

The Changing Structure of Animal Agriculture

Mellie L. Warner

Animal agriculture is becoming less competitive in the economist's sense of the word. The number of firms (farms) is declining and market power is being concentrated more and more in the hands of integrators/contractors. In a perfectly competitive market, both the buyers and the sellers are price takers. The large number of buyers and sellers guarantees that market power is evenly distributed. But now the structure of agricultural markets is changing. Some even believe that we are about to plunge into a new revolution in agriculture where vertical integration will be the norm and the number of independent firms will be few.

I. The poultry industry.ⁱ

The poultry industry has become almost totally vertically integrated starting in the 1960s. Several factors have contributed to this. First, because of the relatively short reproductive cycle of chickens (5 months), biological changes such as genetic changes can be made fairly rapidly. The genetic base of poultry is narrow. This helps to reduce management costs and also helps to ensure uniform products for processors and consumers. The two stages of poultry production (hatching and growing) mean fewer stages of production than for livestock. Poultry enterprises tend to be large and specialized.

Some poultry firms have been successful at developing branded products for consumers. They have also innovated new product lines with greater value added. Chicken products have been enthusiastically welcomed by consumers whether at fast food chains, in the grocery freezer, as whole roasted chickens at the deli counter, or just as skinless/boneless breasts in the meat case.

The organization of the poultry subsector ensures that capital requirements are shared between the integrator and the contract grower. (The grower provides the land, buildings and equipment. The integrator owns the feed, the birds and everything else.) This shifts some risk to the grower. But overall, risk to the grower is limited as is the potential for larger than normal profits.

Little additional integration is expected in the poultry industry because of the high level of integration already existing. However, flock sizes continue to increase. In 1997, nearly 48% of broilers and other meat chickens were raised on farms with 500,000 or more chickens., up from 35.5% in 1992. Farms with 750,000 or more chickens accounted for 26.4% of production.

Broiler and Other Meat-Type Chicken, U.S.

Percent of Sales by Number of Chickens Sold per Farm

Year	1-29,999	30,000-99,999	100,000-199,999	200,000-499,999	500,000+
1997	0.09	2.27	8.49	41.55	47.58
1992	0.18	3.21	12.73	48.35	35.53
1987	0.32	6.68	21.30	47.38	24.31
1982	0.47	10.39	28.77	44.63	15.74
1978	0.86	17.22	35.62	34.43	11.87

II. The hog industry.

The pork industry is following the lead of the poultry industry with respect to vertical integration. The genetic base is narrowing and the biological cycle, while longer than for poultry, is still short enough (12 months) to allow for fairly rapid genetic changes to improve quality and consistency of products. Integrators are building on the tradition of branded processed products such as bacon, ham and sausage, but have not had the same level of success as the poultry companies in introducing new, high value-added products especially with respect to the fast food industry. Some progress is being made such as the Hardee's pork chop sandwiches and biscuits. Also, bacon is very widely available as an ingredient in many specialty sandwiches at fast food restaurants.

Hog operations have increased their sizes and their degrees of specialization. Although large "farrow-to-finish" operations still exist and there are also two-stage setups, the trend is to have three stages: farrow, nursery and grow-out (finish). This tends to increase transactions costs, but efficiency gains more than offset them.

As in the poultry industry, the integrator and the contract grower share the capital requirements and the risk. Growers supply the land, buildings and equipment while the integrators retain ownership of the animals and feed. Growers receive a reasonable return on their investments, but give up the potential for large profits. Vertical integration in the hog industry is likely to continue to grow.ⁱⁱ

Herd sizes continued to increase between 1997 and 1999. In 1997, 55.0% of hogs and pigs were raised in herds of 2000 head or more. By 1999, these large herds accounted for 68.5%. Extremely low hog prices in 1998 probably drove many small producers out of the hog business.

Writing for the National Pork Producer's Council, Dennis DiPietre of University of Missouri--Columbiaⁱⁱⁱ finds that agriculture is subject to the same evolution from labor-based production to knowledge-based production that the rest of the economy has been experiencing.

DePietre defines three paradigms of pork production:

The Pig Producer--swine production is a way to use labor during the crop "off season." Grains can be fed to the pigs when grain prices are low. Characteristics are labor intensive production with little management.

Meat Producers--lean meat is produced efficiently and at low cost. Record keeping and other intensive management practices abound. Pork production is separated from crop production. The ability to produce quality for specialized export markets may be affected.

Food Producers--this post-industrial paradigm is just beginning to emerge. The focus is on the food that hits the plate. Differentiated pork products with multiple quality characteristics will be emphasized. Management/knowledge and capital requirements are great while labor requirements are relatively small. However, most management comes from above. The integrators provide the decision-making while the growers "push buttons."

The evolution of pork production through these paradigms will also contribute to the movement away from a competitive market as products become more differentiated. Vertical and horizontal integration will also play a major role.

Hogs and Pigs, Percent of Inventory by Size Group (number of head), U.S.

