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The Diverse Structure and Organization of U.S. Beef Cow-Calf Farms

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Abstract

Beef cow-calf production in the United States is widespread, occurring in every State. Nearly 765,000 farms, about 35 percent of the 2.2 million farms in the United States, had a beef cow inventory in 2007. Most of these were small, part-time operations. About a third of farms that raise beef animals had a beef cow inventory of less than 10 cows, more than half had fewer than 20 cows, and nearly 80 percent had fewer than 50 cows. In this study, ERS uses data from USDA's 2008 Agricultural Resource Management Survey for U.S. beef cow-calf operations to examine the structure, costs, and characteristics of beef cow-calf producers. Many small operations are "rural residence farms" that specialize in beef cow-calf production, but their income from off-farm sources exceeds that from the farm. Most beef cow-calf production occurs on large farms, but cow-calf production is not the primary enterprise on many of these farms. Findings suggest that operators of beef cow-calf farms have a diverse set of goals for the cattle enterprise.

Keywords: Beef cow-calf production, farm income, animal traceability, Agricultural Resource Management Survey (ARMS), National Animal Identification System (NAIS)

Acknowledgments

Thanks go to Jim MacDonald of USDA's Economic Research Service as well as four other anonymous reviewers for providing indepth reviews of an earlier draft. Thanks also to John Weber and Victor Phillips, Jr. for editorial and design services. Special thanks go to the beef cow-calf producers who participated in USDA's 2008 Agricultural Resource Management Survey and those who collected the data.

Contents

Summary

What is the issue?

Beef cow-calf farms operate in an industry characterized by large numbers of small farms. Many of these farms specialize in beef cattle production, but farm households on these operations tend to generate more income from off-farm sources, such as wages and salaries or retirement income, than from the farm businesses themselves. Large farms account for most beef cow-calf production in the United States, but on many of these farms, cow-calf production is not the primary enterprise. These findings suggest that operators of beef cow-calf farms, large and small, have varying goals for their cattle enterprises, of which farming as a lifestyle choice is not uncommon.

What did the study find?

- About 60 percent of U.S. beef cow-calf farms produce calves that are sold at or shortly after weaning. These are usually small farms, and most are located in the Southeast and Southern Plains. Many of the farm households on these operations generate most of their income from off-farm sources.
- More than a third of beef cow-calf farms retain ownership of calves after weaning and continue grazing, or backgrounding, the calves from 30 to 90 days before selling. These farms are generally larger, have more beef cows, and are distributed throughout the United States, with many in the Northern Plains and West regions.
- The majority of U.S. beef cows are located in the South, including the Southern Plains (primarily Texas) and the Southeast. These regions have the advantage of a longer grazing season and less need for supplemental forage to support beef cattle during the winter, which results in lower feed costs. Despite higher feed costs in the Northern Plains, large beef cow-calf producers in this region are able to compete with those in the South due to production efficiencies and economies of size.
- Economies of size in beef cow-calf production suggest that farms have an incentive to become larger. However, the significant land area required for large-scale beef cow-calf production inhibits many producers from expanding. In most areas of the United States, beef cow-calf production is the residual user of land. As the opportunity cost of pasture and range land increases for uses such as crop production or recreational activities, the size of beef cow-calf operations may be limited or fragmented into smaller units.
- Most farms with beef cows do not specialize in beef cow-calf production. In 2008, cattle production accounted for less than 40 percent of the average farm product value on U.S. beef cow-calf farms. Regionally, cattle production accounted for about two-thirds of farm product value on beef cow-calf farms in the Southern Plains and West regions but less than 40 percent in other regions. Specialization in cattle production increased with farm size and peaked at 60 percent of farm product value for operations with 250-499 beef cows. Among the largest operations, those with 500 or more cows, less than 50 percent of farm product value was from cattle.

- Operators of more than a third of beef cow-calf farms worked off-farm in 2008, and half of beef cow-calf farms are classified as rural residence farms. These farms are small operations that specialize in beef cow-calf production but report off-farm earnings as the primary source of household income. Commercial farms with beef cow-calf enterprises are mostly diversified farm operations on which cattle are a secondary enterprise that accounts for about a fourth of farm product value. On intermediate farms, which have annual farm sales under $250,000 and report farming as the main occupation, the beef cattle enterprise accounts for over half of farm product value. Intermediate farms are among the most financially vulnerable to the input and output price variations of beef cattle production.
- In 2008, more than 80 percent of beef cow-calf producers had some type of animal identification system in place, such as branding or ear tagging. But, nearly a quarter of beef cow-calf producers with 20 or more cows reported a lack of familiarity with the National Animal Identification System (NAIS), and only about a quarter had their premises registered with the system. This lack of participation among the Nation's nearly 765,000 beef cow-calf producers appears to be related to concerns about liability and costs associated with the program. Because beef cow-calf production is a secondary farm enterprise and a secondary household income source for most farms with beef cows, there may be little incentive for these farms to risk any perceived liability or to incur program participation costs. This may create a challenge for Federal or State efforts to enhance product traceability through animal identification on beef-cow calf farms.

How was the study conducted?

In this report, ERS summarizes information from a 2008 survey of U.S. beef cow-calf producers included as part of USDA's annual Agricultural Resource Management Survey, which is administered by ERS and USDA's National Agricultural Statistics Service. The survey covered 22 States and targeted beef cow-calf producers with at least 20 beef cows on the operation during 2008. Data from participating producers were weighted for analysis such that they represent 96 percent of U.S beef cow-calf farms in the target population. Surveyed producers were divided into groups by type of operation (cow-calf only, cow-calf/stocker, or cow-calf/feedlot), region, size, and farm typology, through which structural and economic differences among producers in each group were statistically evaluated. Beef cow-calf producers were also grouped according to their familiarity and participation with the NAIS. Program participants were statistically contrasted with other producers to identify characteristics that distinguish those who participated in animal identification and product traceability programs.

Introduction

Beef cow-calf operations are located throughout the United States, typically on land not suited or needed for crop production. These operations depend on range and pasture forage conditions, which are in turn dependent upon variations in the average level of rainfall and temperature for an area. Beef cows harvest forage from grass and range lands to maintain themselves and raise a calf with little grain fed. Forage availability determines the stocking capacity of range and pasture land and can determine whether calves are sold at weaning or retained for additional grazing and growth (Hoder et al., 2007).

Beef cow-calf production contributes to the agricultural economy in most of the United States. According to the Census of Agriculture, cattle and calf sales generated about $61.2 billion in 2007,[1] accounting for about 20 percent of the total market value of agricultural products sold in the United States during the period and ranking first in sales among all commodities. Nearly 765,000 farms, about 35 percent of the 2.2 million farms in the United States, had a beef cow inventory in 2007 (table 1). Most of these were small operations. About a third of farms had a beef cow inventory of less than 10 cows, more than half had fewer than 20 cows, and nearly 80 percent had fewer than 50 cows (USDA, NASS, 2007).

[1]Includes beef and dairy cattle sales.

Rapid transformation in the size, technologies used, and ownership structure has characterized operations in most livestock sectors during the past decade. For example, the number of hog and dairy farms in the United States fell by around 40 percent between 1997 and 2007 (table 1), while the average size of these operations nearly doubled. In contrast, the number of operations with beef cows fell only 15 percent between 1997 and 2007, and the average size of these farms increased from 38 to 43 head, or about 13 percent. Beef cow-calf operations are primarily tied to land suitable for grazing cattle, while hog and dairy operations have substituted capital for land, facilitating large-scale production by moving animals into confinement facilities.

Feeder cattle prices and supplemental feed costs are important factors affecting the profitability of beef cow-calf production. Feeder cattle prices are affected by prices paid for slaughter cattle, which in turn, are affected by consumer demand for beef as reflected in retail beef prices. Cow-calf producers respond to high (low) feeder cattle prices by increasing

Table 1
Number of U.S. farms and farms with livestock operations

Type of farms	Number of farms		Percent change
	1997	2007	
All farms	2,215,876	2,204,792	-0.5
Farms with beef cows	899,756	764,984	-15.0
Farms with milk cows	125,041	69,890	-44.1
Farms with hogs and pigs	124,889	75,442	-39.6

Source: USDA, Economic Research Service using 2007 Census of Agriculture.

(decreasing) production, but biological constraints of cattle prevent producers from instantly responding to price. This gives rise to the cattle cycle—cyclical increases and decreases in the cattle herd over time, determined by the combined effects of cattle prices; the time needed to breed, calve, and raise cattle to market weight; and climatic conditions (USDA, ERS, 2010b).

Beef cow-calf production costs are sensitive to the amount of supplemental feed, in addition to grazing, that is required to over-winter, feed during drought, or otherwise maintain beef cows during the year. There is a cost advantage for producers in areas with a longer grazing season and milder winter, thus requiring less supplemental feed. Other factors shown to influence beef cow-calf production costs are investments in machinery and equipment, calving percentage, calf death loss, and length of the breeding season (Ramsey et al., 2005).

This report presents information about U.S. beef cow-calf operations, emphasizing the diverse structural and economic characteristics of the farms and ranches. The objective is to provide updated information about the type of farms, size of farms, farm production practices, and farm operator and financial characteristics of the U.S. beef cow-calf industry.

USDA's Agricultural Resource Management Survey

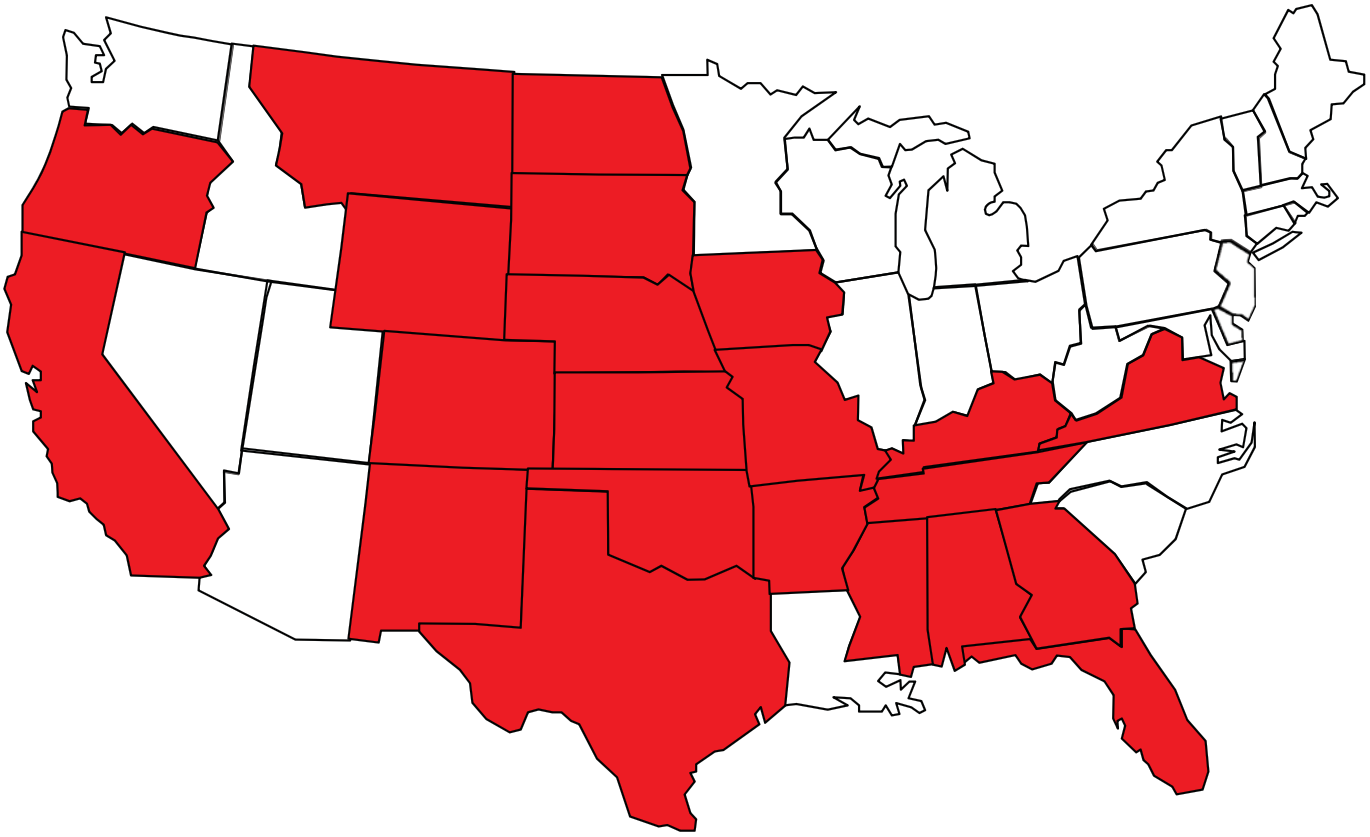
This report summarizes data from an indepth survey of U.S. beef cow-calf producers conducted as part of USDA's 2008 Agricultural Resource Management Survey (ARMS). ARMS is administered annually by ERS and the National Agricultural Statistics Service (NASS). Survey responses were collected from a cross-section of U.S. beef cow-calf operations and include measures of farm size, production costs, business arrangements, production facilities and practices, and farm operator and financial characteristics. The sampling resulted in 1,966 usable responses from 3,600 surveyed producers in 22 States (fig. 1), a survey response rate of 55 percent. Producers in the Northeast, Upper Midwest, and other States were not surveyed because of their minor share of U.S. beef cow-calf production and because of survey cost limitations.

Beef cow-calf farms surveyed in the 2008 ARMS were chosen from a list of farm operations maintained by USDA's NASS. The survey's target population was farms with 20 or more beef cows on the operation at any time during 2008. A primary purpose of the beef cow-calf survey was to collect farm characteristics, farm financial data, and commodity costs-of-production for commercial beef cow-calf operations. Farms with fewer than 20 cows were screened out to exclude farms that raise cattle for onfarm consumption and other noncommercial activities, such as youth projects or hobby farming. Most U.S. beef cow-calf farms are small operations, and limiting the target population to those with fewer than 20 cows omits about 53 percent of the farms with beef cows reported in the 2007 Census of Agriculture. These smallest farms, however, accounted for only about 10 percent of the U.S. beef cow inventory in 2007.

