

CORN AND SOYBEAN CONSUMPTION AND PRODUCTION IN VIRGINIA

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AGRICULTURAL COMPETITIVENESS

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INTRODUCTION

Over the past 20 to 30 years, the agricultural sector in Virginia has experienced many changes. Perhaps the most striking adjustment has been in the composition of the agricultural industry in the state. Large expansion in some agricultural sectors such as turkeys and broilers has occurred, while other sectors, like grain, have failed to flourish. Even with the expansion of some grain-consuming sectors, a decreasing percentage of Virginia land has been used for agricultural purposes, mainly because of a substantial decrease in corn and soybean acreage. While grain production has been declining, grain consumption within the state has reached all-time highs.

Although technological advances have served to lessen some of the impact, the decreases in corn and soybean (particularly corn) acreage over the past 20 to 30 years have been large. Many Virginia producers cannot compete with Midwestern producers and have taken acres out of production, switched to different crops, or used the land for non-agricultural purposes. What has happened to grain production, what will happen in the future, and what the possible implications of this change portend are of widespread concern.

Virginia is a large net importer of grain. Imports have increased over time, resulting in dollars that once contributed to the Virginia economy being sent to other states. The intent of this study is to assess the grain consumption and production within the state of Virginia. Typical feed rations for livestock, poultry, and dairy animals in Virginia were used to determine feed demand for corn and soybeans by each sector. Grain production data by county were collected. Based on the data, state and regional consumption, production, and deficits were calculated. The results provide important insight to the grain, livestock, and poultry sectors for future research to help the existing grain sector remain competitive and to investigate possible cooperation between the grain and poultry sectors to simultaneously improve the economic and environmental well-being of both sectors.

FEED CONSUMPTION

Feed Consumption Calculations and Estimates

The amount of grain consumption in Virginia is not readily available through any data source, thus a method of determining grain consumption had to be formulated. Grain consumption was determined on a monthly basis for the eight primary grain consuming animal sectors in the state. The animal sectors include beef cattle, broilers, cattle on feed, dairy, hogs, horses, layers, and turkeys. Grain consumption was estimated using livestock, poultry, and dairy numbers and feed consumption rations for each. Feed assumptions, reflecting practices in Virginia, were determined by consulting various publications and university and extension personnel. The use estimates are based on the assumptions that corn weighs 56 pounds per bushel and that each 60-pound bushel of soybeans yields 47.3 pounds of soybean meal (sbm). Exports are not included in the use estimates.

For each livestock group, feed consumption was estimated monthly by year from 1965 to 1997. The feed assumptions include use by breeding stock and market animals. They also reflect changing feed efficiency over time and seasonal feeding in some sectors. Basic assumptions about feed use are summarized in Table 1. Detailed feed use assumptions and monthly consumption by county are available in the technical report *Corn and Soybean Production and Consumption in Virginia: Detailed Analysis*.¹

¹ This report is available for \$25.00 from David Kenyon, Dept. of Ag. and Applied Econ. (0401), Virginia Tech, Blacksburg, VA 24061.

