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Characteristics and Production Costs of U.S. Cow-Calf Operations

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In this report...Differences in regional conditions were the chief influence on variations in cow-calf production costs across the United States. Cow-calf operators in the West and Southern Plains have significant cost advantages over operators in other regions because, with a longer grazing season, their herds require less supplemental forage during the winter. The larger acreage size of operations in the West and Southern Plains also can support more cows and take advantage of economies of scale (spreading the fixed investment over more units of production). Because of the harsher climate, operations in the North Central region and Northern Plains spend significantly more to maintain their herds. Cowherds in the Southeast are primarily on small and part-time operations. These findings are based on the 1996 Agricultural Resource Management Study (ARMS), the most recent national survey of cow-calf producers.

Keywords: Cow-calf, operation characteristics, production practices, costs of production, cost variation.

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Beef cow-calf production is relatively widespread and economically important in most of the United States. According to the *1997 Census of Agriculture*, about a million farms had inventories of cattle and calves that generated \$40.5 billion in sales, accounted for 21 percent of the total market value of agricultural products sold in the United States, and ranked first in sales among all commodities.

Four dominant cattle-raising systems have been identified in the United States—the cow-calf feeder, cow-calf-slaughter, stocker purchase-slaughter sales, and stocker purchase-feeder sales systems (Boykin et al.). In the commercial cow-calf feeder system, animals are sold at weaning, shortly thereafter, or when they are a year old (i.e., yearlings). Because profit is related to fluctuating forage supplies and cattle prices, beef cow systems may be modified. Although lightweight calves may be sold following weaning, if forage is available, they may be carried longer and into a stocker phase. Operators can sell calves at lighter weights to stocker or feedlot operators who graze them briefly on pasture and crop residue before placing them in feedlots. Other operators carry calves to the yearling stage, expecting weight gains and possible price increases. According to survey results, about 70 percent of U.S. operations follow the cow-calf feeder system of cattle raising (Boykin et al.).

Production costs and feeder cattle prices are major profit factors of cow-calf production. Feeder cattle prices are affected by prices paid for fed cattle which, in turn, are affected by consumer demand for beef as reflected in retail beef prices. Actions on the part of cow-calf producers to increase (decrease) production in response to high (low) beef prices are slow in taking effect and are likely to intensify the perceived need for change during the interim, promoting overreaction (Gilliam). This helps to explain the periodic swings in beef cattle numbers, a phenomenon called the cattle cycle.

Because cattle are routinely transported, changes in cattle prices tend to be similar around the country (Gilliam). By contrast, changes in annual costs of production are more variable,

particularly because of differences in the cost of providing forage for grazing, the principal feed source in cow-calf production. For example, cropland pasture constitutes more than 25 percent of the total area grazed in the eastern half of the United States, compared with less than 2 percent in the western half. Cropland pasture is usually fertilized regularly and tilled periodically to prepare for reseeding (Gilliam). Thus, petroleum price increases have a greater impact on costs of grazing resources in the eastern half of the Nation than in the western half.

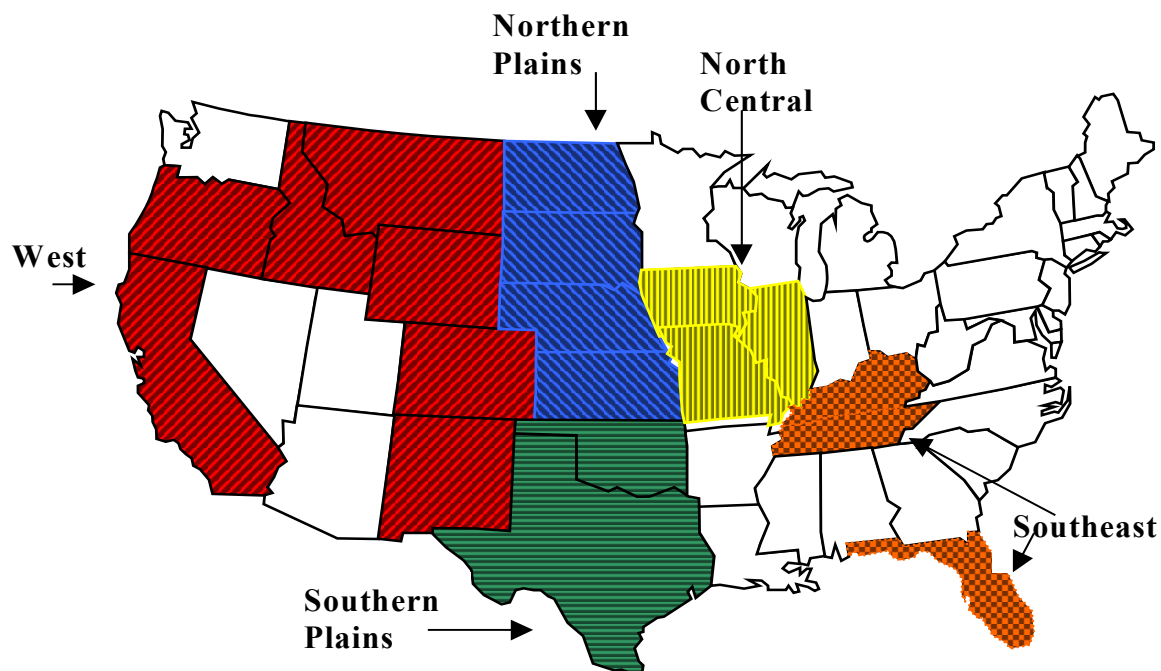
Costs of producing or purchasing feed frequently account for more than half of the total direct cost in cow-calf production. Types and costs of feed used in cow-calf production are quite variable, however, because of the broad range of materials containing cellulose, which cows can easily digest. Cow-calf herds are grazed not only on pasture and range acreage, but also on land used primarily for other purposes. Crop residues are frequently grazed for limited periods following harvest of corn, grain sorghum, soybeans, small grains, hay, etc.

Although beef cows are kept on pasture or range throughout the year in much of the Nation, few producers depend on grazing alone to furnish a year-round supply of forage for their cattle. In parts of the country, snow cover prevents grazing occasionally during the winter; and in other parts, growth or nutritive content of pasture and range plants varies during the year due to plant dormancy and temperature or moisture fluctuations. Grazing during these nonproductive periods would require too much area per cow to be economically feasible (Gilliam). Thus, most producers feed their cows some harvested forage almost every year.

Operation characteristics and production costs of operations are compared using the cow-calf feeder system. Operations are grouped according to regions ([fig. 1](#)), enterprise size, production costs, and farm typology ([glossary](#)). Data are obtained from the 1996 Agricultural Resource Management Study (ARMS) of U.S. cow-calf operations. Only cattle operations producing 10 or more weaned calves were

Figure 1 Regions

The larger acreage size of cow-calf operations in the West and Southern Plains allows operations there to support more cows and take advantage of economies of scale.



surveyed in the ARMS. To isolate resources used in the cow-calf feeder system, costs associated with cattle finishing were excluded in the ARMS data and operations purchasing calves for backgrounding were deleted from the analysis. Of the respondents to the 1996 ARMS, 1,151 reported using the cow-calf feeder system of cattle raising. The ARMS uses a multiframe stratified sample in which each operation surveyed represents a number of similar

operations. These operations represented 296,759 operations and a beef cow inventory of 22 million head (80 percent of the number of farms in the 1997 *Census of Agriculture* classified as beef cattle ranching and farming with 10 or more beef cows not fattening cow/calves on grain and concentrates, and 95 percent of the beef cow inventory on these same farms).

Operating plus ownership costs are used in the analysis of production costs. These costs indicate the cow-calf operation's ability to meet short-term debt obligations and to replace capital assets as needed, and thus stay in business.