Figure 1

States surveyed in the 2008 ARMS of U.S. beef cow-calf producers

Producers in the surveyed States (shaded) accounted for about 96 percent of beef cow farms with 20 or more head and 93 percent of the beef cow inventory on these farms.



Source: USDA, Economic Research Service using USDA's 2008 Agricultural Resource Management Survey (ARMS).

Each farm surveyed in ARMS represents a number of similar farms in the population as indicated by the survey expansion factor. The expansion factor, or survey weight, was determined from the farm's selection probability and thereby expands the sample to represent the target population.[2] Compared with data in the 2007 Census of Agriculture, the sample represents approximately 96 percent of U.S. beef cow-calf farms in the ARMS target population (20 or more cows) and 93 percent of the beef cow inventory on these farms.[3] The difference is primarily due to ARMS collecting information from operators in only 22 States. Figure 2 displays data on beef cow-calf farms and beef cow inventories from the 2007 Census of Agriculture and the 2008 ARMS by farm size category. Both beef cow-calf farms and beef cow inventories in the ARMS sample are distributed across the size categories much like those in the Census of Agriculture.

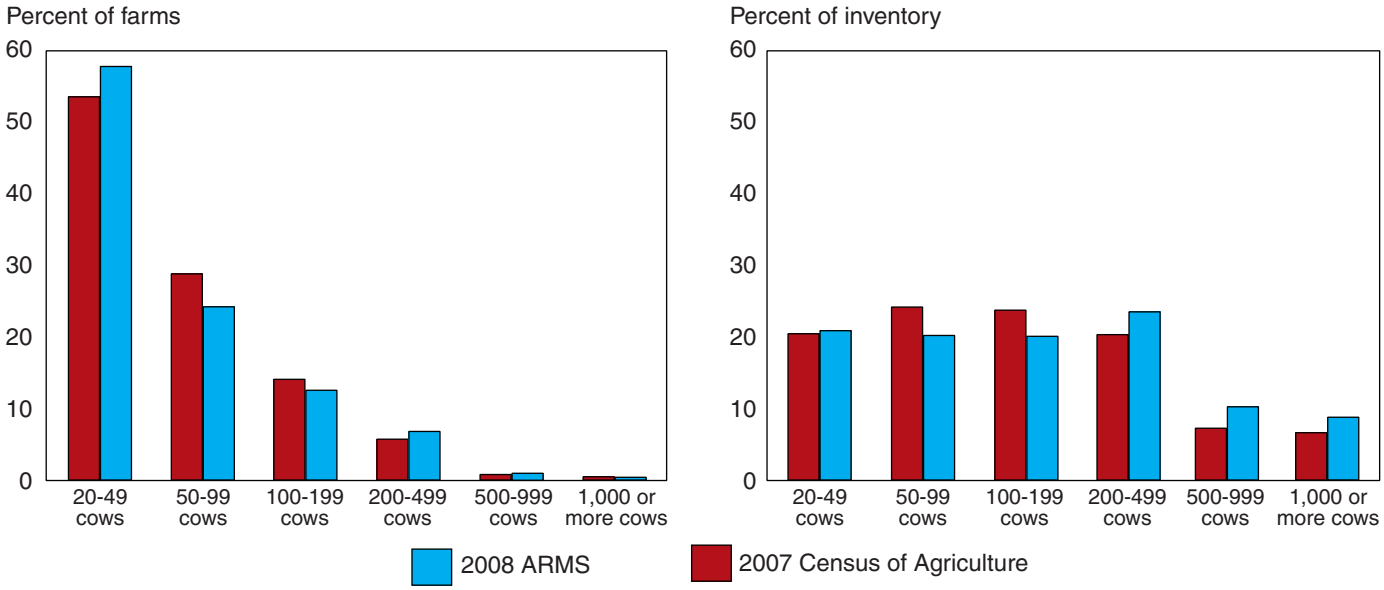
[2]All means estimated from Agricultural Resource Management Survey (ARMS) data and presented in this report are weighted by the survey weights.

[3]The 2007 Census of Agriculture measured beef cow inventory on December 31, 2007. The ARMS beef cow inventory used in this comparison reflects the count on January 1, 2008.

Figure 2

Survey coverage of U.S. beef cow-calf farms and inventory by size of operation, 2008

The expanded ARMS sample of farms with 20 or more beef cows and the ARMS beef cow inventory are distributed similarly across identical size categories of the 2007 Census of Agriculture.



Notes: The 2007 Census of Agriculture measured beef cow inventory on December 31, 2007. The ARMS beef cow inventory is that on January 1, 2008. Differences between the estimates are primarily due to fewer States included in ARMS, and the sampling and nonsampling error of ARMS. Limiting ARMS to operations with 20 or more beef cows omitted about 53 percent of farms with beef cows and 10 percent of the beef cow inventory reported in the 2007 Census of Agriculture.
Source: USDA, Economic Research Service using 2007 Census of Agriculture; and USDA's 2008 Agricultural Resource Management Survey (ARMS).

Other Data

ERS analysts relied on two other sources of data on farms with beef cows. Data from the 1997, 2002, and 2007 Censuses of Agriculture were used to measure changes in farm numbers and cow inventories that provide a context for the ARMS data. These data provide the most reliable estimates of the number of farms and beef cows.

Data from USDA's National Animal Health Monitoring System (NAHMS) were also used to provide context for the ARMS data. NAHMS data provide indications of production practices used on beef cow-calf farms. The NAHMS study of beef cow-calf producers was conducted for 2007 and 2008 and provides information about the health, production, and management practices of beef cow-calf operations. NAHMS coverage closely aligns with, and can be considered complementary to, ARMS. The inference population for the NAHMS study is operations with 1 or more beef cows located in the same 22 States surveyed in ARMS, plus Idaho.

Classifying Beef Cow-Calf Producers

Commercial beef cattle production in the United States can be classified into three phases: (1) cow-calf—cow maintenance during breeding, gestation, and calving to when calves are weaned from between 6 and 9 months of age, weighing 400-700 pounds; (2) stocker—addition of 200-400 pounds of extra weight to weaned calves over 3-8 months; and (3) feedlot—finishing of calves, usually on a combination of forage and grain, to a slaughter weight of 1,000-1,500 pounds (see box, "A Primer on Beef Cow-Calf Production"). About half of U.S. beef cattle operations specialize in the cow-calf phase (USDA, APHIS, 2010a), but the remainder conduct activities in two or all three of the phases.

A Primer on Beef Cow-Calf Production

In most of the United States, beef cows are bred during the summer in order to calve 9 months later in late winter or early spring. This system takes advantage of abundant summer pasture for cattle grazing at a time when lactating cows have their greatest nutritional requirements. In midwinter, most cows are not lactating and thus have lower nutritional requirements. Late winter calving also fits into a slack labor period on most farms.

Fall calving is used on some operations. In this system, calves are born in mid to late fall and marketed anywhere from late spring to early summer. An advantage of this system is that calves are old and large enough by spring and early summer to utilize grass pastures. Fall calves are typically heavier at weaning than spring calves, but the greater cost of feeding a lactating cow through the winter may offset any additional value from the heavier calf. Fall calving may also interfere with harvesting field crops on some farms.

The ideal time of year for calving on a beef cow-calf operation depends on the forage and/or feed supply, available labor, and the intended marketing dates. Also important is a controlled, scheduled calving season (60-90 days), as opposed to year-round calving. With a controlled, scheduled calving season, such as spring or fall calving, (1) most herd management practices can be performed at the same time, (2) use of time and labor can be concentrated and efficient, (3) nonbreeding cows can be more easily identified, and (4) a more uniform calf crop can be produced. Despite these advantages, National Animal Health Monitoring System (NAHMS) data indicate that a significant number of U.S. operations do not use seasonal calving. About 46 percent of U.S. beef cow-calf operations reported year-round calving (USDA, APHIS, 2010b).

Calves are weaned at 400-700 pounds, at 6-9 months of age. Calves are either sold directly after weaning or kept on the operation in a preconditioning program, often referred to as backgrounding, before being sold. Keeping calves on the operation after weaning eliminates the stress of transportation and provides an opportunity to acclimate calves to eating from a feed bunk. NAHMS data show that about half of the calves in the United States are sold at weaning, and more than 80 percent are sold within 60 days of weaning (USDA, APHIS, 2010a).

It is common for beef cow-calf producers to retain calves after weaning and conduct the stocker phase on the same operation, often referred to as backgrounding calves (see glossary). Some cow-calf producers also purchase calves for backgrounding, and weaned calves may be backgrounded on specialized stocker operations. The decision to sell calves at weaning or to retain ownership or purchase calves for backgrounding is made each year based on cattle prices and forage availability. Cow-calf/stocker producers, acting as speculators, distribute the seasonal inventory of calves on the market across the year.

Relatively few cow-calf operations finish calves in farm feedlots. Instead, most calves are finished in large commercial feedlots that purchase most or all feed ingredients, employ nutritionists and veterinarians, and buy and sell cattle weekly (MacDonald and McBride, 2009). However, beef cow-calf producers can also retain ownership of the calves being finished in commercial feedlots.

NAHMS data about days that calves were held on the operation after weaning provide an indication of the production phases conducted on farms with beef cows. Half of all beef cow-calf operations in NAHMS held calves zero days after weaning (USDA, APHIS, 2010a). Selling calves at weaning was most common among small operations and those in the South Central and Southeast regions of the United States. Ten percent of operations retained calves for 123 days or more. This characteristic was more common among large operations and those in the West.

Beef cow-calf producers in ARMS were classified according to which phases were conducted on the farm. *Cow-calf only* operations reported that all calves were sold at weaning. This producer classification accounted for 47 percent of farms in ARMS and 36 percent of beef cows (table 2). *Cow-calf/stocker* operations reported that they retained calves after weaning but sold the calves before finishing. This classification accounted for 44 percent of surveyed farms and 53 percent of beef cows. *Cow-calf/feedlot* operations, including those reporting that they retained ownership of the calves until slaughter, accounted for only 9 percent of farms and 10 percent of beef cows. All calves on the cow-calf only operations were sold at weaning, while nearly 80 percent of the calves weaned on cow-calf/stocker operations were retained after weaning, backgrounded, and sold as stockers. More than half of the calves on cow-calf/feedlot operations were retained after weaning, finished, and sold as slaughter cattle.[4]

[4]Results in this section exclude calves that were retained as replacement breeding stock.

Farm and Operator Characteristics by Producer Classification

The average cow-calf operation surveyed in the 2008 ARMS had a peak inventory of 102 beef cows, had an average inventory of 79 cows, and weaned 73 calves during 2008 (table 2). Cow-calf/stocker operations were largest among the different classifications, with a peak inventory of 123 beef cows and a total of 88 weaned calves in 2008, compared with 79 beef cows and 57 weaned calves on cow-calf only farms.[5] Cow-calf/feedlot operations had a peak inventory of 116 beef cows and weaned 82 calves over the period. Farm size, measured by value of total production, was largest for cow-calf/feedlot operations at nearly $280,000 in 2008, nearly double that for cow-

[5]The differences of group means were statistically tested. The differences emphasized throughout this report are statistically significant at a 95-percent level of confidence.

Table 2

Farm and operator characteristics of U.S. beef cow-calf farms, by producer classification, 2008

Item	Cow-calf only (a)	Cow-calf/ stocker (b)	Cow-calf/ feedlot (c)	All beef cow-calf farms
Percent of farms/beef cows	47/36	44/53	9/10	100/100
Beef cows—peak per farm[1]	79[bc]	123[a]	116[a]	102
Beef cows—average per farm[2]	64[bc]	93[a]	86[a]	79
Beef cows calving	69[bc]	106[a]	97[a]	88
Calves weaned	57[bc]	88[a]	82[a]	73
Weaning age (days)	210	209	210	210
Weaning weight (lbs)	502[c]	499[c]	523[ab]	502
Percent of calves:				
Sold at weaning	100[bc]	21[ac]	28[ab]	59
Backgrounded then sold	0	79[c]	15[b]	36
Retained until slaughter	0	0	57	5
Total farm production value ($)	93,568[bc]	144,305[ac]	279,905[ab]	132,794
Percent from cattle	36[b]	43[ac]	34[b]	39
Acres operated	1,007[bc]	1,623[a]	1,407[a]	1,316
Private pasture/range acres	792[b]	1,274[ac]	969[b]	1,019
Acres per beef cow	10	11[c]	8[b]	10
Percent using private pasture/range	94[b]	91[a]	91	93
Percent using public grazing land	3[bc]	6[a]	8[a]	5
Crops produced (percent of farms):				
Corn	6[bc]	20[ac]	44[ab]	16
Soybeans	5[bc]	14[ac]	43[ab]	13
Small grains	10[bc]	17[a]	21[a]	14
Hay	77	78	79	78
Location (percent of farms):				
North Central	13[bc]	16[ac]	28[ab]	16
Southeast	39[bc]	28[ac]	12[ab]	32
Northern Plains	9[bc]	21[ac]	31[ab]	16
Southern Plains	33[bc]	24[ac]	14[ab]	27
West	6[bc]	11[a]	14[a]	9
Operator:				
Age (years)	61[bc]	59[ac]	56[ab]	60
Age (percent greater than age 65)	42[bc]	34[ac]	21[ab]	36
Off-farm occupation (percent)	41[bc]	34[ac]	20[ab]	36
Completed college (percent)	23[b]	29[a]	27	26
Exit within 5 years (percent)	26[bc]	22[a]	18[a]	23

Notes: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]Largest number of beef cows and heifers that have calved on farm at any time during 2008.

