

APPENDIX A

CALIFORNIA’S LIVESTOCK INDUSTRIES

The total cattle inventory in California peaked at 5.25 million in 1974 and then declined through 1992. The cattle inventory in 1996 was 4.6 million head (Table A1). Of these, 18% were beef cows, 27% dairy cows, 4% beef replacement cows, 13% dairy replacement cows, and 38% other cattle (mainly steers and calves under 500 lb.).

Table A1: California Cattle by Class, Selected Years¹ (1,000 Head)

Year	Cows that have Calved			Heifers 500 Lb. & Over		Other Cattle			All Cattle & Calves	
	Beef	Dairy	All	Replacements	Other Heifers	Calves under 500 Lb.	Bulls 500 Lb. & over	Steers 500 Lb. & over		
										Beef Cow
1987	970	1,062	2,032	155	470	175	1,068	65	785	4,750
1991	900	1,150	2,050	155	505	185	1,015	70	620	4,600
1996	840	1,260	2,100	160	600	170	950	70	550	4,600

¹ All figures as of January 1.
Source: CDFA (1997)

About 90% of the state’s beef herd has historically been located in four regions—San Joaquin Valley, Central Coast, Northern Mountain and Northern Sacramento. Twenty years ago the dairy herd was located mainly in the San Joaquin Valley and the Greater Los Angeles area (mainly the Chino Valley), but in recent years development and environmental pressures have forced a substantial number of dairies to relocate to the San Joaquin Valley and to other states. Today, the San Joaquin Valley has the largest concentration of both dairy and beef animals in the state, with about 29% of the beef cow herd and 55% of the dairy cow herd.

Table A2: California Cattle Inventory, Supply and Disposition, 1995 (1,000 Head)

Beginning Inventory	Calf Crop	Inshipments	Marketings ¹		Farm Slaughter ²	Deaths		Ending Inventory
			Cattle	Calves		Cattle	Calves	
4,650	1,780	800	2,135	252	18	90	135	4,600

¹ Includes custom slaughter for use on farms where produced, but excludes interfarm sales. ² Excludes custom slaughter for farmers at commercial establishments.
Source: CDFA (1997).

California's calf crop in 1995 was 1.78 million head and inshipments amounted to 0.8 million head. Marketings amounted to about 2.4 million head, 18,000 were slaughtered in farms and 245,000 died (Table A2). California's share of the U.S. calf crop has remained relatively stable over the past 25 years. Although California is a major feedlot state, it is still a net exporter of calves. Approximately 60% of the calf crop is born in dairies rather than cow-calf operations, but the male dairy calves are fed for beef production in feedlots. About 34% of all marketed animals are imported from other states, Mexico and Canada.

The number of cattle and calves marketed from feedlots has fallen consistently from 839,000 head in 1986 to 595,000 in 1995. The severe droughts in California between 1988 and 1994 affected the availability and quality of pastures, reducing the number of finished animals available for slaughter. The number of cattle and calves slaughtered under federal and state inspection also decreased steadily between 1986 and 1993. In 1994 and 1995 the slaughter of cattle increased by 10% while the slaughter of calves jumped from 70,000 head to 196,000 head (CDFFA, 1997).

California dairy cows amounted to 15% and California calves to 16% of the national total slaughtered for each category while steers were only about 2% of the national total (Table A3).

Table A3: Federally Inspected Slaughter in California - 1996

Category		1,000 head	% of U.S. total
Total		1,011	3
Steers		293	2
Heifers		68	1
Cows	all	608	9
	dairy	455	15
	other	153	4
Bulls & Stags		42	6
Calves		268	16
Source: author constructions from NASS.			

California has a large beef deficit. Assuming that per capita beef consumption is at the national average (98.12 pounds per annum in 1995), total annual beef consumption in the state is about 3,238 million pounds. Marketings of cattle and calves in 1995 amounted to 2,704 million pounds live weight (CDFFA, 1997). Assuming a meat yield of 55%, the state's net beef production was 1,487 million pounds—and thus the net beef deficit was 1,751 million pounds. The actual deficit is larger because some of the beef produced is sold out of the state. California's beef deficit is covered with beef imported from other states and Canada.