Operating costs include major inputs such as feed, veterinary and medicine, bedding and litter, marketing, customs operations, fuel, lube, electricity, repairs, and interest on operating inputs. Ownership costs include the annualized cost of maintaining the capital investment (depreciation and interest) in cow-calf facilities and equipment, and costs for non-real-estate property taxes and insurance.

The cost of purchased feed items, veterinary and medicine, bedding and litter, marketing, and custom operations are developed by summarizing survey responses about the total amount paid for these inputs. Fuel, lube, electricity, and repair costs are estimated using a combination of survey information and engineering formulas. Detailed information is collected regarding the machinery, buildings, and equipment used in production. The data include hours of use, age, type, and size of machinery, buildings, and equipment items. Engineering formulas are modified periodically to reflect technological change. The interest on operating inputs is the opportunity cost of the investment in total operating inputs during the year.

Capital recovery is an estimate of the annual capital expenditure necessary to replace machinery over its assumed ownership period and includes an interest charge on unrecovered capital. Non-real-estate taxes and insurance for the whole operation are allocated to the cow-calf enterprise according to the gross margin of cow-calf production relative to other farm enterprises. All capital costs are computed using methods recommended by the American Agricultural Economics Association (AAEA) Task Force on Commodity Costs and Returns (AAEA Handbook).

Official U.S. Department of Agriculture cost of production estimates for cow-calf operations (www.ers.usda.gov/data/costsandreturns/car/cowcalf2.htm) include a charge (i.e., an opportunity cost) for owned forage resources, including pasture and harvested forage, along with land and unpaid labor. These charges are excluded in this analysis. Cow-calf operations often make use of pasture and other forage resources that have little or no alternative use. Costs of harvesting owned forage resources were included in this report by charging a custom rate on the amount of hay harvested (Doane's).

Cow-calf operators in the West and Southern Plains had significant cost advantages because climatic conditions allow for a longer grazing season, requiring less supplemental forage during the winter.

Forty-nine percent of cow-calf operations were located in the Southern and Northern Plains combined and accounted for 51 percent of the total number of weaned calves (table 1). Forty percent of the operations were in the North Central and Southeast regions combined and accounted for 27 percent of the total number of weaned calves. Only 10 percent of operations were in the West, and these operations produced over 20 percent of the weaned calves.

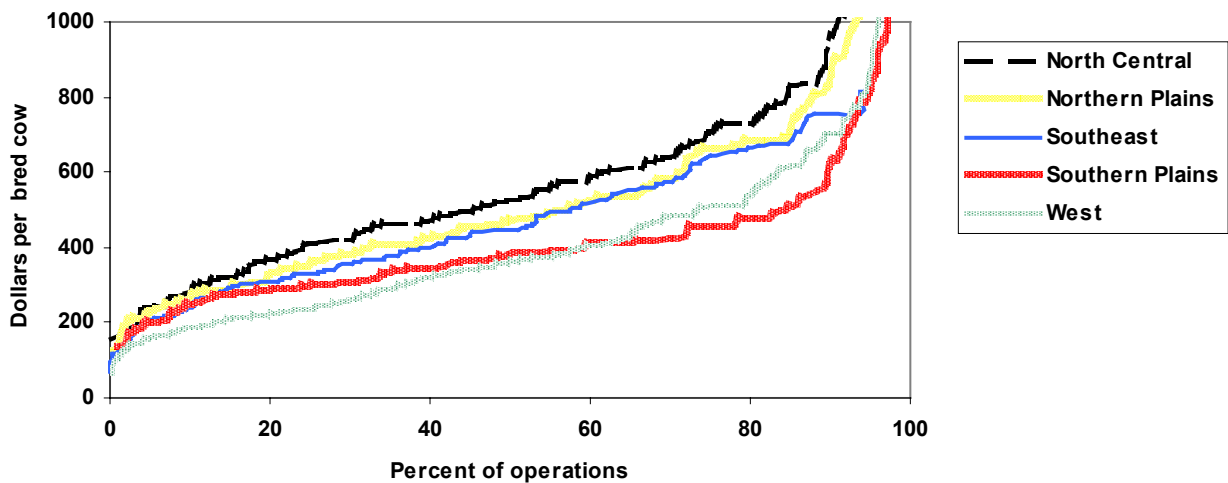
Operations in the North Central region, Northern Plains, and Southeast fed significantly more tons of harvested forage per bred cow than operations in the Southern Plains and West (table 1). The higher feeding rate of harvested forage was likely due to climatic conditions, such as snow in the North Central region and the Northern Plains and temperature or moisture fluctuations in the Southeast (Gilliam). In the North Central region and Northern Plains, snow cover prevents grazing at least occasionally during the winter. In the Southeast, growth or nutritive content of

pasture and range plants varies during the year due to temperature or moisture fluctuations, so adequate grazing during nonproductive periods require too much area per cow to be economically feasible (Gilliam).

Cow-calf operators in the West and Southern Plains had some significant cost advantages over operators in the North Central region, Northern Plains, and Southeast (fig. 2).

More than 80 percent of West and Southern Plains cow-calf operators had operating plus ownership costs less than \$600 per bred cow, compared with 72 percent in the Southeast, 71 percent in the Northern Plains, and 62 percent in the North Central region. Average total operating and ownership costs per bred cow were highest in the North Central region (table 2). In the North Central region, operating costs were higher because of the additional costs of supplemental feed and forage. Ownership costs were driven higher by significantly greater capital recovery costs for tractors, vehicles, and equipment. In the North Central region, winter

Figure 2 Regional cumulative distribution of cow-calf operating plus ownership costs, 1996



Source: 1996 USDA Agricultural Resource Management Study.

feeding is done in centralized locations, and more tractors, vehicles, and equipment are used to process and distribute feed and handle manure. Also, operations in this region have a smaller average herd size, meaning that fixed-cost items like equipment were spread over fewer units of production than in other regions.

Despite the relatively harsher climate, operations in the North Central region, Northern Plains, and West had some reproductive and productive advantages over operations in the Southern Plains and Southeast regions, including higher weaning percentages and weaning more pounds per bred cow ([table 1](#)). Many of these operations may have been more closely managed, since more than 70 percent of operations in the North Central region, Northern Plains, and West had one set calving season. Many operators in these regions must deal with

subfreezing temperatures and/or snow cover in the winter. As a result, operators minimize environmental stress by scheduling calving during periods of moderate temperatures and precipitation.

Cow-calf production was a less important component of the overall operation business in the Southeast ([table 3](#)). The value of cattle production ([glossary](#)) on these operations accounted for 23 percent of the total value of farm production ([glossary](#)), compared with 41 percent in the Southern Plains, 36 percent in the West, 35 percent in the Northern Plains, and 31 percent in the North Central region. Cow-calf production was likely not the primary enterprise for operations in the Southeast. These operations had much less acreage (averaging 318 acres) than those in the other four regions.

Table 1—Performance and input use of cow–calf operations, by region, 1996

Item	Units					
		North Central (a)	Southern Plains (b)	Northern Plains (c)	Southeast (d)	West (e)
Number of operations		65,079	87,400	60,310	53,489	30,481
Beef cow inventory		3,257,319	6,792,631	4,549,566	3,081,265	4,390,904
Share of ARMS		<i>percent</i>				
Cow-calf operations		22	29	20	18	10
Weaned calves		15	28	23	12	21
Size		<i>number</i>				
Bred cows		50	79	78	57	146
Weaned calves		44	60	72	43	132
Calving seasons		<i>percent of operations</i>				
One		59	*19	83	na	85
Two		12	19	na	na	na
None		29	61	na	67	na
Reproduction performance		<i>percent</i>				
Calf death loss		5 c	4 d	4 a d	5 b c	4 b c
Weaning percentage		87 b c d e	76 a c e	93 a b d e	75 a b c e	91 a c d
Female replacement rate percentage		11 c e	*9 c e	20 a b d	9 c e	16 a b d
Production performance						
Average age at weaning	<i>months</i>	7 e	8	7	7 e	8 a d
Pounds weaned per bred cow		437 b c d e	381 a c e	479 a b d	375 a b e	475 a b d
Labor efficiency		<i>hours per bred cow</i>				
Paid		2 b d e	*5 a c	*2 b d e	4 a c	4 a c
Unpaid		17 c e	12 c e	22 a b d	15 a b e	24 a b d
Harvested forage efficiency		<i>tons per bred cow</i>				
		3.38 b e	1.38 a c d e	3.25 b e	3.09 b e	2.37 a b c d

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50.

na indicates value is not available due to no observations, an undefined statistic, or reliability issues.