Table 1. Feeding Assumptions

Beef Cattle	<ul style="list-style-type: none"> - 37% of total number of beef cattle wintered for slaughter are fed grain from November 1 to April 7 - 4.5 lbs. of corn and 1 lb. of soybean meal fed daily
Broilers	<ul style="list-style-type: none"> - commercial broilers fed 42 days - typical feed is 68% corn, 26% sbm, and 6% other - lbs. of feed/lb. of broiler has ranged from 2.02 and 2.00 between 1989 and 1997
Cattle on Feed	<ul style="list-style-type: none"> - cattle enter feedlot on first week of the month and slaughter occurs on 15th of each month - steers enter at 800 lbs. and leave at 1200 lbs.; heifers enter at 750 lbs. and leave at 1125 lbs. - 160 days on feed - steers consume 12 lbs. corn/day, 1.6 lbs. sbm/day; heifers consume 10 lbs. corn/day, 1.3 lbs. sbm/day - annual number of cattle fed is 1.56 times January 1 cattle inventory - 69% are steers, 31% are heifers
Dairy	<ul style="list-style-type: none"> - 87% of herd is in milk at one time - 63% of calves are born from July-December and 37% from January-June - 74% of concentrate portion of ration is corn and 21.5% is sbm for both lactating cows and replacement heifers - replacement heifers fed 4 lbs. of grain/day from 2-5 months of age; 3 lbs./day from 6-10 months; and 4 lbs. per day from 11-24 months - lactating cows fed 17 lbs. of grain concentrates daily
Hogs	<ul style="list-style-type: none"> - gestation period is 114 days - gilts bred at 8 months - sow replacement rate is 25% - one boar per 15.75 sows - market hogs are fed for 166 days - feeder pigs imported at 21 days - commercial hogs slaughtered at 256 lbs.
Horses	<ul style="list-style-type: none"> - 1,100 lb. average body weight - 2/3 of inventory idle - 1/3 of inventory working - all working horses fed year round - 10% of idle horses fed no grain - 30% of idle horses fed grain only November-February - 60% of idle horses fed grain year round - idle horses receive 3 lbs. corn/day and ½ lb. of sbm/day - working horses receive 6 lbs. corn/day and 1 lb. sbm/day
Layers	<ul style="list-style-type: none"> - .253 lbs. of feed consumed per day - feed is 65% corn, 21% soybean meal, and 14% other
Turkeys	<ul style="list-style-type: none"> - feed is composed of 63% corn, 27% sbm, and 10% other - market turkeys fed 111 days - market turkey feed rations combine hens and toms proportionately - market turkeys fed 2.7 lbs. of feed per lb. of bird produced - breeding stock assumed to be in the same proportion as reported in 1992 Census of Agriculture - every tom serves 9 breeding hens - breeding stocks and replacements are equal - breeders fed 365 days, males consume .9 lbs./day; females consume .5 lbs./day - replacements fed 98-112 days and males consume .48-.7 lbs./day; females consumes .36-.45 lbs./day

Feed use depends on feed consumption per animal unit and the number of animal units. The number of animals in each sector are shown in Table 2. These numbers provide an idea of the trend in animal numbers for each sector. Feed use in any sector also depends on breeding stock, imports into Virginia, and seasonal feeding. All these animals are included in the feed-use estimates. The detailed formulas for determining animal numbers by type for each sector are available in the technical report *Corn and Soybean Production and Consumption in Virginia: Detailed Analysis*.

Table 2. Livestock, Poultry and Dairy Numbers: 1989-1997

Year	Beef Cattle	Broilers	Cattle on Feed	Dairy Cows	Pig Crop	Horses	Layers	Turkeys
-----thousands-----								
1989	202	182,371	40	142	748,000	81	3,760	16,600
1990	199	195,900	30	141	759,000	93	3,759	17,000
1991	196	218,700	35	141	748,000	104	3,843	17,300
1992	198	238,200	35	137	792,000	116	4,092	19,300
1993	199	244,400	40	132	735,000	127	3,966	21,000
1994	197	252,700	40	130	713,000	139	3,833	22,000
1995	205	260,100	40	129	640,000	150	3,821	23,500
1996	218	259,100	35	126	675,000	162	3,895	25,000
1997	228	259,400	30	122	667,000	173	3,693	25,000

Source: VASS

Statewide Feed Consumption

In the past three decades, feed consumption of grain has greatly increased in the state of Virginia. Usage of corn (Figure 1) and soybeans (Figure 2) as livestock feed has gradually increased and was at an all-time high in 1996, with corn consumption exceeding 80 million bushels and soybean consumption exceeding 30 million bushels. Corn consumption has increased over 30 percent in the past 15 years, while soybean consumption has increased over 60 percent.