Despite California's large beef deficit, its large slaughterhouses export to other countries about 20% of their output and an additional 25% is shipped to other states. Integrated firms specialize in supply-

ing Japan and Korea with high value cuts obtained from beef cattle, and less demanding markets with low value cuts. Some slaughterhouses export select cuts from cull dairy cows to Japan while the less valuable cuts are ground and shipped to other states. California beef is sold in retail stores as far as the East Coast. All hides of livestock killed in California are salted and exported, mainly to Japan and Korea.

Movement of livestock

The marketing of beef products has been transformed from local-regional to national-international, while live fed-cattle and feeders still tend to be marketed locally or regionally (Cothorn, 1991). However, it is not uncommon to send cattle either for fattening or milking to other states in response to market circumstances.

The latest comprehensive study of cattle movements into California was conducted in 1989. There have been no studies of cattle movements out of the state or of movements in and out of the state of other livestock species. In 1988, 823,347 feeder cattle and 55,705 lactating cattle passed through California's agricultural inspection stations into the state (Oltmans, 1989). Cothorn (1991) estimated that in the late 1980s about 1 to 1.2 million animals were shipped annually into California, more than 90% for stocking or feeding rather than slaughter. Since California has a large supply of grassland, it is common for operators to buy stocker cattle out-of-state, ship them to California to harvest winter and spring grass, and transport these animals out-of-state for finishing and processing, with the resulting boxed product then shipped to California retail warehouses for distribution and consumption. Heron and Suther (1983) report that one livestock auction yard, selling on average 3,000 cattle per day with 50 sales per year, sold to 120 different owners, and shipped to 25 California counties with high livestock densities as well as five other states.

The movement of feeder cattle into California has a clear seasonal pattern. In 1988, 37.95% of animals arrived in the autumn and 37.13% in winter. Northern California receives seasonal shipments from northern or northeastern states with the onset of winter. The northeastern part of California receives cattle on its ranges east of the mountains in the spring, and also from the colder northern states prior to the onset of winter. The San Joaquin Valley and the central coastal area receive their feeder cattle shipments primarily during the months when there is grass on the range. The feedlots in the Imperial Valley receive feeder cattle during the entire year. About 93% of all inshipments of feeder cattle originated within a distance of 1,000 miles from California's eastern border plus Mexico; almost 80% originated in neighboring states plus Mexico. The imported feeder cattle were consigned mainly to the Imperial Valley (35.82%) and the San Joaquin Valley (31.74%). Smaller shipments went to the Sacramento Valley (14.25%) and to the central coast of California (12.47%) (Oltmans, 1989).

No seasonal variation was found in the movement of dairy cows into the state. However, there is a substantial seasonal variation in the areas receiving dairy cattle, indicating that California dairies

vary their demand for herd replacement (Oltmans, 1989). Most of the imports of dairy cattle into the San Joaquin Valley originated in states east of the Rocky Mountains. The share of lactating cattle moving into the state from within a distance of 500 miles or less was 46.90% while 30.86% traveled between 1,000 and 1,500 miles. No imports of lactating cattle from Mexico were registered (Oltmans, 1989). The imported dairy cattle were consigned mainly to the San Joaquin Valley (63.47%) and Southern California (26.10%). A small number of dairy cattle (3,832 animals) was imported for slaughter, with 91% originating in the states west of the Rocky Mountains (Oltmans, 1989).

Most imports of dairy heifers occurred during the winter and autumn (Oltmans, 1989). Dairy cows imported for slaughter originated almost exclusively in neighboring states. Slaughterhouses in the San Joaquin Valley and Southern California receive most of these imported cull dairy cows (Oltmans, 1989).

Dairy statistics

The dairy industry is the largest agricultural industry in California, with an estimated 1.26 million milk cows and heifers calving on dairies in the state in 1995. Total milk production in that year was 25,327 million pounds, yielding an annual average production per cow of 20,197 pounds. Cash receipts from farm marketing of dairy products during 1995 totaled approximately 3.1 billion dollars (CDFA, 1997). Table A4 shows the main dairy industry economic data used in the I/O model. All monetary values are expressed in 1993 dollars.

The evolution of the dairy industry depends on variables determined both at state and national levels, such as income growth, changes in tastes, population growth, ethnic composition, agricultural policies and technical change. The state's relative isolation and a booming population have generated a steady demand for fluid dairy products. Expansion of the larger cities, however, forced dairies to move away from the metropolitan zones, a process facilitated by better transportation and cooling techniques.