Rounded percents may not add to 100.

a, b, c, d, e indicate that estimates are significantly different from the indicated region above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 2—Cow-calf production costs and returns, dollars per bred cow, by region, 1996

Item	North Central (a)	Southern Plains (b)	Northern Plains (c)	Southeast (d)	West (e)
Value of production	245.69 cde	233.29 cde	304.12 abd	191.91 abce	291.28abcd
Operating costs					
Feed					
Concentrates and other feed	28.39 bcde	44.02 acde	20.20 ab	20.97 ab	17.22 ab
Supplemental feed	40.32 bcde	#1.25 acde	21.39 abe	16.25 abe	10.42 abcd
Purchased harvested forages	*8.94 e	13.14 e	*12.21 e	*8.00 e	22.72 abcd
Rented cropland pasture	na	*5.96 cde	*2.64 bd	#0.59 bce	*2.24 bd
Rented private pasture	14.14 bcde	22.99 ad	31.06 ade	5.05 abce	20.87 acd
Public land	na	#0.66 ce	2.23 bd	0.00 ce	#9.37 bd
Total purchased feed cost	98.94 d	88.02 d	89.74 d	50.86 abce	82.84 d
Veterinary and medicine	35.65 bcde	16.69 ac	21.96 abde	16.08 ac	17.55 ac
Bedding and litter	1.06 bcde	*0.13 ae	*0.22 ae	*0.33 a	*0.56 a
Marketing	4.10 bcde	6.68 a	6.08 a	5.51 a	6.32 a
Custom operations	35.48 bd	21.99 ace	34.11 bd	24.95 ac	30.56 b
Forage harvesting charge	37.59 bc	18.70 acde	48.61 b	45.26 b	41.89 b
Fuel, lube, and electricity	18.75 ce	21.30 c	28.98 abde	17.29 ce	22.10 cd
Repairs	25.75 e	28.79	28.53 e	21.25	18.75 ac
Interest on operating inputs	12.12 bcd	8.30 ace	9.77 abe	9.15 ae	12.07 bcd
Total operating costs	269.45 bde	210.61 ac	267.99 bde	190.68 ace	232.64 acd
Ownership costs					
Capital recovery	202.20 bcde	120.08 ade	129.31 ae	156.50 abe	71.32 abcd
Holding facilities	0.01 bde	0.01 acd	0.01 bde	0.01 abce	0.01 acd
Feed storage facilities	5.92 be	#0.76 ac	*4.30 be	*4.14 e	0.96 acd
Tractors, vehicles, equipment	147.58 bcde	59.42 acde	91.78 abe	97.87 abe	38.69 abcd
Breeding animals	48.69 bce	59.89 ace	33.21 abd	54.48 abe	31.66 abd
Non-real-estate property taxes and insurance	42.11 bde	21.18 ace	42.48 ad	26.63 ace	35.45 abd
Property taxes	4.44 bde	2.64 ae	*4.24 de	*1.85 ace	6.89 abcd
Insurance	37.67 bde	18.54 ace	38.24 bd	24.78 b	28.56 ab
Total ownership costs	229.07 bcde	136.94 acde	160.14 abe	177.63 abe	98.70 abcd
Total operating and ownership costs	498.52 bcde	347.55 ac	428.13 abde	368.31 ac	331.34 ac
Returns above					
Operating costs	@-23.75 ce	@22.68	*36.13 a	@1.24 e	58.64 ad
Operating and ownership costs	-252.82 bcde	-114.27 ade	-124.02 ae	-176.40 abe	*-40.06 abcd

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50. # CV is greater than 50 and less than or equal to 75. @ CV is above 75.

a, b, c, d, e indicate that estimates are significantly different from the indicated region above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 3—Cow-calf operator and operation characteristics, by region, 1996

Item	Units	North Central (a)	Southern Plains (b)	Northern Plains (c)	Southeast (d)	West (e)
Age distribution <i>percent</i>						
Less than 50 years		na	*24	47	24	37
50 years or more		na	76	53	76	63
Operator education <i>percent</i>						
High school or less		79	43	51	74	42
Attended college		na	*23	na	na	34
Completed college		na	34	na	na	24
Sales class <i>percent</i>						
\$19,999 or less		66	66	na	65	29
\$20,000-\$49,999		na	na	na	20	18
\$50,000 or more		na	na	39	15	54
Production specialty <i>percent</i>						
Beef, hogs, sheep		91	93	64	64	75
Other livestock		na	na	na	na	na
Cash grains		na	na	35	na	15
Other		na	na	na	26	na
Financial position <i>percent</i>						
Favorable		*38	51	54	60	57
Marginal income		na	40	na	35	35
Marginal solvency		na	na	na	na	na
Vulnerable		na	na	na	na	na
Ranch organization <i>percent</i>						
Individual		95	92	90	86	78
Partnership		na	na	na	na	12
Corp or Co-op		na	na	na	na	10
Typology <i>percent</i>						
Retirement and residential/lifestyle		na	44	na	50	23
Farming occupation/lower-sales		na	44	50	44	44
Farming occupation/higher-sales		na	na	na	na	17
Large and very large family farms		na	na	na	na	14
Cattle production value	<i>dollars</i>	14,334 b c e	24,447 a d e	*44,086 a d	12,312 b c e	52,706 a b d
Farm production value	<i>dollars</i>	42,592 c e	59,494 c e	124,818 a b d	52,744 a b c e	147,782 a b d
Farm debt-to-assets	<i>ratio</i>	*0.08 c	*0.09 c	0.19 a b d e	0.06 c e	0.09 d e
Total acres operated		364 b c e	1,030 a c d e	*2,148 a d	318 a b c e	3,282 a b d

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50.

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Source: 1996 USDA Agricultural Resource Management Study.

Operations with 250 or more bred cows had significantly lower total operating and ownership costs; indicative of the economies of scale experienced as the enterprise size increased.

To analyze the relationship between enterprise size and production costs, cow-calf operations were divided into four enterprise-size groups. Fifty-nine percent of cow-calf operations had operations with fewer than 50 bred cows (table 4). These operations accounted for 22 percent of the total number of weaned calves. The 6 percent of operations with 250 or more bred cows accounted for 29 percent of the 1996 weaned calf crop.