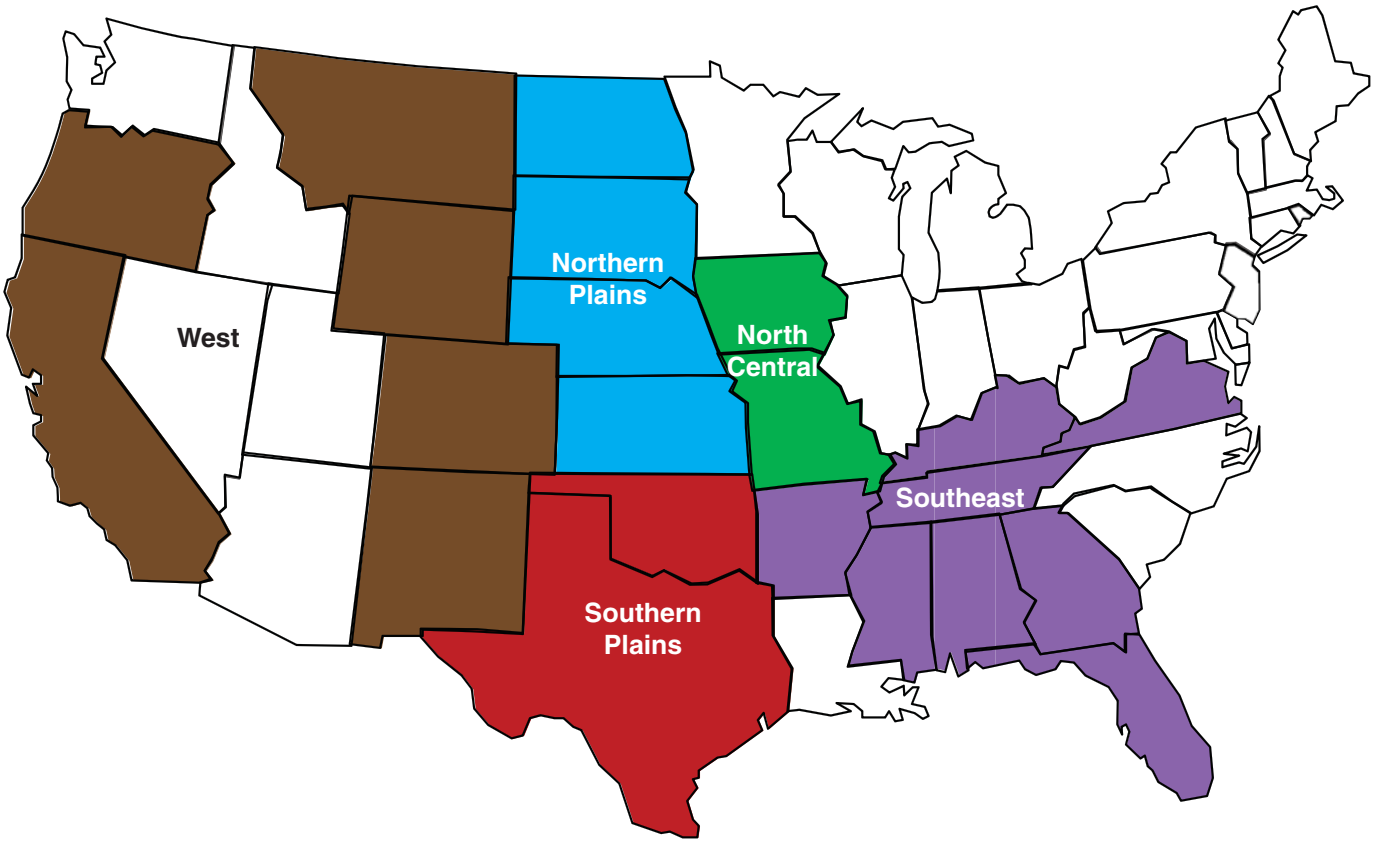
[2]Average of beginning and ending inventories of beef cows and heifers that have calved on farm during 2008.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Figure 3

U.S. beef cow-calf production regions

Nearly a third of ARMS cow-calf producers were located in Southeast States, and 27 percent were in the Southern Plains region.



Source: USDA, Economic Research Service using USDA's 2008 Agricultural Resource Management Survey (ARMS).

calf/stocker operations and triple that for cow-calf only operations. The higher product value on cow-calf/feedlot farms reflects both the high value of finished cattle and the diversity of these farms, as many produced corn and soybeans. Farms with cow-calf/stocker operations were the most dependent on beef cattle, which accounted for 43 percent of the value of farm production on these operations, compared with around 35 percent on the other farm type classifications.

Nearly a third of ARMS beef cow-calf producers were located in Southeast States, and 27 percent were in the Southern Plains region (see fig. 3 for ARMS regions). The majority of cow-calf only farms were in the Southeast and Southern Plains, together accounting for 72 percent. About a third of cow-calf/stocker farms were in the Northern Plains and West regions. Cow-calf/feedlot farms were concentrated in the North Central and Northern Plains regions, together accounting for nearly 60 percent. Cow-calf/feedlot farms were most often located in areas where corn and other crops are readily available for finishing cattle, while cow-calf only farms were located more often in areas with abundant pasture or range land.

Beef cow-calf producers averaged 60 years of age, and more than a third had a primary occupation off-farm (see table 2). Operators of cow-calf only farms were older than operators of other farm types and more often worked off-farm. More than 40 percent of cow-calf only farm operators were older

than age 65, compared with 34 and 21 percent on cow-calf stocker and cow-calf/feedlot farms, respectively. More than 40 percent of cow-calf only farm operators had a primary occupation off-farm, compared with 34 percent on cow-calf/stocker farms and 20 percent on cow-calf/feedlot farms. With fewer beef cows on cow-calf only farms, labor requirements were reduced and farm operators were available to work more time off-farm.

Production Practices and Farm Finances by Producer Classification

The technologies and practices used on beef cow-calf farms were found to vary substantially. Cow-calf only producers were less likely than other cow-calf producers to use many beef cow-calf production practices (table 3), including a defined calving season, artificial insemination, growth promoting implants and/or ionophores, and veterinary and nutritional services. Information management technologies (see glossary), including onfarm computer recordkeeping systems and the Internet, were also used less often on cow-calf only operations than on cow-calf/stocker and cow-calf/feedlot operations. Differences in the use of management technologies may be due to time available for cow-calf production given that more operators of cow-calf only farms worked primarily off-farm (Fernandez-Cornejo, 2007).

U.S. beef cow-calf operations were generally part of diversified farm operations in 2008 as average gross cash income per farm was nearly $48,000 from crop sales and about $58,000 from cattle and other livestock sales (table 3). Among the producer types, cow-calf/feedlot farms were the largest and most diversified, with annual gross cash income more than $100,000 higher than on other farms.[6] Cow-calf feedlot producers benefitted from high prices for corn and soybeans in 2008 as crop sales were greatest on these farms, accounting for 46 percent of cash income. On cow-calf/stocker farms, cattle sales accounted for more than 40 percent of gross cash income. Both crop and cattle sales were lower (and roughly the same) on cow-calf only farms than on other farm types. Cow-calf/feedlot farms had the highest average net cash ($48,000) and farm income ($32,000), about triple that on cow-calf only farms. Net cash and farm income were lowest on cow-calf only farms, both averaging less than $15,000 for 2008.

The amount of off-farm income earned by beef cow-calf producers in 2008 dwarfed farm income. Average off-farm income was about $72,000 among all beef cow-calf farms, nearly three times higher than net cash farm income and $20,000 more than gross cattle sales. Off-farm income was more than twice gross cattle sales on cow-calf only farms and compensated for the low level of farm income. Off-farm income was a substantial part of household income for each beef cow-calf producer classification.

[6]Farm product value discussed in the previous section is the value of all farm products produced in 2008. Gross cash income is the value of products sold in 2008 regardless of when they were produced.

Table 3

Production practices and financial characteristics of U.S. beef cow-calf farms, by producer classification, 2008

Item	Cow-calf only (a)	Cow-calf/ stocker (b)	Cow-calf/ feedlot (c)	All beef cow-calf farms
Practices:		*Percent using*		
Defined calving season	54[bc]	66[ac]	79[ab]	61
Commercial seed stock	16[b]	13[ac]	20[b]	15
Artificial insemination	4[bc]	11[ac]	19[ab]	8
Calf implants and/or ionophores	9[bc]	17[ac]	25[ab]	14
Regular veterinary services	17[bc]	26[a]	32[a]	23
Nutritionist services	4[bc]	8[ac]	18[ab]	7
Rotational grazing	59	62	56	60
Tested forage quality	12[bc]	19[ac]	27[ab]	16
Individual cow records	40[bc]	50[a]	56[a]	46
Onfarm computer records	17[bc]	22[ac]	29[ab]	20
Internet for cattle information	29[bc]	38[a]	42[a]	34
Forward purchase inputs	5[bc]	10[a]	12[a]	8
Negotiate input prices	14[bc]	23[a]	24[a]	19
Farm finances:		*Dollars per farm*		
Gross cash income[1]	74,894[bc]	143,793[ac]	254,531[ab]	121,574
-Cattle sales	33,613[bc]	62,384[ac]	94,180[ab]	51,809
-Other livestock sales	1,269[bc]	10,543[a]	14,000[a]	6,525
-Crop sales	30,620[bc]	51,451[ac]	117,514[ab]	47,657
Cash expenses	59,918[bc]	113,200[ac]	206,892[ab]	96,740
-Variable	46,221[bc]	86,250[ac]	158,893[ab]	74,077
-Fixed	13,698[bc]	26,950[ac]	48,099[ab]	22,663
Net cash farm income	14,975[bc]	30,594[a]	47,640[a]	24,834
Net farm income[2]	11,972[bc]	24,292[a]	31,595[a]	19,197
Off-farm income[3]	69,019	77,465[c]	59,975[b]	71,947

Notes: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]In addition to livestock and crops sales, gross cash income includes Government payments and other farm-related income.

[2]Net farm income equals net cash income less depreciation and the value of noncash benefits for hired labor, plus the net value of commodity inventory change and nonmonetary income.

[3]Off-farm income includes farm household earnings from wages and salaries, earnings from another business, interest and dividend income, pensions and other retirement income, and income from other off-farm sources.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Regional Diversity in Beef Cow-Calf Production

Although beef cows are kept on range or pasture land throughout the year in much of the Nation, few producers can depend on grazing alone to furnish a year-round supply of forage. In parts of the country, snow cover occasionally prevents grazing during the winter. In other parts, growth and nutritive content of range and pasture plants limit grazing during part of the year. Thus, most producers—97 percent according to NAHMS—feed cows some harvested forage almost every year (USDA, APHIS, 2010b). These harvested forages are a substantial production cost for producers in some areas of the United States (USDA, ERS, 2010d).

Cow-calf herds are grazed not only on range and pasture lands but also on land primarily used for other purposes. In some areas, wheat can be grazed for a period during the fall and winter before being harvested for grain later in the year. Crop residues are also grazed in some areas for limited periods following the harvest of corn, grain sorghum, and other crops. Feed costs, including purchased feed, harvested forages, and grazing, frequently account for about two-thirds of the total operating costs of beef cow-calf production (USDA, ERS, 2010d).

Regional variation in climate and grazing conditions affects the calving and weaning practices of beef cow-calf producers. NAHMS data show that a majority of beef cow-calf farms in Southern States calved year-round.[7] In Western States, nearly 80 percent used a spring calving system (USDA, APHIS, 2010b), as calving was scheduled to avoid severe winter weather in much of the West and to take advantage of forage conditions in the summer and on public grazing land (see glossary). More than 60 percent of cow-calf farms in the South sell calves at weaning, compared with 36 percent in the West and 26 percent in the central region (USDA, APHIS, 2010a).

[7]Year-round calving is reported if bulls were not removed from the herd for at least 30 days.

Regional diversity in beef cow-calf production is examined in this report by summarizing farm and operator characteristics and farm production practices and finances for producers in the five beef cow-calf production regions shown in figure 3. Among the regions, little has changed in the inventory of beef cows since 1997 (fig. 4). Regions in the South—the Southern Plains and Southeast—have the most beef cows, and Texas, with more than 5 million head, has more than twice the number of beef cows as any other State. The North Central region has the fewest beef cows, but Missouri ranks second among States in the number of beef cows with more than 2 million head.

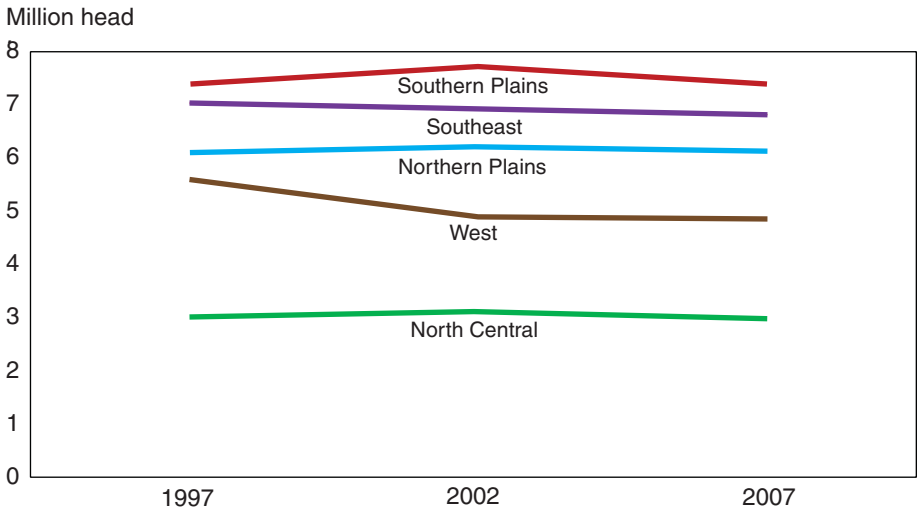
Farm and Operator Characteristics by Region

Nearly 60 percent of beef cow-calf farms surveyed in ARMS were in the Southeast and Southern Plains regions, along with 50 percent of beef cows (table 4). Beef cow-calf farms in the Northern Plains and West together had nearly 40 percent of beef cows, despite accounting for only 25 percent of farms. The largest beef cow-calf operations were in the Northern Plains and West, averaging 129 and 213 cows per farm (at peak), respectively, and the smallest were in the North Central and Southeast, averaging 65 and 78

Figure 4

Beef cow inventory by U.S. production region

Regions in the South, Southern Plains, and Southeast had the most beef cows each year, and the number of beef cows in each region has changed little over time.



Source: USDA, Economic Research Service using 2007 Census of Agriculture.

cows (at peak), respectively. About 70 percent of the calves from beef cow-calf operations in the Southeast and Southern Plains were sold at weaning, compared with about 50 percent or less in the other regions where weaned calves were more often backgrounded before being sold. This may explain the older weaning age and greater weaning weight of calves in the Northern Plains and West regions.