Table A4: Economic Data of the Dairy and Associated Industries Used in the Economic Analysis

	Dairy Farm Products	Creamery Butter	Cheese, Natural & Processed	Condensed & Evaporated Milk	Ice Cream & Frozen Desserts	Fluid Milk
Output Multipliers ¹ (total)	1.62	2.42	2.13	1.88	2.15	2.09
Income Multipliers ¹ (total)	0.83	0.80	0.66	0.74	0.85	0.80
Income Multipliers ¹ (type III)	1.76	4.83	4.04	2.41	2.98	3.27
Employment Multipliers ¹ (total)	15.65	14.70	12.12	10.97	15.64	14.18
Employment Multipliers ¹ (type III)	2.26	7.06	5.70	4.74	3.87	4.73
Industry Output ¹	2,662.09	58.08	1,214.87	327.71	675.65	3,112.36
Domestic Exports ¹	1,202.81	4.82	9.32	17.68	8.17	25.14
Foreign Exports ¹	6.65	1.79	51.79	9.89	96.55	799.19
Total Employment ²	18,439	121	2,582	759	2,732	9,336
¹ In millions of 1993 dollars; ² full time equivalents. Source: M.I.G. Inc.						

Climatic conditions and improved technologies have allowed producers to take full advantage of economies of scale. Due to the higher efficiency of dairies in the West compared to those in the northeastern states it is likely that total milk output in California will continue to grow at the expense of other states (Perez, 1994).

As a consequence of policy, technological and market changes, a dynamic structure of farms and processing plants evolved in which the relative importance of the different production areas varied over time. Between 1965 and 1975, the Chino Valley in Southern California was the largest dairy region in the U.S. Steady expansion of the dairy cow population in the area continued until 1991 when 312,000 cows were reported. Since that time cow numbers there decreased to 289,239 in 1995 (CDFA). In 1995, 23.4% of the state's milk output was produced in Southern California (5.8 billion pounds) by 23% of the state's dairy herd (Table A5). It is expected that the number of dairy farms and cows in the Chino Valley will continue to decrease as environmental and urbanization pressures force dairies to relocate.

The San Joaquin Valley is now the most important dairy area in the state, accounting for 68.2% of all milk produced commercially in the State during 1995 (16.9 billion pounds) and a similar share of the dairy herd (Table A5). The South Valley (Fresno, Kings, Tulare and Kern counties) produced approximately nine billion pounds of whole milk (36.3% of the state total). The rise in cow numbers over the years was caused by a combination of larger operations and more farms. Farms located in the South Valley ship most of their milk to local plants, but a substantial volume of milk is also shipped to plants located as far away as Los Angeles and San Diego. There is also an active movement of milk between plants (Butler and Ekboir, 1995).

Table A5: Selected Statistics of California's Dairy Industry by Districts and Selected Counties, 1996

Location	Total herd	Number of dairies ¹	Average herd	Total Production (thousand pounds)	Average Production per Cow (pounds)
North Coast	32,466	204	159	291,369	15,160
Humboldt	18,587	155	120	257,015	16,889
North Central	36,828	136	271	22,627	17,432
North East	850	1	850	0	0
Sacramento Valley	42,558	208	205	778,193	19,704
San Joaquin Valley	928,205	1,651	562	17,242,816	20,242
Fresno	73,874	114	648	1,483,723	19,947
Kern	41,652	32	1,302	743,627	20,456
Kings	106,018	164	646	1,979,973	20,046
Madera	27,885	57	489	477,985	20,729
Merced	152,700	372	410	3,183,050	20,372
San Joaquin	80,738	179	451	1,629,797	20,597
Stanislaus	156,442	430	364	2,781,071	20,679
Tulare	288,896	303	953	4,963,591	20,142
Central Coast	8,932	25	357	1,031,059	20,390
Southern California	314,263	353	890	5,971,477	19,836
Riverside	116,040	122	951	2,430,710	19,652
San Bernardino	184,635	208	888	3,216,589	19,652
State Totals	1,364,102	2,578	529	25,292,876	20,011

¹ Includes non-pool dairies.

Source: Author construction based on data from Animal Health Branch (CDFA) and CDFA (1997).