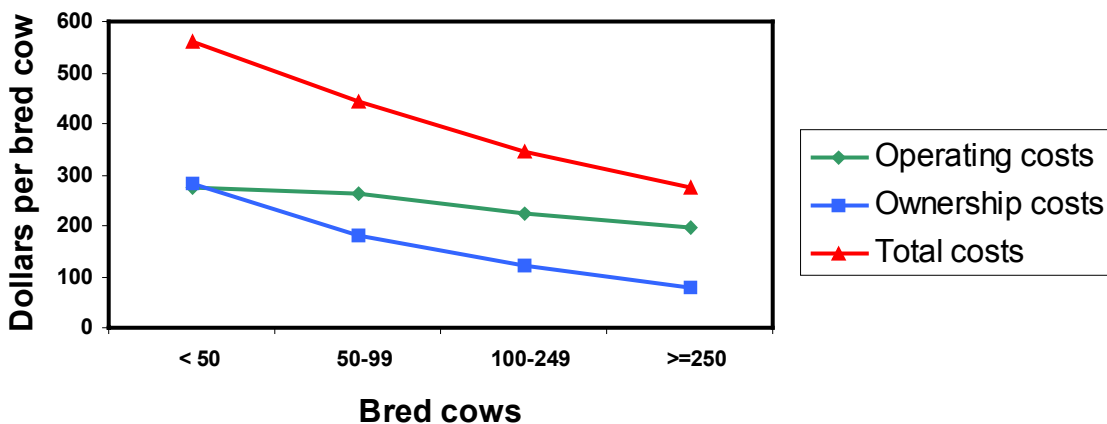
Operations with 100 or more bred cows fed significantly fewer tons of harvested forage per bred cow than all other operations (table 4). Operations with 100-249 bred cows fed 2.3 tons of harvested forage per bred cow, while those with 250 or more bred cows fed only 1.9 tons. This is indicative of the regional distribution of the size groups. Thirty percent of operations with 100-249 bred cows were located in the Southern Plains. Operations in the West comprised 21 percent of 100-249 cow operations and 31 percent of the largest operations. A milder climate with a longer grazing season in the Southern Plains and portions of the West reduce the need for supplemental forage.

Operations with 250 or more bred cows had significantly lower total operating and ownership costs than all other operations, averaging about \$196 per bred cow (table 5). Total operating and ownership costs declined across all size groups (fig. 3).

Many operating costs declined with enterprise size, including costs for: concentrates and other feed; purchased harvested forage; veterinary and medicine; bedding and litter; custom operations; fuel, lube, and electricity; repairs; and interest on operating inputs. Many ownership costs likewise declined with enterprise size, including costs for: feed storage facilities; tractors, vehicles, and equipment; breeding animals; property taxes; and insurance. This is indicative of the economies of scale (i.e., spreading costs over more units of production) experienced as the size of the enterprise increases.

Cow-calf production was a more important component of the overall business on operations with 250 or more bred cows (table 6). The value of cattle production on these operations accounted for 57 percent of the total value of farm production, compared with about 22

Figure 3 Operating and ownership costs by enterprise size, 1996



Source: 1996 USDA Agricultural Resource Management Study.

percent on operations with fewer than 50 bred cows, 25 percent on operations with 50-99 bred cows, and 35 percent on operations with 100-249 bred cows. Operations with 250 or more bred cows consisted of significantly larger total

acres operated (e.g., 8,744 acres versus 340 acres in operations with fewer than 50 bred cows), typical of the large operations in the Southern Plains and West.

Table 4—Performance and input use of cow–calf operations, by enterprise size, 1996

Item	Units	Enterprise size (number of bred cows)			
		Fewer than 50 (a)	50-99 (b)	100-249 (c)	250 or more (d)
Number of operations		176,067	59,615	44,622	16,456
Beef cows inventory		4,648,041	4,040,529	6,630,354	6,752,762
Share of ARMS					
	<i>percent</i>				
Cow-calf operations		59	20	15	6
Weaned calves		22	19	30	29
Size					
	<i>number</i>				
Bred cows		26 a b c	69 a c d	150 a b d	420 a b c
Weaned calves		23 a b c	60 a c d	127 a b d	330 a b c
Calving seasons					
	<i>percent of operations</i>				
One		43	55	59	53
Two		10	18	13	na
None		47	27	28	na
Reproduction performance					
	<i>percent</i>				
Calf death loss		5 b	4 a	4	4
Weaning percentage		88 d	87 d	85	79 a b
Female replacement rate percentage		10	12	15	13
Production performance					
Average age at weaning	<i>months</i>	8	7	7	7
Pounds weaned per bred cow		439	439 d	439	400 b
Labor efficiency					
	<i>hours per bred cow</i>				
Paid		2 c d	2 d	3 a d	6 b c
Unpaid		30 c d	25 c d	18 a b d	10 a b c
Harvested forage efficiency					
	<i>tons fed per bred cow</i>				
		3.02 c d	3.10 c d	2.32 a b d	1.96 a b c
Regional distribution					
	<i>percent</i>				
North Central		25	27	na	na
Southern Plains		30	26	30	na
Northern Plains		18	23	27	na
Southeast		23	13	na	na
West		5	11	21	31

na indicates value is not available due to no observations, an undefined statistic, or reliability issues.

Rounded percents may not add to 100.

a, b, c, d indicate that estimates are significantly different from the indicated enterprise size above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 5—Cow-calf production costs and returns, dollars per bred cow, by enterprise size, 1996

Item	Enterprise size (number of bred cows)			
	Fewer than 50 (a)	50-99 (b)	100-249 (c)	250 or more (d)
Value of production	253.84	259.69	254.78	255.87
Operating costs				
Feed				
Concentrates and other feed	32.41 c	30.40	25.47 a	26.88
Supplemental feed	13.87 b	24.09 a d	16.57 d	9.03 b c
Purchased harvested forages	19.26 c d	16.15	11.18 a	*10.39 a
Rented cropland pasture	*3.20	*5.44	4.06	*3.41
Rented private pasture	14.49 b c	22.28 a	24.71 a	19.44
Public land	*0.21 b d	*1.44 a d	#4.39	3.05 a b
Total purchased feed cost	83.44 b	99.79 a d	86.39 d	72.19 b c
Veterinary and medicine	30.07 c d	24.44 c d	16.34 a b	16.25 a b
Bedding and litter	0.81 c d	*0.58 d	*0.23 a	*0.18 a b
Marketing	6.53 b	5.77 a	6.00	5.61
Custom operations	42.08 b c d	29.88 a d	25.58 a	21.77 a b
Forage harvesting charge	39.91	42.02 c d	34.27 b	31.42 b
Fuel, lube, and electricity	30.58 b c d	22.81 a d	21.43 a d	16.80 a b c
Repairs	30.60 c	27.89 c	22.39 a b	*22.90
Interest on operating inputs	11.67 c d	10.90 c d	9.38 a b	9.05 a b
Total operating costs	275.69 c d	264.08 c d	222.01 a b d	196.17 a b c
Ownership costs				
Capital recovery	238.32 b c d	151.75 a c d	104.35 a b d	67.01 a b c
Holding facilities	0.02 b c d	0.01 a c d	0.01 a b d	0.00 a b c
Feed storage facilities	4.37 c	3.11	2.27 a	#1.96
Tractors, vehicles, equipment	177.09 b c d	101.54 a c d	57.10 a b d	25.00 a b c
Breeding animals	56.85 b c d	47.09 a d	44.97 a	40.05 a b
Non-real-estate property taxes and insurance	62.96 b c d	36.75 a c d	25.21 a b d	15.79 a b c
Property taxes	7.84 b c d	3.86 a d	3.29 a	*2.19 a b
Insurance	55.12 b c d	32.89 a c d	21.92 a b d	13.61 a b c
Total ownership costs	283.84 b c d	179.73 a c d	122.47 a b d	79.67 a b c
Total operating and ownership costs	559.53 b c d	443.81 a c d	344.49 a b d	275.84 a b c
Returns above				
Operating costs	@-21.85 b c d	@-4.39 a c d	*32.77 a b d	*59.70 a b c
Operating and ownership costs	-305.69 b c d	-184.12 a c d	-89.71 a b d	@-19.97 a b c

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50. # CV is greater than 50 and less than or equal to 75. @ CV is above 75.

a, b, c, d indicate that estimates are significantly different from the indicated enterprise size above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 6—Cow-calf operator and operation characteristics, by enterprise size, 1996