Farm value of production was highest for cow-calf farms in the Northern Plains, at an average of more than $200,000 per farm, followed by that for farms in the West (table 4). Cattle production accounted for a significantly larger part of farm product value (about two-thirds) in the West and Southern Plains than in other regions. Acres operated were also much larger in the West, averaging over 4,000 per farm, more than twice that in any other region. Nearly all of this acreage was private pasture and range land for grazing cattle. In addition to using private pasture and range land, more than a third of farms in the West used public grazing land. Cattle production accounted for 25 percent or less of farm product value on beef cow-calf farms in the North Central and Southeast.

More than 90 percent of farms in most regions used private pasture land for grazing beef cattle, although the acreage and stocking rate varied significantly among the regions. Farms in the Northern Plains and Southern Plains averaged more than 2,000 and 1,400 acres in size, respectively, with much of this in pasture and range land for cattle. Farms in the North Central and Southeast had the fewest acres, 518 and 453, respectively, each having just over 200 acres of pasture. Still, the pasture acreage in these regions supported more beef cows (about 3 acres per cow) than that in other regions (10-20 acres per cow). More than 80 percent of farms in the North Central, Southeast, and Northern Plains produced hay for cattle feed, compared with about 60 percent in the other regions. Cow-calf producers in the Northern Plains more often produced small grain crops, mostly wheat, which can be used for cattle grazing in the fall and winter before the summer harvest.

Table 4

Farm and operator characteristics of U.S. beef cow-calf farms, by region, 2008

Item	North Central (a)	Southeast (b)	Northern Plains (c)	Southern Plains (d)	West (e)
Percent of farms/beef cows	16/10	32/24	16/21	27/26	9/18
Beef cows—peak per farm[1]	65[bcde]	78[acde]	129[abde]	99[abce]	213[abcd]
Beef cows—average per farm[2]	56[cde]	59[cde]	105[abde]	75[abce]	155[abcd]
Beef cows calving	61[cde]	63[cde]	118[abde]	82[abce]	186[abcd]
Calves weaned	51[cde]	51[cde]	103[abde]	68[abce]	154[abcd]
Weaning age (days)	210[ce]	206[ce]	219[abd]	204[ce]	222[abd]
Weaning weight (lbs)	501[bce]	480[acde]	543[abd]	493[bce]	538[abd]
Percent of calves:					
Sold at weaning	44[bde]	70[ace]	41[bde]	69[ace]	53[abcd]
Backgrounded then sold	45[bd]	28[ace]	49[bde]	29[ace]	39[bcd]
Retained until slaughter	11[bd]	2[ace]	10[bd]	2[ace]	8[bd]
Total farm production value ($)	164,037[bcd]	106,779[acde]	241,812[abde]	65,430[abce]	176,869[bcd]
Percent from cattle	23[cde]	25[cde]	38[abde]	67[abc]	66[abc]
Acres operated	518[bcde]	453[acde]	2,019[abde]	1,436[abce]	4,186[abcd]
Private pasture/range acres	208[bcde]	246[acde]	1,359[abe]	1,272[abe]	4,028[abcd]
Acres per beef cow	3[cde]	3[cde]	11[abe]	13[abe]	19[abcd]
Percent using private pasture/range	94[bce]	89[acde]	97[abe]	97[be]	82[abcd]
Percent using public grazing land	0	D	7[de]	1[ce]	36[cde]
Crops produced (percent of farms):					
Corn	37[bde]	8[acd]	38[bde]	2[abce]	7[acd]
Soybeans	37[bd]	3[ac]	34[bd]	2[ac]	0
Small grains	11[bc]	3[acde]	43[abde]	11[bce]	16[bcd]
Hay	94[bcde]	86[ade]	83[ade]	62[abc]	58[abc]
Operator:					
Age (years)	58[bd]	61[ace]	57[bd]	61[abe]	59[bd]
Age (percent greater than age 65)	34	41[ce]	29[bd]	39[ce]	30[bd]
Completed college (percent)	18[de]	20[de]	22[d]	37[abc]	33[abc]
Off-farm occupation (percent)	35[cde]	40[cde]	18[abde]	47[abce]	23[abd]
Exit within 5 years (percent)	23	27[d]	25[d]	18[bce]	23[d]

Notes: D= insufficient data for disclosure. The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]Largest number of beef cows and heifers that have calved on farm at any time during 2008.

[2]Average of beginning and ending inventories of beef cows and heifers that have calved on farm during 2008.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Operator age differed little among beef cow-calf farms in each region, but education was somewhat higher among farm operators in the Southern Plains and West, as a third or more of beef cow-calf producers in these regions completed college. More farm operators had a primary occupation off-farm in the North Central, Southeast, and Southern Plains than in the other regions. Nearly half of farm operators in the Southern Plains, 40 percent of those in the Southeast, and 35 percent in the North Central had a primary occupation off-farm, compared with only 18 percent in the Northern Plains and 23 percent in the West.

Production Practices and Farm Finances by Region

Beef cow-calf technologies and practices were generally used more often by producers in the North Central, Northern Plains, and West regions than those in the Southern Plains and Southeast. For example, producers in these regions used a defined calving season more often than producers in the southern regions (table 5). A defined calving season is common in the North because severe winter weather dictates that cows are scheduled to calve during the spring and calving occurs during a slack labor period for crops commonly grown in the North. A defined calving season also means that the calves are more uniform in size at marketing. Also, producers in the North Central and Northern Plains more often used such technologies as calf implants and/or ionophores (see glossary) than producers in other regions.

Other practices, such as regular veterinary and nutritionist services, were also used more often in the North Central, Northern Plains, and West regions. A majority of beef cow-calf producers in the Southeast and Southern Plains rotated grazing acres, but fewer tested forage quality than in other regions. Information management technologies, such as individual cow records, onfarm computer records, and Internet-based beef cattle information, were generally used less often by producers in the southern regions. For example, 35 percent of beef cow-calf producers in the Southeast kept individual cow records, compared with at least 50 percent of producers in the North Central, Northern Plains, and West regions.

Climatic differences among the regions affect beef cow-calf feed costs. In the northern regions, farms may be required to purchase supplemental forage to sustain beef cows during the winter. In contrast, beef cows in some areas of the South and West regions can graze year round, so less harvested forages are needed to sustain cows during the winter months. Feed costs per cow in 2008 were significantly lower in the Southern Plains, Southeast, and West than in the North Central and Northern Plains (fig. 5). This cost advantage helps account for the relatively larger shares of U.S. beef cows in these regions.

Gross cash income of beef cow-calf farms in 2008 was substantially lower in the Southeast and Southern Plains (about $70,000 per farm) than in the North Central (nearly $160,000 per farm) and in the other regions (over $200,000 per farm) (table 5). Cattle sales accounted for the majority of cash income in the Southern Plains and West regions. Livestock and crop income were divided more evenly in the Northern Plains and Southeast, and North Central farms generated most of their gross income from crop sales. Net cash and net farm income were highest for beef cow-calf farms in the Northern Plains and North Central, as many farms in these regions benefited from the high prices received for corn and soybeans produced in 2008 (see table 4).

Table 5

Production practices and financial characteristics of U.S. beef cow-calf farms, by region, 2008

Item	North Central (a)	Southeast (b)	Northern Plains (c)	Southern Plains (d)	West (e)
Practices:			*Percent using*		
Defined calving season	82[bcd]	45[ace]	92[abde]	42[ace]	85[bcd]
Commercial seed stock	16[c]	13[c]	21[abde]	13[c]	15[c]
Artificial insemination	11[bcd]	4[acde]	17[abd]	6[abce]	14[bd]
Calf implants and/or ionophores	28[bde]	7[ace]	26[bde]	8[ace]	13[bd]
Regular veterinary services	27[bcd]	12[acde]	41[abde]	18[abce]	32[bcd]
Nutritionist services	11[bd]	2[acde]	15[bde]	5[abce]	9[bcd]
Rotational grazing	54[de]	60[e]	58[e]	62[ae]	71[abcd]
Tested forage quality	16[bce]	10[acde]	27[abd]	15[bce]	25[abd]
Individual cow records	52[bc]	35[acde]	59[abde]	45[bc]	52[bc]
Onfarm computer records	20[e]	13[cde]	23[be]	22[be]	35[abcd]
Internet for cattle information	33[e]	29[cde]	38[be]	35[be]	49[abcd]
Forward purchase inputs	3[bcde]	7[ace]	10[abde]	8[ace]	17[abcd]
Negotiate input prices	14[cde]	16[ce]	21[abe]	19[ae]	31[abcd]
Farm finances:			*Dollars per farm*		
Gross cash income[1]	157,920[bcd]	73,130[ace]	228,071[abd]	66,692[ace]	203,753[bcd]
-Cattle sales	37,718[bcde]	27,012[acde]	92,407[abde]	43,691[abce]	116,223[abcd]
-Other livestock sales	13,089	4,314[cd]	12,016[bde]	1,980[bce]	6,674[de]
-Crop sales	88,526[bde]	30,582[acd]	103,011[bde]	11,167[abce]	46,419[acd]
Cash expenses	112,245[bcde]	58,097[acde]	169,367[abd]	68,160[abce]	162,149[abd]
-Variable	79,438[bcde]	47,975[ace]	125,594[abd]	54,644[ace]	123,197[abd]
-Fixed	32,807[bcd]	10,122[acde]	43,773[abd]	13,516[abce]	38,952[bde]
Net cash farm income	45,676[bd]	15,033[acde]	58,704[bd]	-1,468[abce]	41,640[bd]
Net farm income[2]	36,650[bd]	15,397[acde]	47,313[bd]	-7,855[abce]	33,394[bd]
Off-farm income[3]	61,311[cd]	61,385[cd]	44,952[abde]	106,266[abce]	72,010[cd]

Notes: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]In addition to livestock and crops sales, gross cash income includes Government payments and other farm-related income.

[2]Net farm income equals net cash income less depreciation and the value of noncash benefits for hired labor, plus the net value of commodity inventory change and nonmonetary income.

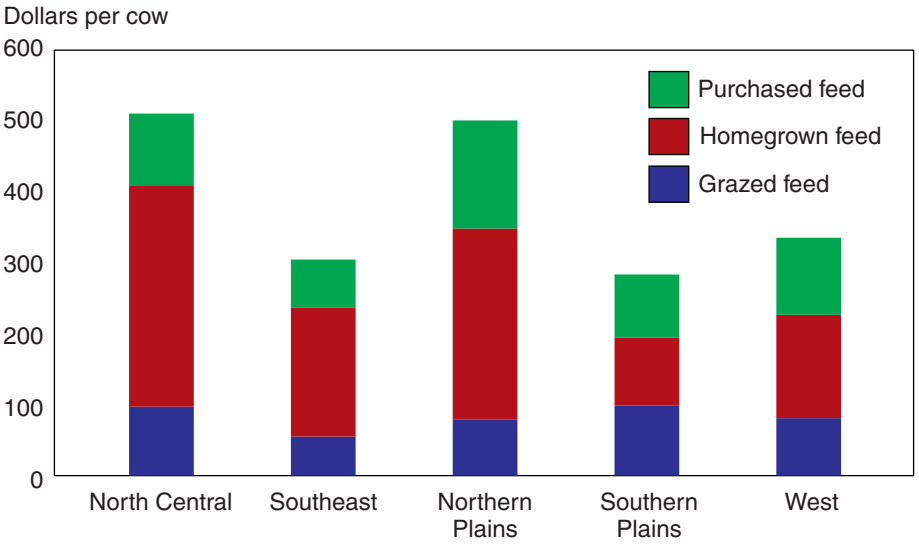
[3]Off-farm income includes farm household earnings from wages and salaries, earnings from another business, interest and dividend income, pensions and other retirement income, and income from other off-farm sources.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Figure 5

Beef cow-calf feed costs by region, 2008

Feed costs per cow were lowest in the Southeast, Southern Plains, and West regions because less homegrown forages and other feeds were needed to sustain the beef herd through the winter.



Source: USDA, Economic Research Service using USDA's 2008 Agricultural Resource Management Survey.

Among the regions, net cash and net farm income were lowest on farms in the Southern Plains and Southeast, where many farm operators worked off-farm to supplement household income. At more than $100,000 per farm, average off-farm income was highest in the Southern Plains, reflecting the high proportion of farm operators working off-farm and the relatively high average education level (see table 4). Beef cow-calf production accounted for a significant share of the farm household income in the Northern Plains and West regions, as gross cattle sales were nearly $50,000 more than off-farm income. Gross cattle sales were much lower than off-farm earnings in the North Central, Southeast, and Southern Plains. Average off-farm earnings were higher than the average net income from farming in all regions except the Northern Plains.

Size and Costs of Beef Cow-Calf Production

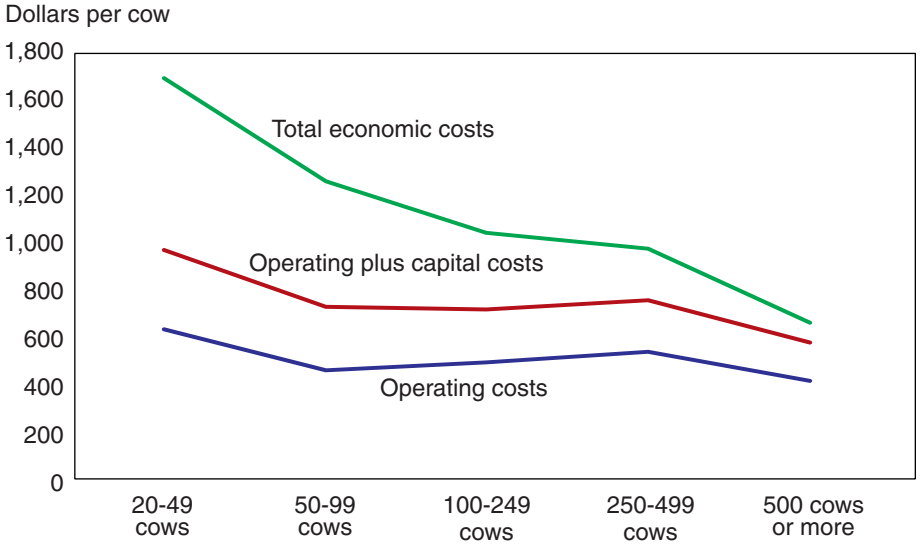
The emergence of large dairy and hog farms and the continued shift in production to such farms is well documented (MacDonald et al., 2007; Key and McBride, 2007), but less is known about the economics of large-scale beef cow-calf production. Langemeier et al. (2004) found evidence of economies of size (decreasing costs as size of operation increases) in beef cow-calf production using the National Cattlemen's Association-Integrated Resource Management-Standardized Performance Analysis (NCA-IRM-SPA) database. The findings indicate that average economic costs per cow for operations declined with farm size up to 500-999 beef cows, but average economic costs per cow were 10 percent higher on operations with 1,000 or more cows than for those with 500-999 cows. The study used data from 206 herds in 20 States that were part of the NCA-IRM-SPA database. Short (2001) also reported finding economies of size in beef cow-calf production using a larger database, but the largest size group included in the analysis was 250 or more cows. Economies of size in beef cow-calf production have also been documented in other studies (Ramsey et al., 2005; Boggs and Hamilton, 1997).