Year	1-99	100-499	500-999	1000-1999	2000-4999	5000+
2001	1.0	5.0	7.5	12.0	22.0	52.5
1997	3.0	12.0	14.0	16.0	20.0	35.0
1992	5.5	25.5	22.0	19.0	28.00	
1987	7.16	32.07	22.81	16.97	12.88	8.11
1982	9.18	36.35	23.68	16.04	9.81	4.94
1978	13.78	43.28	20.25	12.33	6.92	3.41

III. The beef cattle industry.

The beef cattle industry does not lend itself to vertical integration as well as the poultry and pork industries. The biological cycle is longer (24 months) and the genetic base is broad, so genetic modifications to improve quality and achieve uniform products are more difficult and time-consuming. There are three production stages (cow-calf, stocker and feeding) which increase transactions costs and capital requirements. The large rangeland or pasture requirements of cow-calf operations also have slowed integration in this sector. Beef is still marketed mainly as a commodity and efforts to introduce new, branded products have mostly failed.^{iv}

However, the cattle feeding and meat packing industries have also participated in the trend toward larger and fewer firms. From 1972 to 1995, the number of feedlots in the 13 main cattle-feeding states declined from 104,340 to 41,365 while the average marketings per feedlot increased from 2,287 head to 5,648 head. Even more striking is the fact that in 1995 the largest 1,936 feedlots averaged 10,897 head while the rest averaged only 58 head.^v

Meat packing is a highly concentrated industry with the top four firms accounting for an estimated 80% of US steer and heifer slaughter in 1996. Firms have grown in order to take advantage of lower average costs associated with larger plant sizes. Economists have been studying whether concentration in meat packing has led to lower prices for inputs (fed cattle) and higher prices for outputs (wholesale meat.) So far, the effects found have been small. Efficiency gains may have been enough to offset the price changes found.^{vi}

Most of the trend toward concentration in the beef cattle market has been horizontal (fewer, larger firms in each stage of production.) However, there are instances of vertical integration such as packer ownership of cattle, contracting into the stocker stage and retained ownership of cattle into the feedlot. In some states packers are prohibited from owning the animals in a previous stage of production.

Beef Cows, Percent of Inventory by Size Group (number of head), U.S.

Year	1-49	50-99	100-499	500+
2001	28.9	19.1	37.1	14.9
1997	30.3	19.5	36.2	14.0
1992	32.6	19.6	47.8	
1987	23.21	12.9	34.3	29.59
1982	24.49	13.01	34.06	28.44

Cattle and Calves, Percent of Inventory by Size Group (number of head), U.S.

Year	1-49	50-99	100-499	500-999	1000+
2001	11.5	12.4	36.2	12.4	27.5
1997	12.5	13.5	38.1	11.4	24.5
1992	14	14.1	38.7	33.2	
1987	14.93	15.04	38.21	10.31	21.52
1982	15.74	16.04	38.83	9.98	19.41
1978	16.36	16.7	37.27	9.71	19.95

IV. The dairy industry.

The dairy cattle industry has followed a pattern of fewer farms with cows and fewer total cows while the average number of cows has grown along with total and per cow milk production. Dairy cooperatives market most of the bulk milk produced on America's dairy farms. In 1993 and 1994, coops delivered 86% of the total milk delivered to plants and handlers. The number of coops has decreased over the years while their size has grown. Bargaining-only cooperatives act as middlemen to negotiate prices between farmers and processors. Manufacturing/processing coops process the raw milk into dairy products such as butter and cheese.^{vii}

Government programs have eliminated the risk of very low milk prices for producers. With price supports due to expire by 2000, prices will likely become more volatile. Cooperatives may feel the need to try to limit milk supplies in order to control prices better. This may lead to still larger and fewer cooperatives as they try to increase their bargaining power. Many observers feel that vertical integration will also increase as a result of more volatile prices.

Milk Cows, Percent of Inventory by Size Group (number of head), U.S.

Year	1-29	30-49	50-99	100-199	200+
2001	2.6	8.1	20.9	17.4	51.0
1997	3.5	11.5	26.0	20.0	39.0
1994	4.6	14.0	28.7	19.3	33.4
1991	6.3	16.6	31.7	45.4	

ⁱ Ward, Clement E. "Vertical Integration Comparison: Beef, Pork and Poultry." WF-552. Oklahoma Cooperative Extension Service

ⁱⁱ Ward, Clement E. "Vertical Integration Comparison: Beef, Pork and Poultry." WF-552. Oklahoma Cooperative Extension Service

ⁱⁱⁱ DiPietre, Dennis. "Reflections on the Role of Knowledge in the 21st Century Pork Industry.." <http://www.nppc.org/PROD/knowledge.html>.

^{iv} Ward, Clement E. "Vertical Integration Comparison: Beef, Pork and Poultry." WF-552. Oklahoma Cooperative Extension Service.

^v Ward, Clement E. "Structural Changes in Cattle Feeding and Meat Packing." WF-553. Oklahoma Cooperative Extension Service.

^{vi} Ward, Clement E. "Packer Concentration and Its Impacts." WF-554. Oklahoma Cooperative Extension Service.

^{vii} Manchester, Alden C. and Don P. Blayney. "The Structure of Dairy Markets: Past, Present and Future." USDA Agricultural Economic Report No. 757. September 1997.