Item	Units	Enterprise size (number of bred cows)			
		Fewer than 50 (a)	50-99 (b)	100-249 (c)	250 or more (d)
Age distribution	<i>percent</i>				
Less than 50 years		30	35	30	42
50 years or more		70	65	70	58
Operator education	<i>percent</i>				
High school or less		65	48	42	32
Attended college		19	*24	23	32
Completed college		16	28	35	36
Sales class	<i>percent</i>				
\$19,999 or less		79	37	na	na
\$20,000-\$49,999		12	40	na	na
\$50,000 or more		9	24	61	91
Production specialty	<i>percent</i>				
Beef, hogs, sheep		78	80	81	90
Other livestock		na	na	na	na
Cash grains		*10	10	11	na
Other		na	na	na	na
Financial position	<i>percent</i>				
Favorable		51	54	55	51
Marginal income		41	39	32	38
Marginal solvency		na	na	na	na
Vulnerable		na	na	na	na
Ranch organization	<i>percent</i>				
Individual		92	91	84	67
Partnership		na	na	na	na
Corp or Co-op		na	na	na	na
Typology	<i>percent</i>				
Retirement and residential/lifestyle		49	33	na	na
Farming occupation/lower-sales		44	54	51	na
Farming occupation/higher-sales		na	na	17	30
Large and very large family farms		na	na	na	31
Cattle production value	<i>dollars</i>	7,823 b c d	19,581 a c d	50,636 a b d	186,885 a b c
Farm production value	<i>dollars</i>	36,124 b c d	77,644 a c d	143,617 a b d	325,359 a b c
Farm debt-to-assets	<i>ratio</i>	0.07	0.10	*0.13	*0.09
Total acres operated		340 b c d	1,008 a c d	2,403 a b d	8,744 a b c

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50.

na indicates value is not available due to no observations, an undefined statistic, or reliability issues.

Rounded percents may not add to 100.

a, b, c, d indicate that estimates are significantly different from the indicated enterprise size above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Low-cost operations showed the advantages of economies of scale, as the average operation size was more than four times that of high-cost operations.

Estimated operating and ownership costs per bred cow were ranked from lowest to highest to form a weighted cumulative distribution of operations. To analyze factors contributing to variation in these production costs, cow-calf operations were divided into low-, mid-, and high-cost groups. Twenty-five percent of cow-calf operations had costs per bred cow of \$319.46 or less (fig. 4).

These low-cost operations accounted for 45 percent of the total number of weaned calves (table 7). Low-cost operations had significantly larger cowherds than high-cost operations, with an average of 144 bred cows versus only 35 for high-cost operations. High-cost operations, those with per bred cow costs of \$586.28 or more, accounted for 13 percent of weaned calves.

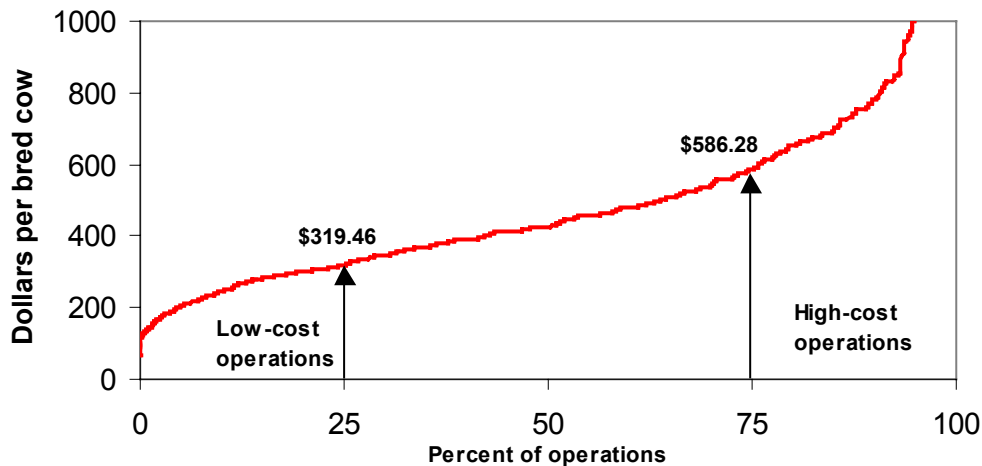
Harvested forages represent a major expense in cow-calf production. Low-cost operations fed significantly fewer tons of harvested forage than all other operations (table 7). High-cost operations fed 4.96 tons of harvested forage per bred cow, about four times the amount fed by

low-cost operations. This difference is likely due to regional differences in production conditions that were discussed earlier. About a third of the high-cost operations were located in the North Central region, while a fourth were located in the Northern Plains (fig. 5). The freeze-free growing season in the North Central region and in the Northern Plains is less than 5 months, requiring more harvested forage to support cattle during the winter season.

Regional factors also likely explain much of the observed differences in the performance indicators of low- and high-cost operators. Weaning percentage and weaning weights were more favorable among the high-cost operators (table 7). The majority of high-cost operators also had a set calving season, while many low-cost operators reported no established calving period. Many high-cost operations were located in regions that are subject to harsh winters, and operators need to schedule calving during periods of moderate temperatures.

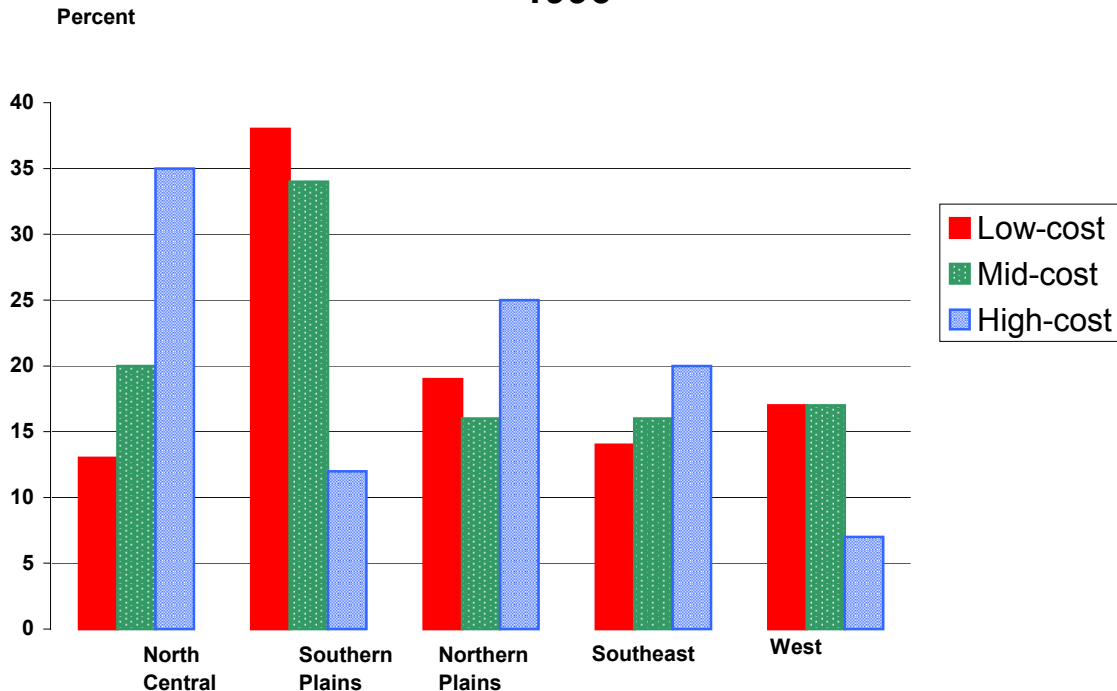
High-cost operations had significantly higher feed costs than all other operations (table 8).