Figure 1. Virginia Corn Consumption: 1970-1997

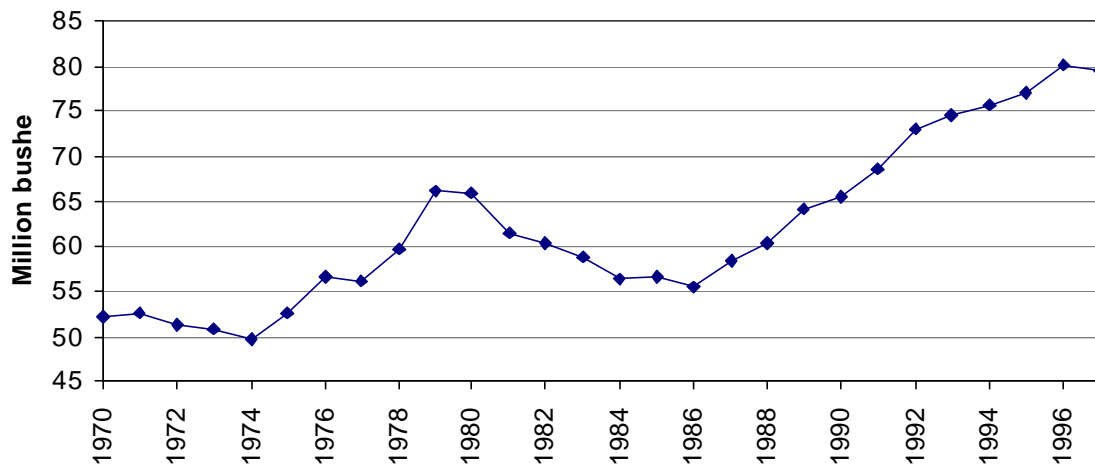
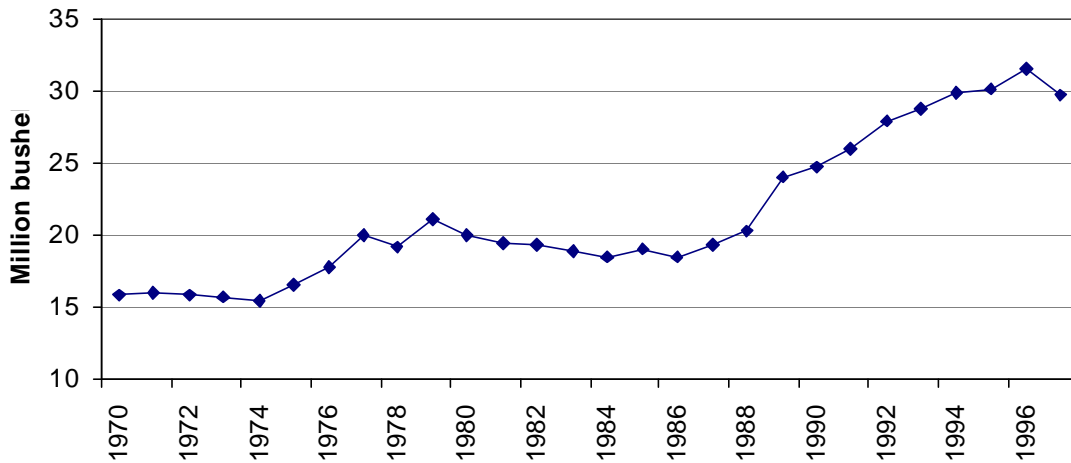


Figure 2. Virginia Soybean Consumption: 1970-1997



Feed Consumption by Livestock, Poultry, and Dairy Sectors

In the past three decades, large increases in broiler and turkey production have increased the demand for feedgrain within the state, particularly in the last 10 years. These increases have offset the decreases in consumption by hogs. At the same time, use by the dairy and layer sectors has remained relatively constant or declined slightly.