It is expected that the South Valley will become the major source of raw milk for the Los Angeles metropolitan area, since it already supplies about 20 to 25% of Southern California's raw milk requirements. However, as the number of cows in the San Joaquin Valley increases, land suitable for large dairy operations is becoming more expensive and scarce. Waste management is also becoming a major problem, forcing imposition of tighter regulations. The combination of potential pollution and scarce land could impose serious restrictions on future expansion of the industry in the Valley. However, even though expansion of the milking herds has already created environmental problems that have forced counties in the area to restrict the location and size of dairies, people familiar with dairying in the region feel that there is still a considerable potential for further expansion (Butler and Ekboir, 1995).

Table A6: California Milk Cow Operations and Inventory Percentage by Size Groups, 1995

1 - 49 Head		50 - 99 Head		100 - 199 Head		200 + Head	
Operations	Inventory	Operations	Inventory	Operations	Inventory	Operations	Inventory
32	0	5	1	9	4	55	95

Source: CDFA, 1997.

California's dairy herd is heavily concentrated in large farms, with 54.5% of the dairies having more than 200 head and accounting for 95% of the total (Table A6). The number of dairies in California declined steadily until 1989, but has increased for the last seven years. The average herd size, however, has been increasing steadily for the last three decades.

Dairies in the South Valley are larger than in the rest of the state, as shown in Table A7. About 28% of those dairies have more than 1,000 animals and account for 58% of the total. The average dairy size in the South Valley, 998 cows, is about twice as large as the average in the northern part of the Valley and the state average.

Table A7: Distribution of dairies and dairy cattle in the South Valley

Herd size	Number of dairies	Total number of animals
0 - 100	26	885
101 - 300	107	23,426
301 - 500	101	40,384
501 - 750	111	69,966
751 - 1000	96	85,582
1,001 - 1,500	90	111,666
1,501 - 2,000	44	77,591
2,001 - 3,000	29	72,545
3,001 - 5,000	11	40,454
5,000 - 10,000	1	8,000
Total	616	530,499

Source: author construction from data provided by Animal Health Branch, CDFA.

All lactating cows in the South Valley and Southern California are housed in corrals. Nearly all dry cows and 75% of heifers are also in corrals. There is a growing trend to keep herd replacement stock in feedlots or in stocker operations separate from the dairy (Shultz, 1994). Still a majority of dairies in the South Valley (60% to 70%) raise their own replacements. The average dairy size on permit applications for new farms in Tulare county in 1993 was 3,074 cows on 629 acres (Butler and Ekboir, 1995).

Every year about one half of dairy calves and one third of the dairy cow herd go to hamburger or veal (Cothorn, 1991). Cull cows provide a variety of products. Hides are salted in California and exported to Japan or Korea. Some of the most valuable cuts (e.g., sirloin) may be exported to Japan or sold in domestic markets, while the rest of the carcass is sold as ground beef. Some slaughterhouses export up to 25% of a cull cow.

In 1997, 20 plants were registered to process milk in the South Valley, 19 in the northern region of the San Joaquin Valley, and 48 in the Chino Valley. During 1995, approximately 16.2% of the total milk fat produced in the state was used in fluid market milk, including fluid whole milk, fluid lowfat milk and fluid skim milk. Fluid half-and-half used 1.0% of the whole milk fat; butter, 30.1%; cheese, including cottage cheese, 41.3%; condensed and evaporated milk products, 1.9%; frozen dairy products, 6.5% and all other manufactured products, 3.0% (CDFA).

The actual milk price received by each farmer in California depends on the prices for the different milk classes determined by the Milk Pooling Branch (CDFA), the fat and solids-not-fat content of each particular shipment, the transportation allowances corresponding to his/her location and quota ownership.¹² The average milk price received by dairy producers results from the interaction of national markets for milk and butter, and the California demand for dairy products.

Beef statistics

In the mid-1990's, California had the sixth largest cattle inventory, tenth largest beef cow herd, and seventh largest fed cattle marketings in the United States (Lawrence and Otto, 1995). Despite major changes in the beef industry, California continues to be a major beef producing state. Table A8 shows the main economic data related to the livestock and meat industries used in the I/O model. All monetary values are expressed in 1993 dollars. Meat processing industries use several types of animals—mainly cattle, hogs, and poultry—and the data on other types are included in the same table with cattle. Cattle provide the largest volume of meat, and in any case the data do not discriminate between the different types of meats being processed.