Figure 4 Cumulative distribution of operating plus ownership costs, 1996



Source: 1996 USDA Agricultural Resource Management Study.

Figure 5 Distribution of cost groups by region, 1996



Source: 1996 USDA Agricultural Management Study.

The cost of purchased feed averaged about \$159 per bred cow in these operations, compared to close to \$52 in low-cost operations. Feed costs per bred cow for low-cost operations were significantly lower, probably because many of them were located in the Southern Plains (fig. 5), where the freeze-free growing season can last more than 10 months, making grazing possible almost all year.

High-cost operations also had significantly higher ownership costs than all other operations (table 8). The capital recovery costs for tractors, vehicles, and equipment alone were more than \$209 per bred cow for the high-cost operations. A relatively large number of high-cost operations were in areas where much of the winter feeding is done in centralized locations. Tractors, vehicles, and equipment are used not only for feed processing and distribution, but

also for manure handling. Total capital recovery costs per bred cow for low-cost operations were about \$75. Low-cost operations showed the advantages of economies of scale as the average operation size was more than four times that of high-cost operations (144 versus 35 bred cows).

Cow-calf production was a more important component of the overall operation business on low-cost operations than on high-cost operations (table 9). The value of cattle production on low-cost operations accounted for 51 percent of the total value of farm production, more than twice the percentage on high-cost operations. Cow-calf production was likely the primary enterprise on many low-cost operations, but more often a secondary enterprise on high-cost operations. Low-cost operations consisted of much more acreage (2,477 acres) than did high-cost operations (849 acres).

Table 7—Performance and input use of cow–calf operations, by production cost group, 1996

Item	Units	Production cost group		
		Low-cost operations (a)	Mid-cost operations (b)	High-cost operations(c)
Number of operations		73,317	148,616	74,826
Beef cow inventory		10,320,176	9,107,550	2,643,961
Share of ARMS	<i>percent</i>			
Cow-calf operations		25	50	25
Weaned calves		45	42	13
Size	<i>number</i>			
Bred cows		144 b c	62 a c	35 a b
Weaned calves		114 b c	53 a c	33 a b
Calving seasons	<i>percent of operations</i>			
One		45	44	60
Two		17	12	na
None		38	43	na
Reproduction performance	<i>percent</i>			
Calf death loss		4 c	4	5 a
Weaning percentage		80 b c	86 a c	96 a b
Female replacement rate percentage		13	13	14
Production performance				
Average age at weaning	<i>months</i>	7	8 c	7 b
Pounds weaned per bred cow		400 b c	440 a c	493 a b
Labor efficiency	<i>hours per bred cow</i>			
Paid		4	4 c	3 b
Unpaid		14 b c	20 a c	29 a b
Harvested forage efficiency	<i>tons fed per bred cow</i>			
		1.56 b c	2.88 a c	4.96 a b
Regional distribution	<i>percent</i>			
North Central		13	20	35
Southern Plains		38	34	12
Northern Plains		16	20	25
Southeast		16	18	20
West		17	9	7

Coefficient of Variation (CV) = (Standard Error/Estimate)x100.

na indicates value is not available due to no observations, an undefined statistic, or reliability issues.

Rounded percents may not add to 100.

a, b, c indicate that estimates are significantly different from the indicated production cost group above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 8—Cow-calf production costs and returns, dollars per bred cow, by production cost group, 1996

Item	Production cost group		
	Low-cost ranches (a)	Mid-cost ranches (b)	High-cost ranches (c)
Value of production	220.09 b c	279.60 a	316.63 a
Operating costs			
Feed			
Concentrates and other feed	19.44 b c	34.87 a	40.58 a
Supplemental feed	7.14 b c	7.73 a c	37.78 a b
Purchased harvested forages	7.28 b c	16.56 a c	28.16 a b
Rented cropland pasture	*2.05 c	*3.40 c	*13.49 a b
Rented private pasture	13.46 b c	25.96 a	29.83 a
Public land	2.11 b	1.23 a	@9.14
Total purchased feed cost	51.49 b c	99.75 a c	158.97 a b
Veterinary and medicine	13.02 b c	20.14 a c	53.47 a b
Bedding and litter	0.11 b c	0.48 a c	1.28 a b
Marketing	5.89	5.94	6.19
Custom operations	16.36 b c	28.87 a c	77.54 a b
Forage harvesting charge	24.16 b c	40.57 a c	67.77 a b
Fuel, lube, and electricity	15.76 b c	25.26 a c	37.06 a b
Repairs	16.38 b c	25.62 a c	*60.05 a b
Interest on operating inputs	7.58 b c	10.69 a c	17.67 a b
Total operating costs	150.74 b c	257.33 a c	480.00 a b
Ownership costs			
Capital recovery	75.23 b c	149.84 a c	276.23 a b
Holding facilities	0.01 b c	0.01 a c	0.02 a b
Feed storage facilities	*0.96 b c	*2.98 a c	9.33 a b
Tractors, vehicles, equipment	34.53 b c	96.24 a c	209.20 a b
Breeding animals	39.73 b c	50.61 a	57.68 a
Non-real-estate property taxes and insurance	16.68 b c	30.62 a c	89.20 a b
Property taxes	2.66 c	3.53 c	9.75 a b
Insurance	14.02 b c	27.09 a c	79.45 a b
Total ownership costs	87.81 b c	171.97 a c	352.68 a b
Total operating and ownership costs	238.56 b c	429.29 a c	832.68 a b
Returns above			
Operating costs	69.35 b c	*22.27 a c	-163.37 a b
Operating and ownership costs	@-18.46 b c	-149.69 a c	-516.05 a b

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50. # CV is greater than 50 and less than or equal to 75. @ CV is above 75.

a, b, c indicate that estimates are significantly different from the indicated production cost group above at the 90 percent or better level using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 9—Cow-calf operator and operation characteristics, by production cost group, 1996

Item	Unit	Production cost group		
		Low-cost operations (a)	Mid-cost operations (b)	High-cost operations (c)
Age distribution	<i>percent</i>			
Less than 50 years		29	32	35
50 years or more		71	68	65
Operator education	<i>percent</i>			
High school or less		40	64	54
Attended college		*24	19	24
Completed college		36	17	22
Sales class	<i>percent</i>			
\$19,999 or less		42	63	49
\$20,000-\$49,999		28	16	*20
\$50,000 or more		30	21	30
Production specialty	<i>percent</i>			
Beef, hogs, sheep		86	83	67
Other livestock		na	na	na
Cash grains		na	9	16
Other		na	na	na
Financial position	<i>percent</i>			
Favorable		57	51	49
Marginal income		34	39	44
Marginal solvency		na	na	na
Vulnerable		na	na	na
Ranch organization	<i>percent</i>			
Individual		81	93	89
Partnership		*11	na	na
Corp or Co-op		*8	na	na
Typology	<i>percent</i>			
Retirement and residential lifestyle		34	44	34
Farming occupation/lower-sales		49	44	47
Farming occupation/higher-sales		na	6	8
Large and very large family farms		na	4	*11
Cattle production value	<i>dollars</i>	42,605 b c	24,186 a	22,240 a
Farm production value	<i>dollars</i>	82,741	62,662 c	110,310 b
Farm debt-to-assets	<i>ratio</i>	*0.09	0.09	0.13
Total acres operated		2,477 b c	1,000 a	849 a

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50.

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Rounded percents may not add to 100.

a, b, c indicate that estimates are significantly different from the indicated production cost group above at the 90 percent or better level using the t-stistic.

Source: 1996 USDA Agricultural Resource Management Study.