In 1997, broilers, turkeys, and dairy were the largest consumers of corn and soybeans in the state (Figure 3). Broilers were the largest corn and soybean consumers: 37 percent of all corn for grain and 43 percent of all soybeans. Turkeys were the second largest consumers of corn and soybeans, consuming 20 percent and 26 percent, respectively. Dairy is the third largest consumer of corn and soybeans, consuming 15 percent and 13 percent, respectively. These three sectors account for 72 percent of all corn consumed and 82 percent of all soybeans consumed. The category labeled as “Other” in each case represents the combination of horses, cattle on feed, and beef cattle wintered. Table 3 shows how these percentages by sector have changed every ten years starting in 1967.

Figure 3. Percentage of Corn and Soybean Use by Livestock Category: 1997

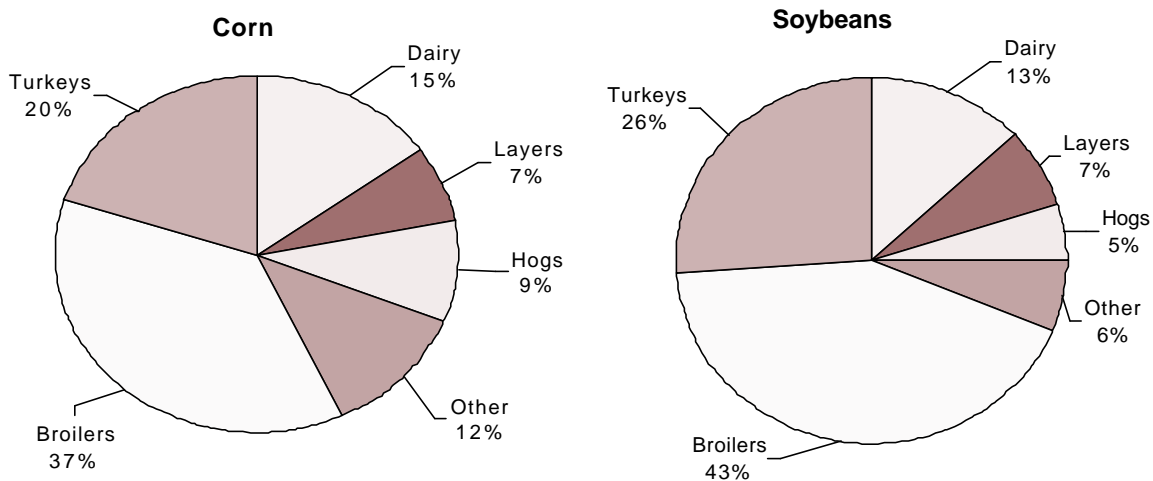


Table 3. Percentage of Corn and Soybean Use by Livestock Category Over Time

Category	1967	1977	1987	1997
-----Corn-----				
Broilers	12	20	25	37
Turkeys	8	11	16	20
Layers	11	7	7	7
Dairy	30	22	23	15
Hogs	32	32	18	9
Other	7	8	11	12
-----Soybeans-----				
Broilers	18	25	34	43
Turkeys	8	21	17	26
Layers	15	9	8	7
Dairy	33	21	24	13
Hogs	22	19	10	5
Other	4	5	7	6

Source: 1967-1987 "Corn and Soybean Use and Production in Virginia: Trends and Issues," 1989.

The consumption figures in Tables 4 and 5 give a picture of the trends in consumption for each individual sector over the last 25 years. In 1967, hogs and dairy accounted for most of the grain consumption. However, over the past 10 years, poultry has dominated consumption within the state. Consumption of corn and soybeans peaked in 1996 and is expected to remain high with the possibility of expansion in the turkey, broiler, and horse sectors.