The number of farmers raising beef cattle in California has dropped after increasing through the early 1980s. The current number, about 25,000, is nearly 30% below the peak in 1981-1983. The

¹² A detailed explanation of the California milk pricing system can be found in Ekboir et al. (1996b)

TableA8: Economic Data of the Cattle and Associated Industries Used in the Economic Analysis

	Ranch Fed Cattle	Range Fed Cattle	Cattle Feedlots	Meat Packing Plants	Sausages and Other Prepared Meats	Leather Tanning
Output Multipliers ¹ (total)	3.03	3.20	1.93	2.25	1.80	1.95
Income Multipliers ¹ (total)	1.37	1.42	0.77	0.60	0.63	0.60
Income Multipliers ¹ (type III)	5.88	6.68	2.99	17.01	2.36	4.11
Employment Multipliers ¹ (total)	58.12	61.47	20.83	21.30	13.79	16.72
Employment Multipliers ¹ (type III)	2.00	2.10	3.34	8.18	3.26	3.02
Industry Output ¹	459.48	435.26	624.79	1,426.84	987.11	84.94
Domestic Exports ¹	206.08	252.54	338.00	6.48	10.62	68.25
Foreign Exports ¹	2.21	3.08	2.41	129.45	1.46	16.63
Total Employment ²	13,301	12,726	3,898	3,714	4,176	471

¹ In millions of 1993 dollars; ² full time equivalents.
Source: M.I.G. Inc.

average herd size increased from 140 in 1970 to 194 in 1995 and fed-cattle marketings per feedlot increased from 4,625 to 15,000 head per year (Lawrence and Otto, 1995).

The San Joaquin Valley is the largest beef area in the state, with over 35% of the total (Table A9). Most livestock operations are located in the foothills, either the Sierra Nevada or the Coastal Range; a few feedlots, however, are located in the Valley.

Table A9: Leading Counties for Gross Value of All Cattle and Calves, 1995 (Percentage of state total)

State total (1,000 Dollars)	Tulare	Imperial	Fresno	Kern	San Bernardino
1,209,521	18	13	9	6	6

Source: CDFA, 1997.

The cattle industry is concentrated in large operations. In 1995, 4.4% of all beef ranches had more than 1,000 head and concentrated 56.0% of the inventory. Meanwhile, 75.6% of the operations with between one and 99 head accounted for only 6% of the state's herd (Table A10). The smaller beef operations are of particular concern in regard to exotic diseases. Many are backyard operations with very weak bio-security operating close to commercial operations in the South Valley. Additionally, most backyard operations are very difficult to locate because they do not operate on a continuous basis. Due to these characteristics, it is very difficult and expensive to monitor backyard operations; specific programs aimed at them should be studied.

Table A10: California Cattle Operations and Inventory, 1995 (Percentage by size groups)

1 -99 Head		100 - 499 Head		500 - 999 Head		1,000 + Head	
Operations	Inventory	Operations	Inventory	Operations	Inventory	Operations	Inventory
76	6	15	18	5	20	4	56

Source: CDFA, 1997.

The swine industry

California's pig and hog industry is small compared to other agricultural industries in the state. Measured by the total value of production it ranked 63 in 1995, with annual sales of \$38 million (CDFA, 1997).¹³ Table A11 shows the main economic data pertaining to the hog and pig industry used in the I/O model. All monetary values are expressed in 1993 dollars.

Table A11: Economic Data of the Hog Industry Used in the Economic Analysis

Output Multipliers ¹ (total)	1.95
Income Multipliers ¹ (total)	0.89
Income Multipliers ¹ (type III)	2.71
Employment Multipliers ¹ (total)	27.03
Employment Multipliers ¹ (type III)	1.98
Industry Output ¹	72.88
Domestic Exports ¹	41.14
Foreign Exports ¹	6.05
Total Employment ²	659
1 In millions of 1993 dollars; 2 full time equivalents. Source: M.I.G. Inc.	

The industry is heavily concentrated in the San Joaquin Valley. Five counties there concentrate 85% of the state's production (Table A12).