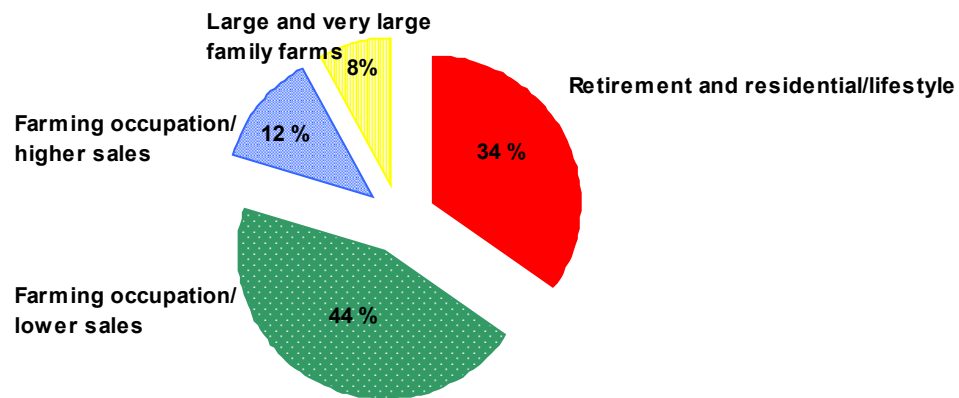
Cow-calf production tends to fit well into retirement and part-time farm operations and as a secondary enterprise on smaller farming operations where land and labor resources are often limited.

Ninety percent of the cow-calf operations surveyed in 1996 were classified as small family farms¹ (total farm sales less than \$250,000²) (table 10; fig. 6; glossary). These small farms accounted for over 80 percent of weaned calves. More than 90 percent of the farms with 10 or more beef cows not fattening cow/calves on grain and concentrates had total farm sales less than \$250,000 (1997 Census of Agriculture).

Over one-third of the cow-calf operations were classified among the retirement and residential/lifestyle farms. Also, 44 percent of the operations were in the farming occupation were in the farming occupation/lower sales group. Cow-calf

Operations among the farming occupation/higher sales and large and very large family farm groups were often located in the Plains and West, where large cattle operations predominate. However, 30 percent of the farming occupation/higher sales group and 25 percent of the largest farm group were in the North Central region. Since North Central farms had relatively small cowherds (table 1), these farms in the largest typology groups had small cow-calf enterprises that were secondary to other farm activities. The primary activity of these North Central farms was likely cash grain production.

Figure 6 Distribution of cow-calf operations by typology group, 1996



Source: 1996 USDA Agricultural Resource Management Study.

production has a relatively low labor requirement and makes use of land that is often unsuitable for other uses. Thus, cow-calf production tends to fit well into retirement and part-time farm operations and as a secondary enterprise on smaller farming operations where land and labor resources are often limited.

Cow-calf operations in the retirement and residential/lifestyle category had significantly lower total operating costs per bred cow than operations in the other three categories (table 11). These cow-calf operations had significantly smaller bred cowherds and relied primarily on owned pasture resources to feed the animals. These operations tended to be low-input, low-maintenance, part-time operations. However, total ownership costs mostly declined from the smallest farm to the largest farm typology groups, showing the advantages of economies of scale associated with larger herd sizes.

¹ Because farm operator household income was not available for cow-calf operators, limited-resource farms were excluded from this analysis.

² The \$250,000 cutoff for small farms was suggested by the National Commission on Small Farms.

Cow-calf production was a more important component of the overall business for operations in the retirement and residential/lifestyle group (table 12). For this group, the value of cattle production accounted for more than 50 percent of the total value of farm production. Cow-calf operations in the retirement and residential/lifestyle group do little else but graze

a small number of animals. Similarly, cow-calf production is a relatively large part of lower-sales farming operations, accounting for 45 percent of the total value of farm production. Among the two largest farm typology groups, however, the value of cow-calf production averaged less than 30 percent of the total value of farm production.

Table 10—Performance and input use of cow–calf operations, by typology group, 1996

Item	Units	Typology group			
		Retirement and residential /lifestyle (a)	Farming occupation /lower-sales (b)	Farming occupation /higher-sales (c)	Large and very large family farms (d)
----- Small family farms-----					
Number of operations		106,986	138,689	38,040	26,303
Beef cows inventory		5,071,017	8,173,335	4,344,375	3,188,580
Share of ARMS	<i>percent</i>				
Cow-calf operations		34	44	12	8
Weaned calves		23	39	20	15
Size	<i>number</i>				
Bred cows		50 b c d	63 a c d	122 a b	147 a b
Weaned calves		41 b c d	54 a c d	100 a b d	127 a b c
Calving seasons	<i>percent of operations</i>				
One		na	37	72	55
Two		na	11	na	na
None		51	46	na	na
Reproduction performance	<i>percent</i>				
Calf death loss		5 d	5 d	4	3 a b
Weaning percentage		82	86	82	87
Female replacement rate percentage		*10	11	13 d	10 c
Production performance					
Average age at weaning	<i>months</i>	8 b	7 a	7	7
Pounds weaned per bred cow		417	430	414	451
Labor efficiency	<i>hours per bred cow</i>				
Paid		*2 c d	3 d	*4 a	6 a b
Unpaid		20	24 c d	17 b d	12 b c
Harvested forage efficiency	<i>tons fed per bred cow</i>				
		2.32 c	2.45	2.94 a	2.79
Regional distribution	<i>percent</i>				
North Central		19	20	30	25
Southern Plains		37	29	na	na
Northern Plains		na	22	36	23
Southeast		24	16	na	na
West		na	13	18	*21

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50.

na indicates value is not available due to no observations, an undefined statistic, or reliability issues.

Rounded percents may not add to 100.

a, b, c, d indicate that estimates are significantly different from the indicated typology group above at the 90 percent level or better using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 11—Cow–calf production costs and returns, dollars per bred cow, by typology group, 1996

Item	Typology group			
	Retirement and residential /lifestyle (a)	Farming occupation /lower-sales (b)	Farming occupation /higher-sales (c)	Large and very large family farms (d)
	----- Small family farms -----			
Value of production	267.60	245.64	269.34	277.12
Operating costs				
Feed				
Concentrates and other feed	37.42 b c d	26.96 a	25.74 a	22.59 a
Supplemental feed	*8.21 c d	11.03 c d	22.36 a b	21.36 a b
Purchased harvested forages	16.31	15.66	*14.50	*14.75
Rented cropland pasture	*6.88 b	*1.66 a c d	*6.97 b	*4.73 b
Rented private pasture	21.09	19.36 d	20.26	28.40 b
Public land	#0.57 b c	*1.64 a	*2.39 a	*1.41
Total purchased feed cost	90.47	76.32 c	92.22 b	93.26
Veterinary and medicine	17.61 d	13.55 c d	21.48 b d	40.54 a b c
Bedding and litter	*0.17 b	*0.60 a	*0.29	*0.54
Marketing	5.95	6.63 c	4.88 b d	6.81 c
Custom operations	21.07 c d	21.39 c d	32.27 a b d	53.07 a b c
Forage harvesting charge	29.59 c d	35.25	40.53 a	43.91 a
Fuel, lube, and electricity	19.38 b	28.27 a c d	21.25 b	17.67 b
Repairs	20.92 b	30.97 a c	19.78 b	25.01
Interest on operating inputs	9.29 d	10.31	10.11	11.30 a
Total operating costs	214.45 d	223.28 d	242.82 d	292.11 a b c
Ownership costs				
Capital recovery	162.37 c d	140.34 c d	107.11 a b	101.15 a b
Holding facilities	0.01 c d	0.01 d	0.01 a	0.01 a b
Feed storage facilities	1.10 b c d	*2.32 a	3.76 a	*3.58 a
Tractors, vehicles, equipment	107.92 b c d	86.50 a c d	69.61 a b	56.95 a b
Breeding animals	53.33 c d	51.51 c d	33.73 a b	40.61 a b
Non-real-estate property taxes and insurance	28.84 c d	27.38 c d	34.99 a b d	51.95 a b c
Property taxes	4.02	4.04	5.19	5.19
Insurance	24.82 d	23.34 c d	29.80 b d	46.75 a b c
Total ownership costs	191.21 c d	167.72 c	142.10 a b	153.10 a
Total operating and ownership costs	405.67	391.00	384.92	445.20
Returns above				
Operating costs	*53.14	*22.36	#26.52	@-14.99
Operating and ownership costs	-138.07	-145.36	-115.58	*-168.09

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50. # CV is greater than 50 and less than or equal to 75. @ CV is above 75.