Table 4. Annual Corn Consumption by Sector: 1970-1997

Year	Beef	Broiler	COF ^a	Dairy	Hogs	Horses	Layers	Turkey	Total
1970	1,036	8,042	1,383	12,591	20,671	1,325	4,222	2,547	52,032
1971	1,046	8,621	1,818	10,795	21,288	1,376	4,138	3,262	52,549
1972	1,062	9,186	1,466	11,669	19,259	1,416	3,925	3,092	51,268
1973	1,117	8,978	1,542	11,730	18,970	1,453	3,729	3,168	50,876
1974	1,277	8,790	1,224	11,456	18,441	1,489	3,510	3,357	49,732
1975	1,423	9,417	1,224	11,997	18,053	1,498	3,504	5,300	52,597
1976	1,426	10,546	1,581	11,887	19,829	1,507	3,641	6,008	56,597
1977	1,402	11,055	1,777	12,238	17,874	1,517	3,745	6,431	56,213
1978	1,234	10,762	1,975	14,486	18,138	1,525	4,033	7,245	59,577
1979	1,194	13,109	2,282	14,598	20,284	2,090	4,344	7,680	66,086
1980	1,971	13,055	2,328	15,218	20,951	1,801	4,200	5,934	65,957
1981	2,098	14,059	1,870	14,706	16,517	1,512	4,271	6,028	61,512
1982	1,982	14,523	2,379	14,630	14,282	1,521	4,192	6,397	60,363
1983	2,308	14,088	1,697	14,363	14,184	1,529	3,698	6,422	58,731
1984	2,754	14,545	1,636	13,715	11,605	1,538	3,683	6,564	56,443
1985	2,569	15,258	1,377	13,984	10,176	1,538	3,699	7,547	56,548
1986	2,620	14,032	1,780	13,476	9,302	1,546	4,090	8,088	55,335
1987	2,356	14,572	2,428	13,609	10,238	1,555	4,055	9,060	58,290
1988	2,013	16,224	2,042	14,031	10,591	1,582	4,015	9,513	60,391
1989	2,875	19,683	2,068	13,759	8,684	1,841	4,584	10,510	64,004
1990	2,549	21,516	1,831	13,475	8,759	2,100	4,800	10,453	65,483
1991	2,505	24,020	1,895	14,161	8,584	2,359	4,236	10,690	68,450
1992	2,528	25,453	1,965	13,399	8,921	2,619	6,240	11,985	73,110
1993	2,544	27,302	2,177	13,092	8,466	2,878	5,172	12,977	74,608
1994	2,516	28,844	2,248	12,598	8,329	3,137	6,000	13,528	75,658
1995	2,625	29,058	2,248	12,656	7,169	3,396	5,472	14,593	77,025
1996	2,789	30,204	2,037	12,410	6,977	3,655	6,336	15,676	80,084
1997	2,909	29,609	1,758	11,843	7,332	3,955	5,916	15,980	79,342

Source: 1967-1987 "Corn and Soybean Use and Production in Virginia: Trends and Issues," 1989 and 1988-1997 computed from livestock and poultry numbers using feeding assumptions.

^a COF is Cattle on Feed.