Figure 6 illustrates the relationship between costs of production and size of operation for beef cow-calf operations using data from the 2008 ARMS. Operating, operating plus capital, and total economic costs (see glossary) per cow are highest among the smallest (20-49 cows) producers and lowest among the largest (500 or more cows). Significant economies of size are

Figure 6

Beef cow-calf cost of production per cow by size, 2008

Economies of size are apparent in beef cow-calf production, particularly for total economic costs.



Notes: Production cost estimates for operations with less than 20 beef cows are not available because the ARMS sample is limited to operations with 20 or more beef cows. The number of cows refers to the peak number on the operation at any time during 2008.
Source: USDA, Economic Research Service using USDA's 2008 Agricultural Resource Management Survey (ARMS).

achieved by moving from the 20-49 cow herd size to the 50-99 cow herd size.[8] Between the 50-99 and 200-499 herd sizes, operating and operating plus capital costs per cow are much the same for the three size groups.

Total economic costs, primarily due to charges for unpaid labor, reveal economies of size across all size groups, and the largest farms (500 cows or more) have significantly lower costs per cow than all other farms. Capital and labor costs are much lower on larger operations because they are able to spread fixed units of these resources over greater production. For example, farms with 20-49 cows reported using 31 hours of labor per cow (29 unpaid hours), compared with 6 hours per cow (2.5 unpaid hours) on farms with 500 or more cows. Even if charges for unpaid labor are omitted from production costs, significant economies of size remain.

Despite this evidence for the existence of economies of size in beef cow-calf production, the dramatic shift to larger operations that occurred in hog and milk production was not evident among beef cow-calf farms. Census of Agriculture data reveal that the number of operations with beef cows dropped 15 percent from 1997 to 2007, but the distribution of farms by herd size changed little. In 1997, 82 percent of farms with beef cows had fewer than 50 cows, compared with 80 percent in 2007. Farms with 500 or more cows increased from 0.6 percent of farms with beef cows in 1997 to 0.8 percent in 2007. The beef cow inventory on farms with 500 or more cows increased from 15 percent of the U.S. total in 1997 to 16 percent in 2007 (USDA, NASS, 2007).

Calving and weaning practices used on beef cow-calf operations surveyed in the NAHMS study varied significantly by size of operation. NAHMS data indicate that the largest beef cow-calf operations were more likely to follow a defined calving season than smaller operations. More than three-fourths of farms in the largest size group (200 or more cows) used spring calving, compared with 38 percent of the smallest operations (1-49 cows) (USDA, APHIS, 2010b). The smallest operations were more likely to sell calves at weaning, whereas the largest were more likely to add value to the calves after weaning by backgrounding (USDA, APHIS, 2010a).

To evaluate the relationship between beef cow-calf farm characteristics, practices, costs, and size of operation, we divided producers surveyed in ARMS into size groups and measured differences in farm structural and financial characteristics among the groups. Beef cow-calf operations were assigned to the following groups based on the reported peak number of beef cows on an operation at any time during 2008: (1) 20-49 cows, (2) 50-99 cows, (3) 100-249 cows, (4) 250-499 cows, and (5) 500 or more cows. Of the 765,000 U.S. beef cow farms reported in the 2007 Census of Agriculture, about 407,000 had less than 20 cows, whereas more than 200,000 had 20-49 cows. Only 5,800 farms, or less than 1 percent, had 500 or more cows.

[8]With significant economies of size achieved by operations with 50 or more cows, one would expect operations with 1-19 cows to have much higher costs, especially capital and labor costs, than other operations.

Farm and Operator Characteristics by Size

Beef cow-calf operations with less than 100 cows far outnumbered those with 250 or more cows during 2008 but included a disproportionately small share of total beef cows (table 6). Seventy-three percent of farms had less than 100 beef cows. These small operations accounted for about a third of total beef cows. The 7 percent of farms with 250 or more cows accounted for 35 percent of total beef cows, and the 2 percent of farms with 500 or more cows accounted for 20 percent of beef cows. These largest operations had an average size of 961 cows (at peak), compared with an average of only 34 cows (at peak) for producers in the smallest size group.

Larger beef cow-calf operations more often backgrounded calves after weaning. Almost two-thirds of the calves were sold at weaning from operations with less than 100 cows, compared with 39 percent of calves from operations with 500 or more cows. Over half of the calves from the largest operations were backgrounded and then sold. The proportion of operations retaining ownership of the calves until slaughter was much the same regardless of size, at about 6 percent of farms in each size group.

Farm specialization in cattle production increased with farm size up to farms with 250-499 beef cows, and then declined among the largest operations. The proportion of farm value of production from cattle peaked at 60 percent among operations with 250-499 beef cows and declined to less than 50 percent for those with 500 or more cows. The largest farm operations contained more than 15,000 acres per farm, with about 13,000 acres of pasture and range land; both of these measurements are nearly three times the average acreage on farms in the next largest size group. Also, 29 percent of farms with 500 or more cows, and 24 percent of those with 250-499 beef cows, used public grazing land, compared with 8 percent or less of farms in the other size groups. The largest size group included many farms in the West and Northern Plains, where public grazing lands are common. More than 60 percent of farms in the smallest size group were in the Southeast and North Central regions (fig. 7).

Farm operator (see glossary) characteristics differed by size among the beef cow-calf producers. Average farm operator age was lower for the largest producers (57 years) than for those with less than 100 cows (60 years), as was the share of farm operators older than age 65 (table 6). Thirty-eight percent of farm operators with less than 100 cows were older than age 65, compared with 22 percent of those with 500 or more cows. The share of farm operators with a primary occupation off-farm declined with farm size, ranging from 47 percent among the smallest producers to 10 percent among the largest. Operator education, indicated by the share graduated from college, increased with size of operation, from 23 percent among the smallest producers to 42 percent among the largest.

Table 6

Farm and operator characteristics of U.S. beef cow-calf farms, by size of operation (at peak),[1] 2008

Item	20-49 cows (a)	50-99 cows (b)	100-249 cows (c)	250-499 cows (d)	500 or more cows (e)
Percent of farms/beef cows	41/13	32/21	21/31	5/15	2/20
Beef cows—peak per farm[1]	34[bcde]	68[acde]	147[abde]	332[abce]	961[abcd]
Beef cows—average per farm[2]	29[bcde]	54[acde]	116[abde]	260[abce]	640[abcd]
Beef cows calving	31[bcde]	60[acde]	128[abde]	292[abce]	746[abcd]
Calves weaned	26[bcde]	49[acde]	107[abde]	247[abce]	622[abcd]
Weaning age (days)	208[cde]	209[cde]	213[ab]	218[ab]	214[ab]
Weaning weight (lbs)	494[cde]	493[cde]	523[abd]	538[abce]	522[abd]
Percent of calves:					
Sold at weaning	63[cde]	62[cde]	51[abe]	49[abe]	39[abcd]
Backgrounded then sold	31[cde]	35[cde]	43[abe]	45[abe]	55[abcd]
Retained until slaughter	6[b]	3[acde]	6[b]	6[b]	6[b]
Total farm production value ($)	68,259[bcde]	93,473[acde]	198,807[abde]	303,144[abce]	931,690[abcd]
Percent from cattle	24[cde]	32[cde]	43[abd]	60[abce]	47[abd]
Acres operated	346[bcde]	781[acde]	1,654[abde]	5,506[abce]	15,473[abcd]
Private pasture/range acres	196[bcde]	613[acde]	1,255[abde]	4,611[abce]	13,134[abcd]
Acres per beef cow	6[bcde]	9[ae]	9[ae]	14[a]	14[abc]
Percent using private pasture/range	93	92	94	91	90
Percent using public grazing land	1[bcde]	3[acde]	8[abde]	24[abc]	29[abc]
Crops produced (percent of farms):					
Corn	15[bcd]	10[acd]	25[abe]	20[ab]	14[c]
Soybeans	14[bcde]	9[ace]	18[abde]	9[ace]	3[abcd]
Small grains	10[cde]	11[cd]	24[ab]	26[ab]	19[a]
Hay	78	76[c]	81[be]	78	70[c]
Operator:					
Age (years)	60[ce]	61[cde]	58[ab]	58[b]	57[ab]
Age (percent greater than age 65)	38[cde]	40[cde]	32[abe]	30[ab]	22[abc]
Completed college (percent)	23[cde]	26[de]	27[ade]	37[abc]	42[abc]
Off-farm occupation (percent)	47[bcde]	37[acde]	21[abe]	18[ab]	10[abc]
Exit within 5 years (percent)	26[cde]	26[cde]	17[abde]	10[abc]	7[abc]

Notes: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]Largest number of beef cows and heifers that have calved on farm at any time during 2008.

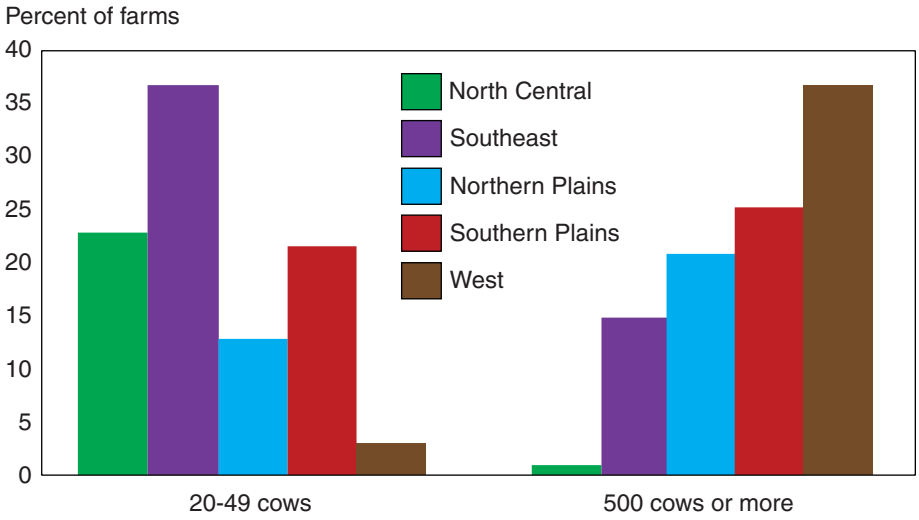
[2]Average of beginning and ending inventories of beef cows and heifers that have calved on farm during 2008.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Figure 7

The smallest and largest beef cow-calf farms by region, 2008

Southeast beef cow-calf farms were most common in the smallest size group, while farms in the West were most common in the largest size group.



Notes: The number of cows refers to the peak number on the operation at any time during 2008.
Source: USDA's Economic Research Service using USDA's 2008 Agricultural Resource Management Survey.

The share of producers planning to exit beef cow-calf production in the next 5 years declined with farm size, from 26 percent of those with less than 100 cows to 7 percent of producers with 500 or more cows. This finding suggests that although beef cow-calf production occurs primarily on small operations, the trend is toward increasingly larger operations. However, the number of small operations may not decline as much as suggested if a significant number of retirees purchase farms and begin raising cattle.

Production Practices and Farm Finances by Size

The largest beef cow-calf farms more often used advanced production technologies and practices than did smaller farms. Use of a defined calving season, artificial insemination, calf implants and/or ionophores, regular veterinary and nutritionist services, rotational grazing, and forage testing increased with size of operation among beef cow-calf producers (table 7). The use of information management technologies, such as onfarm computer records and Internet-based beef cattle information, also increased with size of operation. The largest producers were also most likely to forward purchase inputs and negotiate input prices. Still, the rate of use of many of these practices was below 50 percent even among the largest producers. On many of the largest farms, the cow-calf operation is a secondary enterprise, and this may account for the low rate of adoption and use of high-tech practices.

