac}	17 ^{ab}
Phases of production (percent of farms)			
Cow-calf only	73 ^{bc}	59 ^{ac}	43 ^{ab}
Cow-calf and stocker	23 ^c	32	41 ^a
Cow-calf, stocker, and finishing	5 ^c	9	16 ^a

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey.

Technology Adoption, Operator Demographics, and Farm Finances by Farm Typology

Commercial farms generally adopted advanced technologies, management practices, and production systems at greater rates, which is consistent with McBride and Key (2013) (table 12). Higher percentages of commercial farms used artificial insemination (19 percent) than rural residence farms (10 percent), followed by intermediate farms (4 percent). In addition, commercial farms used embryo transplants and sexed semen at greater rates (6 percent) than intermediate farms (1 percent). Commercial farms were also greater users of the following compared with rural residence and intermediate farms: regularly scheduled veterinary services; a nutritionist to design rations or purchase feed; forage quality testing; forward purchasing inputs; negotiating input price discounts; and a calving season. Commercial farms used the internet for cow-calf information at higher percentages (57 percent) than intermediate farms (43 percent). The greater use of advanced technologies and management practices reflects the larger size of these operations, as well as a greater dependence on farm versus off-farm income. Commercial farms used less labor on a per-cow basis compared with rural residence or intermediate farms, which could likely reflect the economies of size associated with larger commercial farms.

Table 13 shows the operator characteristics and farm finances of cow-calf farms by farm typology. The average age of intermediate farm operators was older than rural residence and commercial farm operators—although the operators from the retirement farm subgroup were the oldest of the subgroups at 71 years.

Higher percentages of rural residence farm operators held 4-year college degrees than intermediate farm operators, largely due to including off-farm occupation farms in the calculations, of which 36 percent held 4-year college degrees. Higher percentages of rural residence and intermediate farm operators were female compared with commercial farm operators. The larger size of commercial farms was reflected in their higher average gross cash farm income, expenses, net cash farm income, and net farm income. However, rural residence farms had the highest average off-farm household income, underscoring the importance of off-farm employment in the nonfarm occupation subgroup. The ratio of operator household off-farm income to operator total household income provided an indication of the importance of farm income to the household. Average ratios for rural residence, intermediate, and commercial farms were 1.04, 0.99, and 0.24, respectively, showing dependence on off-farm income for rural residence and intermediate farms compared with the greater dependence on farm income for commercial farms.

Table 12

Use of technology, management practices, production systems, and labor on U.S. beef cow-calf farms, by farm typology and means, unless otherwise noted, 2018

Item	Rural residence farms (a)	Intermediate farms (b)	Commercial farms (c)
Production practices used (percent of farms)			
Artificial insemination	10 ^{bc}	4 ^{ac}	19 ^{ab}
Embryo transplants or sexed semen	3	1 ^c	6 ^b
Weaned calves implanted with growth promotant	6	8	22
Regularly-scheduled veterinary services	18 ^c	22 ^c	36 ^{ab}
Nutritionist to design rations or purchase feed	4 ^c	7 ^c	26 ^{ab}
Tests forage quality	12 ^c	16 ^c	33 ^{ab}
Individual cow-calf production records	50	49	57
Onfarm computer to manage cattle records	30	25	34
Internet for cow-calf information	50	43 ^c	57 ^b
Forward purchases cow-calf inputs	3 ^c	6 ^c	18 ^{ab}
Negotiates price discounts for cow-calf inputs	6 ^c	8 ^c	22 ^{ab}
Grazes cattle on public land	2 ^{bc}	6 ^{ac}	13 ^{ab}
Utilizes one or more breeding seasons	55 ^c	56 ^c	88 ^{ab}
Most replacement heifers from seedstock producers	9	9	13
Rotational grazing	46	41	46
Weaning weight of calves weaned (average pounds)	507 ^c	519	539 ^a
Labor use per cow per year, cow-calf enterprise			
Operator hours per cow per year	17.2 ^c	16.7 ^c	3.5 ^{ab}
Unpaid labor hours per cow per year	5.5 ^c	4.2 ^c	1.0 ^{ab}
Paid labor hours per cow per year	1.7	1.7	4.4
Total labor hours per cow per year paid and unpaid labor	24.4^c	22.6^c	8.9^{ab}

Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey.