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a, b, c, d indicate that estimates are significantly different from the indicated typology group above at the 90 percent level or better using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Table 12—Cow-calf operator and operation characteristics, by typology group, 1996

Item	Unit	Typology group			
		Retirement and residential /lifestyle (a)	Farming occupation /lower-sales (b)	Farming occupation /higher-sales (c)	Large and very large family farms (d)
----- Small family farms -----					
Age distribution	<i>percent</i>				
Less than 50 years		43	20	45	37
50 years or more		57	80	55	63
Operator education	<i>percent</i>				
High school or less		48	66	49	*35
Attended college		22	17	na	32
Completed college		30	16	na	*32
Sales class	<i>percent</i>				
\$19,999 or less		75	53	na	na
\$20,000-\$49,999		na	28	na	na
\$50,000 or more		na	19	100	100
Production specialty	<i>percent</i>				
Beef, hogs, sheep		90	80	49	48
Other livestock		na	na	na	na
Cash grains		na	na	27	33
Other		na	8	na	na
Financial position	<i>percent</i>				
Favorable		42	55	73	69
Marginal income		47	38	21	na
Marginal solvency		na	na	na	na
Vulnerable		na	na	na	na
Ranch organization	<i>percent</i>				
Individual		90	93	86	65
Partnership		na	na	na	na
Corp or Co-op		na	na	na	na
Cattle production value	<i>dollars</i>	12,975 b c d	17,796 a c d	59,938 a b d	*160,335 a b c
Farm production value	<i>dollars</i>	24,289 b c d	39,750 a c d	211,288 a b d	568,019 a b c
Farm debt-to-assets	<i>ratio</i>	*0.12	0.07 c d	0.14 b	0.12 b
Total acres operated		486 b c d	996 a c d	2,798 a b d	6,539 a b c

Coefficient of Variation (CV) = (Standard Error/Estimate)x100. * CV is greater than 25 and less than or equal to 50.

na indicates value is not available due to no observations, an undefined statistic, or reliability issues.

Rounded percents may not add to 100.

a, b, c, d indicate that estimates are significantly different from the indicated typology group above at the 90 percent level or better using the t-statistic.

Source: 1996 USDA Agricultural Resource Management Study.

Acres operated are all farmland for which the operator made day-to-day decisions. Includes land that is owned by the operation, plus land rented in, less land rented out, plus land that is used part of the year and rented out during another part of the year. Rental may be for cash, for a share of production, or free-of-charge. Excludes land rented in on an animal-unit-month (AUM) basis.

Calf death loss is the number of calves that died per bred cow.

Calving percentage is the number of calves born per bred cow x 100.

Enterprise size is a structural indicator of farm size based on the number of bred cows.

Farm operator is the person who makes most of the day-to-day decisions about the farm, regardless of whether or not others share management responsibility. Thus, for the ARMS as for the census of agriculture, the number of farm operators equals the number of farms.

Farm operator household income is the sum of earnings of the operator household from farming activities and earnings from all off-farm sources received by household members in the reporting year.

Farm typology is a classification developed by the Economic Research Service to divide U.S. farms into mutually exclusive and more homogeneous groups. The farm typology focuses on "family farms," or farms organized as proprietorships, partnerships, and family corporations that are not operated by a hired manager. To be complete, however, it also considers nonfamily farms.

- **Small Family Farms** (sales less than \$250,000)

Limited-resource. Any small farm with gross sales less than \$100,000, total farm assets less than \$150,000, and total operator household income less than \$20,000. Limited-resource farmers may report

farming, a non-farm occupation, or retirement as their major occupation.

Retirement farms. Small farms whose operators report they are retired. (Excludes limited-resource farms operated by retired farmers.)

Residential/lifestyle farms. Small farms whose operators report they had a major occupation other than farming. (Excludes limited-resource farms with operators reporting a nonfarm major occupation.)

Farming occupation/lower-sales. Small farms with sales less than \$100,000 whose operators report farming as their major occupation. (Excludes limited-resource farms whose operators report farming as their major occupation.)

Farming occupation/higher-sales. Small farms with sales between \$100,000 and \$249,999 whose operators report farming as their major occupation.

- **Other Farms**

Large family farms. Sales between \$250,000 and \$499,999.

Very large family farms. Sales of \$500,000 or more.

Nonfamily farms. Farms organized as nonfamily corporations or cooperatives, as well as farms operated by hired managers.

Female replacement rate percentage is the raised replacement heifers exposed for first calf + purchased replacement heifers and bred cows ÷ total number of bred cows x 100.

Financial position describes the financial health of a farm business from a combination of income (net operation income) and solvency (debt/asset ratio) measures. Farm businesses are categorized into one of four classes:

- **Favorable**—positive income and debt/asset ratio less than 0.40. These businesses are generally considered financially stable.
- **Marginal income**—negative income and a debt/asset ratio less than 0.40. Periods of negative income may not pose financial difficulties if these businesses are carrying a low debt load and can either borrow against equity or obtain income from off-farm sources.
- **Marginal solvency**—positive income and a debt/asset ratio above 0.40. A high debt/asset ratio may be acceptable if these businesses can generate enough income to service their debt and meet other financial obligations.
- **Vulnerable**—negative income and a debt/asset ratio above 0.40. These businesses are generally considered financially unstable.

Sales class is a structural indicator of farm size based on gross value of sales.

Value of farm production is the dollar value of all commodities produced on the farm in a given year, excluding commodities used on the farm. Commodities included in the value of production may be sold or added to inventory. Value of sales differs from value of production in that the value of sales includes commodities sold in the current year but produced in previous years (drawing down inventory) and also includes government payments received.

Value of cattle production is the dollar value of all cattle produced on the farm in a given year.

Cattle included in the value of cattle production may be sold or added to inventory.

Weaning percentage is the number of calves weaned per bred cow x 100.

Data Reliability

Survey results are only indications of the total population. They may differ from data collected in a complete census using the same questionnaires, instructions, and enumerators. The U.S. Department of Agriculture's (USDA) annual ARMS survey applies complex, stratified, multiple-frame, probability-weighted, and sometimes multiple-phase sampling methods to provide financial measures of the agricultural sector. These sampling methods lead to complications in estimating the efficiency of summary statistics. Software has been developed within USDA's Economic Research Service (ERS) that addresses the intricacies of the ARMS. This software employs the delete-a-group jackknife variance estimator (Dubman). The jackknife is a universal all-purpose variance estimator that avoids problems in complex sample design. The delete-a-group jackknife is easy to apply to all weighted estimates, regardless of their complexity or statistical properties. In this report, ranges for coefficients of variation (CVs) are presented if the CV is greater than 25.

Differences among means of the characteristics and cost and return items for the various groupings presented in this report were statistically tested. Although t-statistics are not reported here, the discussion in each section emphasizes comparisons among the groups only when means were significantly different at the 95-percent level.

Survey data are also influenced by nonsampling errors, which are not measurable or known. Nonsampling errors may be introduced by enumerators, respondents, and questionnaire design, among other factors. Efforts were made to minimize these errors and maintain survey accuracy, including training of data collectors, detailed review and editing of data, and analysis for comparability and consistency.

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