Table 7

Production practices and financial characteristics of U.S. beef cow-calf farms, by size of operation (at peak), 2008

Item	20-49 cows (a)	50-99 cows (b)	100-249 cows (c)	250-499 cows (d)	500 or more cows (e)
Practices:			*Percent using*		
Defined calving season	55[cde]	57[cde]	73[abe]	78[ab]	82[abc]
Commercial seed stock	15[e]	15[e]	15[e]	17[e]	24[abcd]
Artificial insemination	5[cde]	7[cde]	13[abde]	19[abce]	24[abcd]
Calf implants and/or ionophores	12[cde]	12[cde]	19[abe]	21[abe]	26[abcd]
Regular veterinary services	16[cde]	20[cde]	34[abe]	41[ab]	43[abc]
Nutritionist services	6[bcde]	2[acde]	13[abde]	18[abc]	25[abc]
Rotational grazing	54[bcde]	62[ade]	66[ade]	75[abc]	71[abc]
Tested forage quality	10[bcde]	15[acde]	25[abe]	32[ab]	39[abc]
Individual cow records	41[cd]	44[cd]	55[ab]	58[ab]	50[ab]
Onfarm computer records	12[bcde]	22[acde]	27[abde]	36[abce]	49[abcd]
Internet for cattle information	27[bcde]	34[acde]	45[ade]	46[ace]	48[abcd]
Forward purchase inputs	4[bcde]	6[acde]	12[abde]	22[abce]	38[abcd]
Negotiate input prices	11[bcde]	20[ade]	24[ade]	43[abc]	53[abc]
Farm finances:			*Dollars per farm*		
Gross cash income[1]	60,443[bcde]	76,775[acde]	185,598[abde]	324,910[abce]	883,310[abcd]
-Cattle sales	16,522[bcde]	29,675[acde]	85,831[abde]	180,530[abce]	439,474[abcd]
-Other livestock sales	1,525[cde]	4,773[de]	7,320[ade]	36,082[abc]	56,047[abc]
-Crop sales	32,767[cde]	27,764[cde]	69,577[abe]	74,802[abc]	355,180[abcd]
Cash expenses	46,924[bcde]	66,157[acde]	146,561[abde]	245,539[abce]	689,617[abcd]
-Variable	34,022[bcde]	50,089[acde]	112,460[abde]	189,215[abce]	568,869[abcd]
-Fixed	12,903[bcde]	16,067[acde]	34,101[abde]	56,325[abce]	120,693[abcd]
Net cash farm income	13,519[cde]	10,619[cde]	39,037[abde]	79,370[abce]	193,693[abcd]
Net farm income[2]	11,410[cde]	9,253[cde]	25,508[abde]	55,484[abce]	175,935[abcd]
Off-farm income[3]	71,487[e]	68,301[e]	70,613[e]	78,421[e]	144,619[abcd]

Note: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]In addition to livestock and crops sales, gross cash income includes Government payments and other farm-related income.

[2]Net farm income equals net cash income less depreciation and the value of noncash benefits for hired labor, plus the net value of commodity inventory change and nonmonetary income.

[3]Off-farm income includes farm household earnings from wages and salaries, earnings from another business, interest and dividend income, pensions and other retirement income, and income from other off-farm sources.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Gross cash income ranged from an average of just over $60,000 per farm on the smallest beef cow-calf operations to nearly $900,000 per farm on the largest. Cattle sales accounted for the largest share of gross cash income on farms in all size groups except the smallest. Cattle sales were most important among operations with 250-499 beef cows, accounting for about 56 percent of gross cash income. Nearly 50 percent of gross cash income on the largest operations was from cattle sales (table 7). The expense structure of beef cow-calf farms exhibits economies of size as fixed cash expenses are spread over more units of production on the largest farms. Fixed cash expenses expressed as a share of total cash expenses decline across the size groups, ranging from 38 percent for producers with 20-49 cows to 18 percent for those with 500 or more cows.

Average cash and net farm income on farms with less than 250 cows are at a level that likely requires many farm households to supplement their income from other sources to reach a subsistence level. Off-farm income, averaging around $70,000 per farm, is likely a critical component of household well-being on many of these small farms. Average net farm income was highest for the largest farms, more than three times that of farms with 250-499 beef cows. Households of the largest farms' operators also generated an average off-farm income that was nearly twice that of the other size groups.

A Farm Typology of Beef Cow-Calf Producers

ARMS data indicate that over a third (36 percent) of beef cow-calf producers cite some type of off-farm employment as their main occupation. This share is much higher than that for other types of livestock and crop producers and suggests that cow-calf producers have a diverse set of goals for their farm operations. Genter and Tanka (2002) identified eight clusters, or distinct sets, of cattle and sheep ranchers based on their attributes and attitudes about the farm business. Their study found ranchers to be very heterogeneous, with many placing more value in ranching as a tradition and a place to raise a family than as a profit-generating endeavor.

NAHMS data provide other information about the importance of beef cow-calf production to household income. Only 5 percent of farms with 50 or fewer cows reported that the beef cow-calf operation was a primary source of income (USDA, APHIS, 2008). This percentage increased with size of operation to where 65 percent of operations with 200 or more beef cows regarded the beef cow-calf operation as a primary source of income. Among regions, the West had the highest share (25 percent) of farms that considered the beef cow-calf operation to be a primary income source. Overall, NAHMS data show that only 14 percent of U.S. farms with beef cows regarded beef cow-calf production as a primary source of income.

We divided beef cow-calf producers in ARMS into three groups based on a farm typology that reflects different producer characteristics and goals (Hoppe et al., 2000). The first group is *rural residence farms*, those with annual gross sales below $250,000 and operators who consider farming to be a secondary activity in terms of resources invested in the farm and the amount of income it contributes to the farm household. Rural residence farms comprise three groups: (1) limited resource farms, those with sales less than $100,000, farm assets less than $150,000, and total household income less than $20,000; (2) farms whose operators report that they are retired; and (3) residential lifestyle farms, whose operators report a major occupation off-farm. The second typology group is *intermediate farms*, those with annual sales below $250,000 and operators who report farming as their main occupation. The final group, *commercial farms*, consists of large family farms with annual sales above $250,000 and some nonfamily enterprises organized as cooperatives or nonfamily corporations, and farms with a hired manager.

Farm and Operator Characteristics by Farm Typology

Half of beef cow-calf producers were classified as rural residence farms, and these farms were smaller than other beef cow-calf farms, accounting for about a third of total beef cows (table 8). Only 13 percent of beef cow-calf producers were commercial farms, and these farms accounted for 30 percent of beef cows. Rural residence farms averaged 66 beef cows (at peak), compared with 101 beef cows (at peak) on intermediate farms and 244 beef cows (at peak) on commercials farms. Two-thirds of the calves produced on rural residence farms were sold at weaning, compared with 36 percent on

Table 8

Farm and operator characteristics of U.S. beef cow-calf farms, by farm typology, 2008

Item	Rural residence farms (a)	Intermediate farms (b)	Commercial farms (c)
Percent of farms/beef cows	50/32	38/38	13/30
Beef cows—peak per farm[1]	66[bc]	101[ac]	244[ab]
Beef cows—average per farm[2]	51[bc]	79[ac]	186[ab]
Beef cows calving	57[bc]	88[ac]	211[ab]
Calves weaned	46[bc]	73[ac]	181[ab]
Weaning age (days)	206[bc]	213[a]	215[a]
Weaning weight (lbs)	491[bc]	511[ac]	523[ab]
Percent of calves:			
Sold at weaning	67[bc]	57[ac]	36[ab]
Backgrounded then sold	31[bc]	37[ac]	48[ab]
Retained until slaughter	2[bc]	6[ac]	16[ab]
Total farm production value ($)	31,559[bc]	74,561[ac]	708,462[ab]
Percent from cattle	75[bc]	57[ac]	27[ab]
Acres operated	720[bc]	1,135[ac]	4,217[ab]
Private pasture/range acres	622[bc]	941[ac]	2,832[ab]
Acres per beef cow	9	9[c]	12[b]
Percent using private pasture/range	94[b]	90[ac]	93[a]
Percent using public grazing land	2[bc]	7[ac]	9[ab]
Crops produced (percent of farms)			
Corn	6[bc]	16[ac]	55[ab]
Soybeans	4[bc]	14[ac]	45[ab]
Small grains	6[bc]	17[ac]	39[ab]
Hay	76[c]	79	83[a]
Operator:			
Age (years)	60[bc]	62[ac]	55[ab]
Age (percent greater than age 65)	36[bc]	43[ac]	19[ab]
Completed college (percent)	28[b]	23[a]	27
Off-farm occupation (percent)	71[c]	0	6[a]
Exit within 5 years (percent)	25[c]	24[c]	14[ab]

Notes: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.
[1]Largest number of beef cows and heifers that have calved on farm at any time during 2008.
[2]Average of beginning and ending inventories of beef cows and heifers that have calved on farm during 2008.
Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

commercial farms. Commercial farms were more likely to retain calves for backgrounding (48 percent) and for finishing (16 percent).

The value of farm production and the importance of cattle on the beef cow-calf farms differed greatly among the farm typology groups. Commercial farms generated on average $700,000 of farm product value in 2008, compared with about $75,000 on intermediate farms and $32,000 on rural residence farms. Cattle accounted for 27 percent of the production value on commercial farms, compared with 57 percent on intermediate farms and 75 percent on rural residence farms. The high share of acres in pasture and range land, the high share of farms producing hay, and the low share of farms

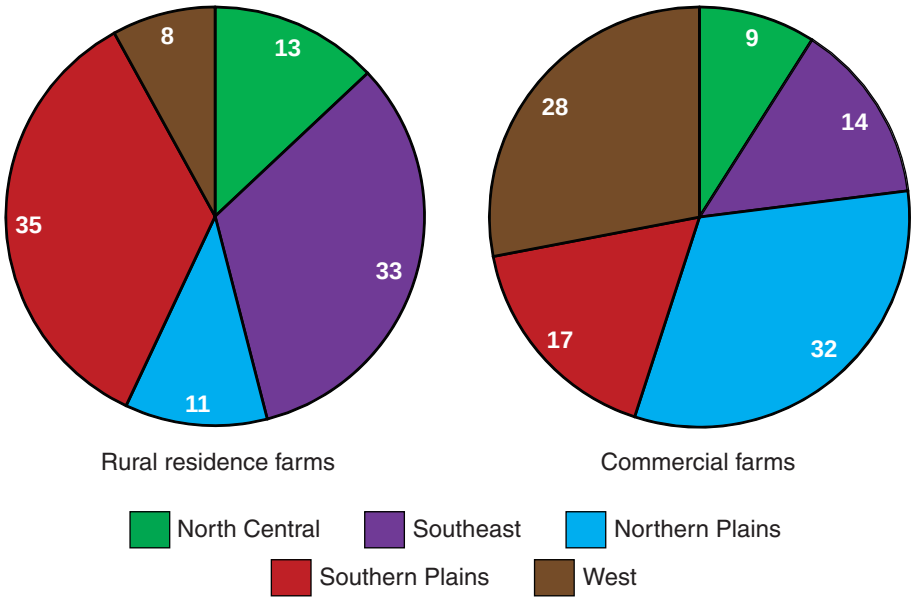
engaged in field crop production is also indicative that intermediate and rural residence farms were much more specialized in cattle production than were commercial farms. Cattle was a secondary enterprise on most commercial farms, as fewer acres were in pasture and range land, and many of these farms produced corn, soybeans, and small grains crops.

Among beef cow-calf operations, shares of rural residence and commercial farms varied by region. Nearly 70 percent of rural residence farms were located in the Southeast and Southern Plains, with each region accounting for about a third (fig. 8). In contrast, 60 percent of commercial beef cow-calf farms were located in the Northern Plains and West regions. Operator characteristics of beef cow-calf farms also varied significantly by farm typology. Operators of rural residence and intermediate farms, on average, were 5-7 years older than operators of commercial farms, and more were over age 65. Thirty-six percent of rural residence farm operators and 43 percent of intermediate farm operators were over age 65, compared with only 19 percent of commercial farm operators. By definition, more rural residence farm operators (71 percent) had a major occupation off-farm than operators of other farms. Also, about a quarter of rural residence and intermediate farm operators expected to exit cow-calf production in the next 5 years, compared with 14 percent of commercial farm operators.

Figure 8

Rural residence and commercial beef cow-calf farms by region, 2008

Southeast and Southern Plains beef cow-calf farms accounted for nearly 70 percent of rural residence farms, while most commercial farms were in the Northern Plains and West.



Source: USDA's Economic Research Service using USDA's 2008 Agricultural Resource Management Survey.

Production Practices and Farm Finances by Farm Typology

Commercial beef cow-calf farms were more likely than other farm types to use advanced technologies and practices, such as a defined calving season, calf implants and/or ionophores, veterinary and nutritionist services, and forage quality testing (table 9). Commercial farms were also more likely to use information management technologies, such as onfarm computer records and the Internet, and input purchasing practices, such as forward purchasing and negotiating discounts (see glossary).

The average gross cash income in 2008 on commercial farms was over $600,000, compared with $77,000 on intermediate farms and $34,000 on rural residence farms. The composition of gross cash income on farms in each typology group reflects their relative specialization. Most of gross cash income on rural residence and intermediate farms was from cattle, while commercial farms generated most of gross cash income from crops. Net cash and net farm incomes in 2008 were about $174,000 and $136,000, respectively, on commercial farms. In contrast, intermediate farms earned about $11,000 and $7,000 in net cash and net farm income.

Average net cash and farm incomes were negative in 2008 on rural residence beef cow-calf farms. Operators of rural residence farms often have goals other than profitability, as most work off-farm or are retired, and farming may be regarded as a lifestyle choice. Off-farm earnings on rural residence farms averaged nearly $90,000 per farm in 2008. In contrast, running a profitable enterprise is important to operators of commercial farms, where net farm income was significantly higher than off-farm income. Operators of intermediate farms, by definition, cite farming as their main occupation. Low farm income and relatively low off-farm income on these farms suggest that they are more vulnerable to changing economic conditions.

Table 9

Production practices and financial characteristics of U.S. beef cow-calf farms, by farm typology, 2008

Item	Rural residence farms (a)	Intermediate farms (b)	Commercial farms (c)
Practices:		*Percent using*	
Defined calving season	52[bc]	77[ac]	81[ab]
Commercial seed stock	14[c]	14[c]	19[ab]
Artificial insemination	1	3	2
Calf implants and/or ionophores	10[c]	13[c]	33[ab]
Regular veterinary services	18[bc]	25[ac]	35[ab]
Nutritionist services	4[bc]	8[ac]	18[ab]
Rotational grazing	60	52	59
Tested forage quality	13[bc]	16[ac]	31[ab]
Individual cow records	44[c]	47	51[a]
Onfarm computer records	20[c]	18[c]	29[ab]
Internet for cattle information	32[c]	33[c]	51[ab]
Forward purchase inputs	7[c]	7[c]	17[ab]
Negotiate input prices	14[bc]	21[ac]	33[ab]
Farm finances:		*Dollars per farm*	
Gross cash income[1]	33,677[bc]	77,165[ac]	602,849[ab]
-Cattle sales	23,720[bc]	42,202[ac]	191,789[ab]
-Other livestock sales	729[bc]	1,299[ac]	45,186[ab]
-Crop sales	4,618[bc]	18,493[ac]	305,683[ab]
Cash expenses	36,212[bc]	66,142[ac]	428,210[ab]
-Variable	26,738[bc]	49,555[ac]	335,106[ab]
-Fixed	9,474[bc]	16,587[ac]	93,104[ab]
Net cash farm income	-2,535[bc]	11,023[ac]	174,639[ab]
Net farm income[2]	-803[bc]	6,669[ac]	136,014[ab]
Off-farm income[3]	89,929[bc]	53,571[a]	53,991[a]

Notes: The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]In addition to livestock and crops sales, gross cash income includes Government payments and other farm-related income.