Table 13

Principal operator characteristics and farm finances of U.S. beef cow-calf farms, by farm typology and means, unless otherwise noted, 2018

Item	Rural residence farms (a)	Intermediate farms (b)	Commercial farms (c)
Principal operator characteristics			
Spent ≥50 percent of work time in farming (percent)	9 ^{bc}	100 ^{ac}	91 ^{ab}
Average age (years)	59 ^b	65 ^{ac}	58 ^b
Education, 4-year college graduate (percent)	35 ^b	24 ^a	30
Female (percent)	8 ^c	10 ^c	3 ^{ab}
Farm finances (U.S. dollars)			
Gross cash farm income	39,300 ^{bc}	66,979 ^{ac}	837,766 ^{ab}
Total variable expense	24,622 ^{bc}	40,996 ^{ac}	406,337 ^{ab}
Total fixed expense	9,497 ^{bc}	15,503 ^{ac}	120,657 ^{ab}
Total expense	34,118^{bc}	56,498^{ac}	526,994^{ab}
Net cash farm income	5,182 ^c	10,480 ^c	310,771 ^{ab}
Net farm income	3,480 ^c	11,155 ^c	287,204 ^{ab}
Operator household off-farm income	134,782 ^{bc}	70,308 ^a	73,312 ^a
Operator household total income	130,216 ^{bc}	71,218 ^{ac}	306,007 ^{ab}
Debt-to-asset ratio (percent)	4	4	6

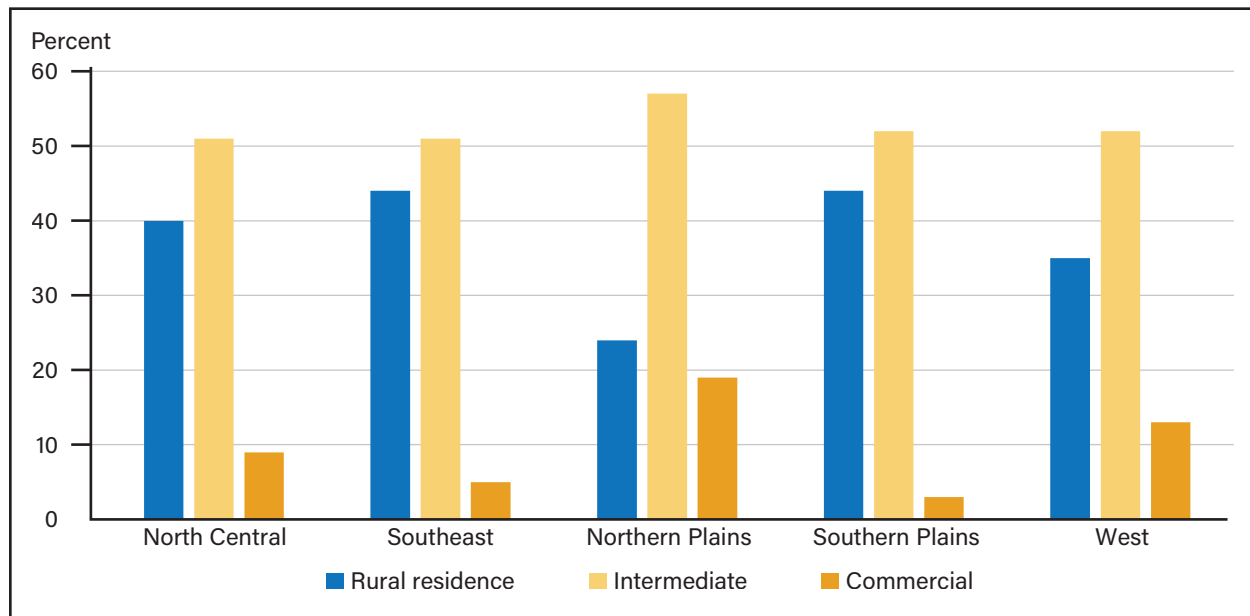
Note: The lettered superscripts throughout the table denote significant statistical differences. A lettered superscript denotes that the item mean reported in a column is significantly statistically different from the item mean reported in the column identified by the superscript letter. Tests are expressed at a 95-percent level of confidence. Tests were conducted using a delete-a-group jackknife variance estimator with 30 replicates provided with the USDA, National Agricultural Statistics Service's Agricultural Resource Management Survey data, as discussed in Dubman (2000).

Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

Figure 17 shows the percentages of cow-calf farms by U.S. region that are in the selected farm typology groups. The following differences in proportions at the 95-percent confidence level were found. Higher proportions of rural residence farms were found in the Southeast and Southern Plains regions compared with the Northern Plains. Higher proportions of commercial farms were found in the Northern Plains region compared with all other regions except for the West. Lower proportions of commercial farms were found in the Southern Plains compared with all other regions except for the Southeast region. The Southeast region had a lower proportion of commercial farms compared with the West.

Figure 17

Percentage of cow-calf farms in each U.S. region that are rural residence, intermediate, and commercial farms, 2018



Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service 2018 cow-calf version of Agricultural Resource Management Survey data.

The Calves Are Weaned: Next Steps

Once calves are weaned, they can be sold to feedlots to be raised to slaughter weight or retained onfarm for backgrounding or stocker production and perhaps finishing. Some stocker producers purchase calves for further weight gain before eventually selling the stockers to feedlots.

Cow-calf producers have a number of marketing options available for selling calves, including auctions where the producer generally delivers cattle to be sold to the highest bidder; direct-video/internet auctions where animals are displayed via video or photographs for sale to potential online buyers; direct-private treaty where animals are sold directly to the buyer, often on the farm; forward contracting⁷ where animals are sold ahead of the sales date for delivery on a particular future date, usually at an agreed upon weight; carcass-basis where animals are sold and priced based upon how they grade at slaughter; and others. USDA, Animal and Plant Health Inspection Service (APHIS) National Animal Health Monitoring System (NAHMS) 2017 Beef Cow-Calf Studies (2021) showed that auctioning cattle was most frequently used by cow-calf producers as the primary marketing option for selling weaned steers and weaned heifers (not for breeding) in 2017. A direct-private treaty was the second most common method used to sell the animals, with the remaining methods each accounting for less than 1.5 percent each.

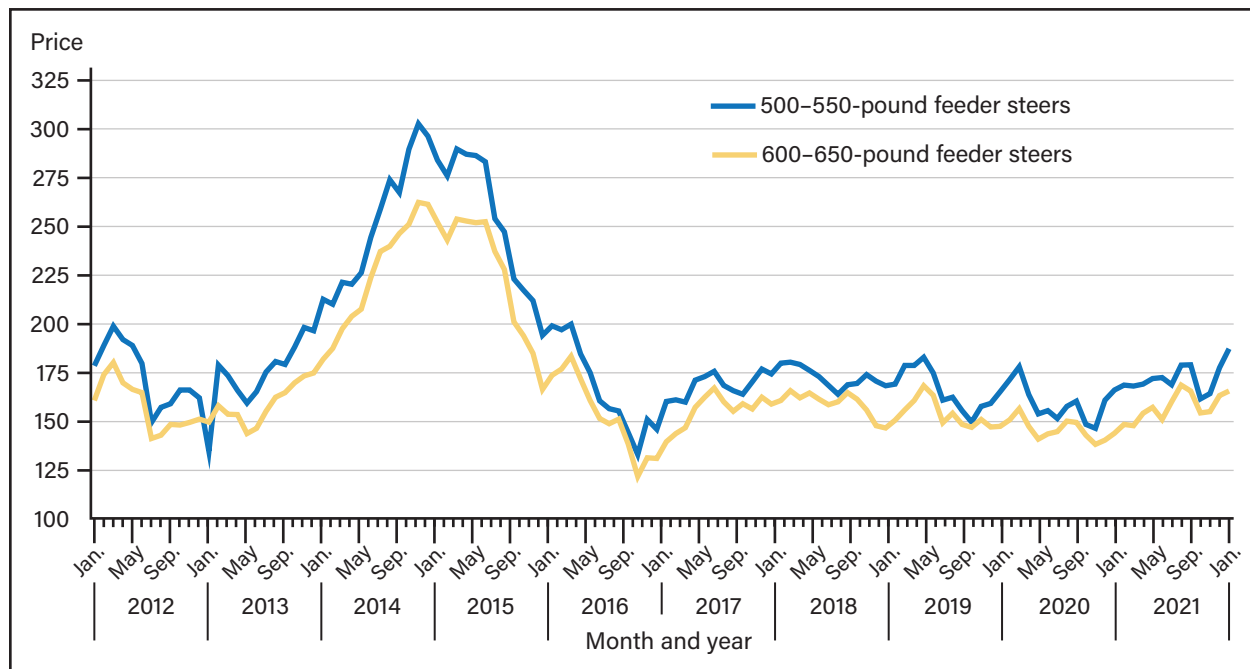
Weaned calf prices (shown as “Feeder steer prices” in figure 18) varied widely, depending upon the cattle cycle and other factors that affect supply and demand, such as production conditions, trade, and economic expectations. Cow-calf producers consider various factors in determining when to sell animals, and expected