Table A12: Leading Counties for Gross Value of Hogs and Pigs Production, 1995 (Percentage of state total)

State total (million dollars)	Tulare	Merced	Fresno	San Bernardino	Kings
39	62	7	6	5	4
Source: author construction from CDFA (1997)					

The inventory of hogs and pigs in the state increased strongly in the last decade jumping from 145,000 head in 1986 to 255,000 head in 1995 (Table A13). Production increased from 58.4 million pounds in 1986 to 101.8 million pounds in 1993 and fell to 88.6 million pounds in 1995. The average annual slaughter of hogs and pigs under federal and state inspection in the last decade was 1.92 million head.

¹³This value includes only the direct value of hog production and does not include forward and backward linkages.

Table A13: California Hogs and Pigs Inventory, Supply and Disposition, Selected Years (1,000 Head)

Year	Beginning Inventory Dec. 1 (Prev. Year)	Pig Crop		Inshipments ¹	Marketings ²	Farm ³ Slaughter	Deaths	Ending Inventory Dec. 1	Av. Price \$/100 Lb.
		Dec.- May	June - Nov.						
1986	145	133	131	21	250	14	16	150	52
1990	140	167	191	44	310	20	17	195	58
1995	255	223	199	40	413	24	40	240	40

¹ For feeding or breeding, excludes stock brought in for immediate slaughter.

² Includes custom slaughter for use on farms where produced and State outshipments, excludes interfarm sales.

³ Excludes custom slaughter for farmers at commercial establishments.

Source: CDFA, 1997.

The sheep industry

The value of sheep and lamb production in California in 1995 was \$56 million. Measured by its value, the industry ranked 54 among California’s agricultural industries. The main purpose of the flock is meat production with wool as a by-product. Wool production in California is relatively small; 690,000 sheep and lambs were shorn in 1995, producing 5.25 million pounds of wool with a total value of \$5.36 million.

Table A14: Economic Data of the Sheep, Lambs and Goats Industry Used in the Economic Analysis

Output Multipliers1 (total)	2.51
Income Multipliers1 (total)	1.03
Income Multipliers1 (type III)	4.44
Employment Multipliers1 (total)	36.09
Employment Multipliers1 (type III)	2.37
Industry Output1	72.88
Domestic Exports 1	41.14
Foreign Exports 1	6.05
Total Employment2	38.98
1 In millions of 1993 dollars; 2 full time equivalents.	
Source: M.I.G. Inc.	

Table A14 shows the main economic data referring to the sheep, lamb and goat industries used in the I/O model. All monetary values are expressed in 1993 dollars. Even though goats are not analyzed in this study, the data provided with the I/O model do not discriminate between sheep and goats.

The largest concentration of sheep in the state is recorded in the South Valley (Table A15). However, the location varies with the season and state of pastures. In summer and fall sheep move into alfalfa fields and unfenced pastures in the South Valley; in the winter they move to pastures in northern California or the Imperial Valley, or to other states.

Table A15: Leading Counties for Gross Value of Sheep and Lambs, 1995 (Percentage of state total)

State total (1,000 Dollars)	Kern	Solano	Imperial	Fresno	Merced
56	22	15	12	7	4
Source: CDFA, 1997.					

Sheep in the foothills do not share grazing areas with cattle. These migrant flocks have about 800 ewes. A large number of lambs is shipped from out of state into feedlots in the Imperial Valley. In addition to these large migrant flocks, there is a large feedlot (over 10,000 lambs) in Bakersfield and hundreds of small resident flocks with 50 to 200 ewes. Finally, many sheep are raised by children in youth programs.

Table A16: California Sheep and Lambs Inventory, Supply and Disposition, selected years (1,000 Head)

Year	Beginning Inventory Jan. 1	Lamb Crop	Inshipments	Marketings ¹		Farm Slaughter	Deaths		Ending Inventory Jan. 1
				Sheep	Lambs		Sheep	Lambs	
1986	1,065	630	198	111	685	24	43	50	980
1990	1,000	535	260	144	566	8	32	30	1,015
1995	1,060	380	380	120	649	5	29	17	1,000
¹ Includes custom slaughter for use on farms where produced, but excludes interfarm sales within the state.									
Source: CDFA, 1997.									

Even though the reported size of the sheep flock has varied little over the last decade, (Table A16), the lamb crop fell by about 40% and inshipments rose by 52% (CDFA, 1996). Such a substantial reported change in the state’s flock should be suspected because it would indicate a very large change in the efficiency of the flocks, and could be the result of a reporting error.