[2]Net farm income equals net cash income less depreciation and the value of noncash benefits for hired labor, plus the net value of commodity inventory change and nonmonetary income.

[3]Off-farm income includes farm household earnings from wages and salaries, earnings from another business, interest and dividend income, pensions and other retirement income, and income from other off-farm sources.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Beef Cow-Calf Production and the National Animal Identification System

Historically, U.S. beef cattle producers have had three primary motives for establishing a traceability system for live animals: (1) protect property from theft or loss, (2) control the spread of animal diseases, and (3) provide proof of credence attributes that add product value (Golan et al., 2004). During the past 20 years, however, protecting consumer confidence in beef products has emerged as an additional motive. This led to a series of plans that resulted in the implementation of the National Animal Identification System (NAIS) in 2004 (see box, "Evolution of the National Animal Identification System").

Evolution of the National Animal Identification System

The importance of having an animal identification system was highlighted during 1986-88 when bovine spongiform encephalopathy (BSE), or mad cow disease—a fatal neurological disease—was identified in cattle herds of the United Kingdom. Subsequent testing found BSE to be widespread among the UK cattle population, resulting in the slaughter of 3.7 million head. In 1997, an outbreak of foot-and-mouth disease in swine in Taiwan caused $6.9 billion in losses and eradication costs, including the slaughter of 3.8 million pigs, and decimated Taiwan's previously strong pork export market (Schnepf, 2010). In May 2003, Canadian officials announced that a single cow from a farm in Alberta was diagnosed as having BSE. All beef and cattle exports from Canada immediately stopped, devastating the Canadian beef industry, where approximately half of annual production is exported (Lawrence et al., 2003).

To ensure confidence in the U.S. beef supply, among the initiatives USDA announced was the acceleration of a verifiable national animal identification system. The U.S. Animal Identification Plan (USAIP) called for the establishment of individual premises identification by the summer of 2004, individual animal identification by 2005, and full implementation and compliance (all covered species and their movements—both interstate and intrastate) by July 2006 (Schnepf, 2010). The USAIP evolved into the National Animal Identification System (NAIS), retaining most of its essential elements.

Participation in the NAIS was originally planned to be mandatory, but in response to various concerns raised by livestock producers and small farmers, USDA announced in August 2006 that the NAIS would be entirely voluntary at the Federal level. During 2006-09, USDA released a series of draft reports that developed the framework of the NAIS. In 2009, the U.S. Secretary of Agriculture undertook a series of listening sessions with stakeholders from around the country to gather feedback and help shape decisions about the future direction of animal identification and traceability in the United States. In February 2010, USDA announced substantial revisions in its approach to achieving a national capacity for animal disease traceability. The NAIS was replaced with a new approach that allows individual States (and tribal nations) to choose their own degree of within-State animal identification and traceability of livestock. USDA did require that all animals moving in interstate commerce have a form of identification that allows traceability back to the originating State (Schnepf, 2010).

The foundation of the NAIS and the first step for producer participation was premises registration. To register a premises, producers contacted the appropriate State (e.g., State Veterinarian's office) or tribal authority and provided contact information for the premises and minimal information about the livestock operation (USDA, APHIS, 2007). Producers who provided premises information were to be notified quickly when a disease event might affect their area or animal species. The intention of premises registration was to enable animal health officials to quickly locate at-risk animals and take actions to address emergency situations, minimize hardships, and speed disease eradication efforts.

After registering a premises, a producer could participate in the animal identification component of the NAIS. Animals of the same species that typically move through the production chain as a group could be identified by a group or lot identification number (GIN), determined by the animal owner using the premises identification number and the date the group was assembled. Animals that move through the chain individually had to be identified with a USDA-recognized animal identification number (AIN) tag or device. Once producers identified their animals, they could choose to report animal records to an animal tracking device (ATD) of their choice (USDA, APHIS, 2007).

In contrast to other U.S. livestock sectors, there was resistance to the NAIS among some beef cow-calf producers. A study of beef cow-calf producer preferences for voluntary traceability systems found that producers are sensitive to cost, the managing entity, and information requirements of the system (Schulz and Tonsor, 2010). Costs of the NAIS could be significant for small operations because beef cattle have to be individually identified. A USDA study of NAIS costs for full traceability reported that cattle industry costs represented 91.5 percent of the total annual costs of the NAIS for the primary food animal species (cattle, sheep, swine, and poultry). The study estimated the total cost of the NAIS for cattle producers in aggregate as $175.9 million annually at a 90-percent participation level (USDA, APHIS, 2009).

The USDA study also estimated costs of full traceability for the beef cow-calf sector by size of operation and separately for those who currently tag animals and those that do not. Economies of size were found to exist for full participation in the NAIS, as costs ranged from $2.48 per cow for the largest operations (5,000 or more cows) currently tagging cattle to $6.16 per cow for the smallest operations (1-49 cows) not currently tagging cattle.[9] Most economies of size were captured by operations with 50-99 cows, compared with those with fewer cows. For example, among operations currently tagging, costs declined $1.82 per cow between the 1-49 and the 50-99 cow groups and only an additional $0.82 between the 50-99 and 5,000 or more cow groups. However, the high costs faced by the smallest operations would affect most U.S. cow-calf producers, as nearly 80 percent have fewer than 50 cows.

[9]Tags and tagging costs reflect the costs of official identification devices and the application of these devices to the cattle. It was assumed that RFID (radio frequency) eartags would be used for the identification of all cattle.

Familiarity and Registration With the NAIS

Beef cow-calf producers surveyed in ARMS were asked if they were familiar with NAIS, and if so, were their premises registered with the NAIS.[10] Producers were classified into one of three groups: (1) those not familiar with NAIS, (2) those familiar, but not registered with NAIS, and (3) those regis-

[10]The survey questions were: Are you familiar with the National Animal Identification System? If yes; Are your premises registered with the NAIS?

tered with NAIS. Among beef cow-calf producers, 24 percent reported not being familiar with NAIS, 52 percent were familiar but had not registered their premises with NAIS, and 24 percent had registered their premises with NAIS (table 10). This compares with the 16 percent of beef cow-calf operations that had a unique premises registration found in the 2007 NAHMS study (USDA, APHIS, 2008).[11]

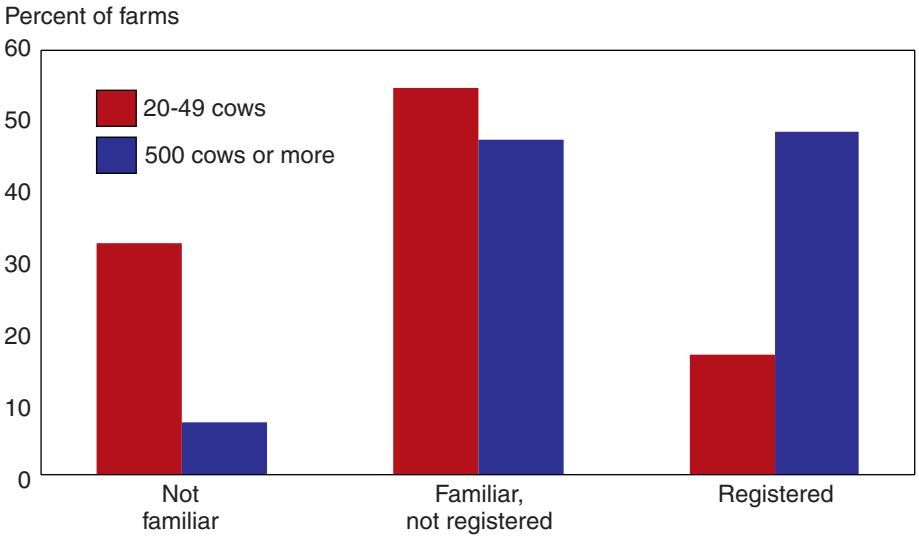
There was an association between familiarity and registration with NAIS and size of cow-calf operation. The 24 percent of farms registered with NAIS accounted for a third of beef cows, while the 24 percent not familiar with NAIS accounted for only 16 percent. Operations registered with NAIS had an average of 140 beef cows (at peak), double the average size of those not familiar with NAIS. Nearly a third of cow-calf operations with 20-49 beef cows were not familiar with the NAIS, and only 16 percent of these small operations were registered. In contrast, only 7 percent of operations with 500 or more cows were not familiar with NAIS, and nearly half of these farms were registered (fig. 9).

NAIS registration was associated with location, as registration rates were below 20 percent in many Southeast States (e.g., AL, GA, MS, FL, and KY) but above 40 percent in States in the West (e.g., CA and CO). Differences in farm operator characteristics were also significant among the groups. Cow-calf producers not familiar with NAIS were 5 years older, on average, than other producers, and nearly half were over age 65 (table 10). Producers registered with NAIS were more educated than other producers, as a third had graduated from college, compared with 17 percent not familiar with NAIS and 27 percent familiar but not registered. Also, a higher percentage of cow-calf producers not familiar with NAIS planned to exit the beef cow-calf business within 5 years.

Figure 9

NAIS familiarity and registration by size, 2008

Only 16 percent of beef cow-calf producers with 20-49 cows were registered with the NAIS, compared with nearly half of those with 500 cows or more.



NAIS = National Animal Identification System.
Source: USDA, Economic Research Service using USDA's 2008 Agricultural Resource Management Survey.

[11]Part of this difference is due to NAHMS targeting operations with any beef cows, while farms in ARMS had to have at least 20 cows. NAIS registration is lowest among the smallest operations. NAHMS indicates that only 11.7 percent of beef cow-calf operations with less than 50 cows were registered with NAIS (USDA, APHIS, 2008).

Table 10

Farm and operator characteristics of U.S. beef cow-calf operations, by producer familiarity and registration with the NAIS, 2008

Item	Not familiar (a)	Familiar, not registered (b)	Registered (c)
Percent of farms/beef cows	24/16	52/50	24/32
Beef cows—peak per farm[1]	70[bc]	98[ac]	140[ab]
Beef cows—average per farm[2]	56[bc]	77[ac]	106[ab]
Beef cows calving	62[bc]	85[ac]	120[ab]
Calves weaned	51[bc]	71[ac]	101[ab]
Weaning age (days)	209	211	208
Weaning weight (lbs)	486[bc]	504[ac]	515[ab]
Percent of calves:			
Sold at weaning	62[c]	61[c]	52[ab]
Backgrounded then sold	34[c]	34[c]	41[ab]
Retained until slaughter	4[c]	5[c]	7[ab]
Total farm production value ($)	84,178[bc]	130,391[ac]	185,446[ab]
Percent from cattle	34	39	41
Acres operated	759[bc]	1,242[ac]	1,824[ab]
Private pasture/range acres	565[bc]	962[ac]	1,391[ab]
Acres per beef cow	8[c]	10	10[a]
Percent using private pasture/range	91	94[c]	91[b]
Percent using public grazing land	4	5	5
Crops produced (percent of farms)			
Hay	76	79	79
Small grains	12	14	16
Location (percent of farms):			
North Central	14	18[c]	14[b]
Southeast	37[bc]	30[a]	30[a]
Northern Plains	14	17	17
Southern Plains	29	26	29
West	7[bc]	9[a]	10[a]
Operator:			
Age (years)	63[bc]	59[a]	58[a]
Age (percent greater than age 65)	47[bc]	34[a]	32[a]
Off-farm occupation (percent)	39	36	34
Completed college (percent)	17[bc]	27[ac]	33[ab]
Exit within 5 years (percent)	31[bc]	21[a]	20[a]

Notes: NAIS = National Animal Identification System. The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]Largest number of beef cows and heifers that have calved on farm at any time during 2008.

[2]Average of beginning and ending inventories of beef cows and heifers that have calved on farm during 2008.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Table 11

Production practices and financial characteristics of U.S. beef cow-calf operations, by producer familiarity and registration with the NAIS, 2008

Item	Not familiar (a)	Familiar, not registered (b)	Registered (c)
Practices:		*Percent using*	
Defined calving season	50[bc]	63[ac]	70[ab]
Commercial seed stock	12	16	16
Artificial insemination	2[bc]	8[ac]	16[ab]
Calf implants and/or ionophores	12[c]	12[c]	22[ab]
Regular veterinary services	17[bc]	21[ac]	32[ab]
Nutritionist services	3[bc]	7[ac]	12[ab]
Rotational grazing	54[bc]	62[a]	65[a]
Tested forage quality	8[bc]	17[ac]	24[ab]
Individual cow records	31[bc]	46[ac]	63[ab]
Onfarm computer records	10[bc]	20[ac]	32[ab]
Internet for cattle information	18[bc]	35[ac]	51[ab]
Forward purchase inputs	5[bc]	7[ac]	14[ab]
Negotiate input prices	12[bc]	19[ac]	27[ab]
Farm finances:		*Dollars per farm*	
Gross cash income[1]	70,356[bc]	116,965[ac]	180,276[ab]
-Cattle sales	28,385[bc]	50,602[ac]	76,493[ab]
-Livestock sales	1,712[bc]	4,702[ac]	14,466[ab]
-Crop sales	28,993[bc]	44,925[ac]	72,594[ab]
Cash expenses	59,222[bc]	90,885[ac]	143,872[ab]
-Variable	43,977[bc]	68,569[ac]	113,447[ab]
-Fixed	15,245[bc]	22,315[ac]	30,425[ab]
Net cash farm income	11,134[bc]	26,081[ac]	36,404[ab]
Net farm income[2]	7,517[bc]	20,407[a]	28,772[a]
Off-farm income[3]	66,607	73,104	72,648

Notes: NAIS = National Animal Identification System. The superscripts refer to the results of statistical tests of differences between item means in each column. All tests are expressed at a 95-percent level of confidence. A lettered superscript denotes that the item mean reported in a column is significantly different from that in the superscript column. The tests were conducted using a jackknife variance estimator with 15 replicates provided with the ARMS data.