⁷ Forward contracts such as these are a type of marketing contract through which the producer retains ownership of the commodity until it is sold. Compared with forward contracts, production contracts are where a contractor typically owns the commodity throughout the production process, and the producer uses onfarm inputs to raise the commodity to market size.

price and production conditions are among the most important factors. Though the price per hundredweight for heavier animals has been lower than for lighter animals (as shown in figure 18), the decision of whether to retain calves for stocker or backgrounding has generally depended upon whether the additional revenue associated with weight gain exceeded feed and other costs.⁸

Figure 18

Oklahoma City feeder steer cash market prices in dollars per hundredweight for 500–550 and 600–650-pound animals, 2012–2021



Source: USDA, Economic Research Service Livestock and Meat Domestic Data.

Once calves are sold, most are transported to feedlots for finishing. USDA, National Agricultural Statistics Service's 2017 Census of Agriculture reported 25,776 U.S. farms fed cattle, with 15,254 holding less than 100 animals in inventory, which accounted for about 4 percent of fed cattle. In addition, 700 of the farms held 2,500 or more animals in inventory, which accounted for 71 percent of the U.S. fed cattle inventory. Almost 60 percent of the feedlots were concentrated in three States including Nebraska, Texas, and Kansas. The length of time required to raise a calf to market weight ranges from 90 to 300 days, depending on the weight of the calf at feedlot placement and the average weight gain per day. Upon completion, finished cattle generally weigh from 1,200 to 1,400 pounds. Finished cattle are then shipped to slaughter plants for processing, where the carcasses are generally processed into eight primal cuts graded as prime, choice, or select. The meat is then distributed for human consumption in restaurants, retail, institutional, and other outlets.

⁸ The interested reader is directed to Peel and Riley (2018) for more information on cattle pricing.

Conclusion

Cow-calf production is unique among major U.S. agricultural segments in that it is suitable for a wide variety of climates and land types and can be adapted to relatively small-scale farms. As such, producers have a range of motivations for entering cow-calf production, with small-scale retired producers accounting for about 5 percent of cow-calf producers and small-scale producers whose main employment is off-farm accounting for about 35 percent of cow-calf producers. These factors, as well as the relatively long reproduction cycle for cattle—1 calf per year with a 9-month gestation period—contribute to a relatively slow rate of structural change in this segment of the beef industry. Though cow-calf farms are becoming more specialized, the adoption of most advanced technologies, management practices, and production systems has been relatively slow or stagnant. Regional differences in cow-calf production are notable. For example, larger scale operations tended to be greater adopters of advanced technologies, management practices, and production systems, which are largely located in the North Central and West regions. Scale economies are also notable, primarily in the cost of labor, with operator and unpaid labor costs per cow declining significantly with larger farm sizes. Larger operations also tended to be greater adopters of technology and less specialized in the cow-calf segment. Larger operations also had a greater tendency to produce other crops and be involved in the stocker segment.

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