[1]In addition to livestock and crops sales, gross cash income includes Government payments and other farm-related income.

[2]Net farm income equals net cash income less depreciation and the value of noncash benefits for hired labor, plus the net value of commodity inventory change and nonmonetary income.

[3]Off-farm income includes farm household earnings from wages and salaries, earnings from another business, interest and dividend income, pensions and other retirement income, and income from other off-farm sources.

Source: USDA, Economic Research Service using data from USDA's 2008 Agricultural Resource Management Survey (ARMS).

Cow-calf producers registered with NAIS were more likely to use advanced technologies and practices than other producers. Those registered were more likely to have a defined calving season, artificially inseminate cows, use growth-promoting implants and/or ionophores, use regular veterinary and nutritionist services, and manage forage quality by rotational grazing and forage testing (table 11). Differences in the use of information technologies were also significant among beef cow-calf producers in each group. More than 60 percent of those registered in the NAIS kept individual cow records, 30 percent kept onfarm computer records for beef cattle, and about half used the Internet to obtain beef cattle information, all much higher usage rates than among other cow-calf producers. More than 80 percent of beef cow-calf

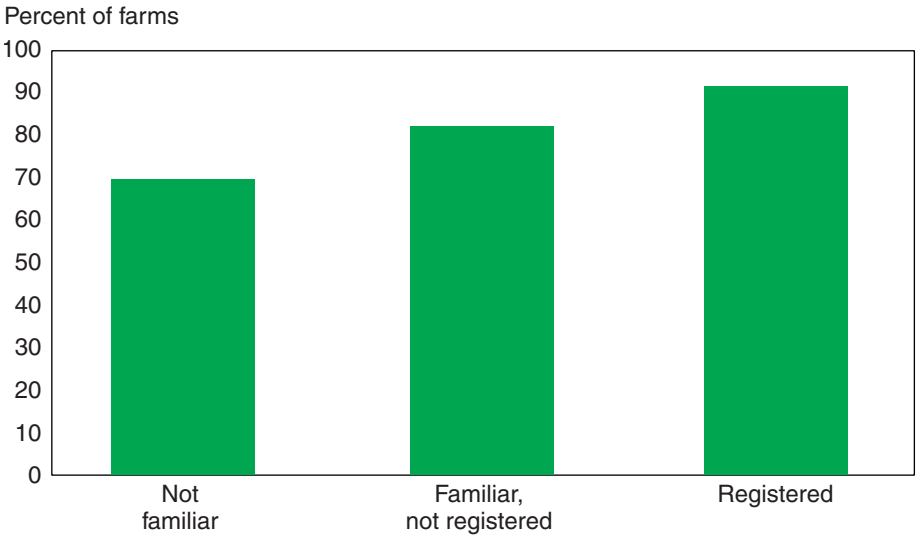
producers used some method for identifying cattle, including more than 90 percent of those with premises registered with NAIS and nearly 70 percent of those not familiar with NAIS (fig. 10). Visual ear tagging and branding were the most common methods used to identify beef cattle.

The average income per farm of cow-calf producers registered with NAIS was much higher than those of other cow-calf producers. Net cash farm income and net farm income were more than three times higher than for those not familiar with NAIS and $8,000-$10,000 more than that for those familiar with but not registered (table 11). Off-farm incomes were similar among the groups, from about $67,000 to $73,000, all much higher than net farm income.

Figure 10

Use of cattle ID by NAIS familiarity and registration, 2008

Most beef cow-calf producers used some type of cattle ID (e.g., ear tagging, branding) regardless of NAIS participation.



NAIS = National Animal Identification System.
Source: USDA, Economic Research Service, using USDA's 2008 Agricultural Resource Management Survey.

Conclusions

Analysis of 2008 ARMS data reveals a commercial beef cow-calf industry in the United States that is diverse in type, size, location, and characteristics of farm operators. About half of beef cow-calf farms produce calves that are sold at or shortly after weaning. These are usually small farms, and most are located in the Southeast and Southern Plains. Many of these farm households rely on off-farm income to supplement a low level of farm income. Most of the other beef cow-calf farms retain ownership of calves after weaning and continue grazing, or backgrounding, the calves, from 30 to 90 days before selling the calves to feedlots. These farms are generally larger, have more beef cows, and are distributed throughout the United States, with many in the Northern Plains and West regions. A small percentage of beef cow-calf producers retain ownership of the calves after weaning until the animals reach slaughter weight. These operations are primarily located in areas where corn is produced for livestock feed, such as the North Central and Northern Plains.

The majority of U.S. beef cows are located in the South, including the Southern Plains (primarily Texas) and the Southeast. These regions have the advantage of a longer grazing season, meaning that less supplemental forage is usually required to support beef cattle during the winter, resulting in lower feed costs. Despite higher feed costs in the Northern Plains, large beef cow-calf producers in this region have been able to compete with those in the South due to efficient production methods and economies of size.

Economies of size in beef cow-calf production suggest that farms have an incentive to become larger. However, land area required for large-scale beef cow-calf production makes it difficult for beef cow-calf producers to take advantage of economies of size. In most areas of the United States, beef cow-calf production is the residual user of land. As the opportunity cost of pasture and range lands increases for such uses as crop production or recreational activities, the size of beef cow-calf operations may be limited or fragmented into smaller units.

Unlike farms in other livestock industries, most farms with beef cows do not specialize in beef cow-calf production. For example, on hog and dairy farms, the average share of farm product value from hog and milk production is more than 70 and 80 percent, respectively (McBride and Key, 2007; Short, 2001). On farms with beef cows, less than 40 percent of farm product value stems from cattle production.[12] The degree of specialization in beef cow-calf production varies significantly by region. About two-thirds or more of farm product value on farms in the Southern Plains and West regions was from cattle production, compared with less than 40 percent of farms in other regions. Size of operation as measured by the number of beef cows did not necessarily indicate specialization in beef cow-calf production. Operations with 250-499 beef cows earned 60 percent of farm product value from cattle; the share dropped to less than 50 percent for operations with 500 or more cows.

Beef cow-calf operations also differed significantly from other livestock operations in the extent to which farm operators have a primary occupation off-farm. More than a third of beef cow-calf farm operators worked off-farm, and half of the farms were classified as rural residence-farms. Less than

[12]Part of the farm product value was from the production of harvested forages that were fed to cattle. The value of these forages was not counted as part of the value of beef cow-calf production.

10 percent of hog and dairy farms are classified as rural residence farms (McBride and Key, 2007; Short, 2001). These rural residence farms were small operations that specialized in beef cow-calf production (75 percent of farm product value from cattle), but off-farm income was their primary household income source.

Commercial farms, those with annual sales of at least $250,000, with beef cow-calf enterprises were mostly diversified operations on which beef cattle was a secondary enterprise, accounting for about a fourth of farm product value. Intermediate farms, those with annual farm sales less than $250,000 and with operators whose main occupation is farming, depended more on the beef cattle enterprise as a farm income source, with more than half of farm product value coming from cattle. The low levels of net cash and net farm income generated by these intermediate farms in 2008 suggest that farms in this group are among the most financially vulnerable to the input and output price variations of beef cattle production.

In 2008, more than 80 percent of beef cow-calf producers had some type of animal identification system in place, such as branding or ear tagging. But, nearly a quarter of beef cow-calf producers with 20 or more cows reported a lack of familiarity with the NAIS, and only about a quarter had their premises registered with the system. This lack of participation among the nearly 765,000 U.S. beef cow-calf producers appears to be related to concerns about liability and costs associated with the program. Since beef cow-calf production is a secondary farm enterprise and a secondary household income source for most farms with beef cows, there may be little incentive for these farms to risk any perceived liability or to incur program participation costs. This creates a challenge for Federal or State efforts to enhance traceability through animal identification on beef cow-calf farms.

Glossary

Artificial insemination is the process by which sperm is placed in the reproductive tract of a beef cow or heifer for the purpose of impregnating the cow or heifer by means other than natural service from a bull.

Backgrounding is an intermediate stage sometimes used in beef cattle production that begins after weaning calves and ends when calves are placed in a feedlot to be fed to a slaughter weight. Feeding during the backgrounding phase relies more heavily on forages (e.g., pasture, hay, crop residues) in combination with grains to increase a calf's weight by several hundred pounds before it enters a feedlot (see stocker calves). Backgrounding is often conducted on farms where calves are born, but some farms specialize in backgrounding cattle.

Beef cow-calf farms are represented by those selected in a targeted sample of beef cow-calf farms as part of USDA's 2008 Agricultural Resource Management Survey. Beef cow-calf farms are defined as farms that had a beef cow inventory of 20 or more head on the acres operated at any time during 2008. This excludes a large portion of farms with beef cows but covers most of the beef cows.

Commercial seed stock producers are cattle producers who specialize in the production and sale of high-quality breeding animals.

Defined calving season refers to a period, or season, each year during which beef cows are bred to calve. In northern areas of the United States, cows are most often bred to calve during the late winter or early spring to minimize calf loss due to severe winter weather. Some producers prefer fall calving so that calves will be old enough to take advantage of grazing on spring pastures. Year-round calving, or the lack of a calving season, is defined in the National Animal Health Monitoring System as the failure to remove a bull from the herd for at least 30 days (USDA, APHIS, 2010b).

Economies of size is a concept that the average cost of production per unit declines as the number of units produced increases. If so, large operations are able to take advantage of economies of size.

Farm operator refers to the principal operator—the one most responsible for making the day-to-day decisions and running the farm operation.

Farm typology is a farm classification that categorizes farms according to a measure of size, operators' expectations from farming, stage in the life cycle, and dependence on agriculture. The farm typology measure used in this report is:

> **Rural residence farms** are those with annual gross sales below $250,000, including: (1) farms with sales less than $100,000, farm assets less than $150,000, and total household income less than $20,000 per year (limited resource farms); (2) farms whose operators report that they are retired (retirement farms); and (3) farms whose operators report a major occupation off-farm (residential lifestyle farms).

Intermediate farms are those with annual sales below $250,000 and whose operators report farming as their major occupation.

Commercial farms consist of large family farms with annual sales above $250,000 and some nonfamily enterprises organized as cooperatives or nonfamily corporations, and farms with a hired manager.

Feedlot is a type of animal-feeding operation used for finishing cattle prior to slaughter. Cattle are finished, usually on a combination of forage and predominantly grain, to a slaughter weight of 1,000-1,500 pounds. Beef cow-calf producers may feed cattle in a farm feedlot or retain ownership of their cattle being fed off-farm in a commercial feedlot.

Forage quality testing is used to measure such forage components as dry matter, crude protein, and total digestible nutrients. Information from forage quality tests allows cattle producers to better align feed nutrients with animal requirements.

Growth promoting implants are hormones implanted in the ear of beef calves to be absorbed in the blood stream with the purpose of increasing daily gain and feed efficiency.

Information management technologies are systems or processes that provide the information necessary to manage operations more effectively. Examples used on beef cow-calf farms include individual cow records, onfarm computer records, and beef cattle information accessed from the Internet.

Ionophores are antibiotic-like compounds that are fed to beef calves with the purpose of increasing daily grain and feed efficiency.

Net cash farm income is gross cash income less cash expenses. This indicates the cash earnings realized within a calendar year from the sales of farm production and the conversion of assets, both inventories and capital consumption, into cash. Net cash income is a solvency measure representing the funds that are available to farm operators to meet family living expenses and make debt payments (USDA, ERS, 2010c).

Net farm income is net cash farm income less charges for depreciation and the value of noncash benefits for hired labor, plus the value of commodity inventory changes and nonmonetary income. Net farm income is a value of production measure, indicating the farm operators' share of the net value added to the national economy within a calendar year, independent of whether it is received in cash or a noncash form such as increases or decreases in inventories and imputed rental for the farm operator's dwelling (USDA, ERS, 2010c).

Off-farm income is the portion of farm household income derived from off-farm businesses, wages and salaries, interest and dividends, and other sources. Dividends earned by the household are from investments in equities such as stocks or mutual funds. Other sources of off-farm income include pensions, annuities, military, retirement, unemployment, Social Security, veterans' benefits, other public retirement and public assistance programs,

and rental income from nonfarm properties (Mishra et al., 2002). Off-farm income can be generated by the farm operator, the spouse, and/or other members of the farm household.

Operating costs of beef cow-calf production are the costs for purchased input items that are consumed during one production period. These are feed; cattle purchased for backgrounding; veterinary services; marketing; custom services and supplies; fuel, lubrication, and electricity; repairs; hired labor; and operating capital.

Ownership costs of beef cow-calf production are the costs associated with the ownership of depreciable assets, such as farm tractors, beef cows, and cattle-handling facilities. These are depreciation, interest, property taxes, and insurance.

Primary occupation is the occupation, farming or otherwise, in which farm operators of beef cow-calf operations spend the majority of their time.

Private pasture/range refers to pasture or range land that is owned or rented by the farm in order to graze beef cattle.

Producer classification is a designation given to farms according to which phases of beef cattle production are conducted on the farm:

> **Cow-calf only** producers sell all calves at or around weaning.
>
> **Cow-calf/stocker** producers retain calves after weaning and background the calves until they are sold to a feedlot.
>
> **Cow-calf/feedlot** producers retain calves after weaning and finish all or part of the calves in a feedlot until they are sold as slaughter cattle.

Public grazing land refers to land that is owned by the public sector and managed by Federal, State, or tribal governments. Public grazing land is primarily in large tracts in Western States and is allocated for the use of grazing cattle by ranchers. Fees collected from ranchers for raising cattle on public grazing lands offset costs of range improvements.

Rotational grazing involves dividing the pasture or range into parcels and grazing each in sequence throughout the grazing period. Utilizing rotational grazing can improve livestock distribution while incorporating a rest period for new forage growth.

Stocker calves are young growing animals raised on pasture with very little other feed, with the intention of increasing animal weight and maturity before placing the calves in a feedlot (see backgrounding).

Total economic costs of beef cow-calf production are the full costs of all resources engaged in the beef cow-calf enterprise. These include operating plus ownership costs, opportunity costs for unpaid labor and land, and general farm overhead costs.

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