Table 5. Annual Soybean Consumption by Sector: 1970-1997

Year	Beef	Broiler	COF ^a	Dairy	Hogs	Horses	Layers	Turkey	Total
1970	272	3,662	278	4,225	4,341	262	1,923	893	15,873
1971	275	3,926	369	3,623	4,426	271	1,884	1,149	15,939
1972	279	4,183	296	3,843	3,996	280	1,787	1,088	15,764
1973	296	4,087	314	3,948	3,932	287	1,699	1,114	15,689
1974	338	4,002	249	3,838	3,842	294	1,600	1,183	15,358
1975	376	4,290	249	4,032	3,812	295	1,595	1,866	16,257
1976	375	4,803	321	3,994	4,201	296	1,658	2,115	17,775
1977	368	5,035	360	4,232	3,831	299	1,704	4,098	19,939
1978	325	4,900	398	4,872	3,890	301	1,836	2,585	19,119
1979	314	5,968	358	4,919	4,406	401	1,978	2,704	21,136
1980	519	5,945	365	5,113	3,862	349	1,606	2,143	19,979
1981	552	6,402	293	4,941	3,061	292	1,634	2,178	19,421
1982	521	6,613	373	4,915	2,633	297	1,604	2,311	19,333
1983	607	6,415	266	4,826	2,677	297	1,414	2,321	18,890
1984	724	6,623	256	4,608	2,099	298	1,409	2,372	18,454
1985	676	6,948	216	4,699	1,919	298	1,415	2,728	18,963
1986	689	6,389	279	4,528	1,743	298	1,564	2,924	18,481
1987	620	6,636	381	4,573	1,954	301	1,551	3,275	19,356
1988	530	7,388	320	4,714	1,980	304	1,536	3,439	20,275
1989	678	8,910	351	4,623	1,975	356	1,752	5,333	23,978
1990	669	9,740	287	4,528	1,976	403	1,836	5,304	24,743
1991	659	10,874	298	4,759	1,921	452	1,620	5,424	26,007
1992	667	11,522	309	4,501	1,987	508	2,388	6,081	27,963
1993	667	12,359	339	4,400	1,875	559	1,980	6,584	28,763
1994	662	13,057	351	4,232	1,834	610	2,292	6,864	29,902
1995	690	13,154	351	4,230	1,567	658	2,088	7,404	30,145
1996	732	13,673	319	4,169	1,517	710	2,424	7,954	31,498
1997	764	13,403	243	3,981	1,597	764	2,256	8,108	31,116

Source: 1967-1987 "Corn and Soybean Use and Production in Virginia: Trends and Issues," 1989 and 1988-1997 computed from livestock and poultry numbers using feeding assumptions.

^a COF is Cattle on Feed.

Overview of Feed Consumption by Sector

Broilers: Not only are broilers the largest consumers of corn and soybeans, but they are also the fastest growing sector. Since 1970, corn and soybean consumption by this sector has increased by more than 250 percent. In the past 10 years alone, consumption has increased by over 100 percent. Consumption by broilers peaked in 1996; however, the upward trend in consumption is expected to continue in the future.

Turkeys: Since 1970, corn and soybean consumption by turkeys, the second largest consumer of feedgrain in the state, has increased by over 500 percent. In the past 10 years, it has increased by over 75 percent. The sector has become more feed efficient while simultaneously increasing bird weight. In the past 5 years, the number of turkeys raised has increased by nearly 20 percent, and the pounds produced has increased by over 30 percent. These increases indicate growth of this sector is likely to continue.

Dairy: Cow numbers have declined over the past ten years in Virginia. During this same time, feeding practices have changed very little. In the past 10 years, both the number of animals and feedgrain consumption have decreased about 15 percent. A pattern of slight decline in consumption is expected to continue in the future.

Hogs: From 1965 to 1980, hogs were the largest grain consumers in the state (Thornsbury and Kenyon, 1989). Consumption was anticipated to increase in the late 1980's with the introduction of contract hog feeding in Virginia; however, these increases failed to materialize as smaller producers left the sector (Thornsbury and Kenyon, 1989). In the past 10 years, corn consumption by hogs has dropped 30 percent and soybean consumption has dropped 20 percent. Although some of the decline is due to improved feed efficiency, the majority of the decline has been the result of a decrease in the number of animals being fed (Table 2). Environmental and nuisance concerns have contributed to the decline of the hog sector in Virginia over the past ten years (Purcell, p. 13). Environmental and zoning regulations will likely affect the future growth of this sector in Virginia.

Layers: Feed consumption by layers has increased slightly over the past three decades. In the past five years, rapid growth and increased variability in usage has occurred from year to year. Whether this recent increase in consumption will continue in the future is not clear.

Other: This category is generally comprised of beef cattle wintered, cattle on feed, and horses. Beef cattle wintered and cattle on feed have remained relatively stable over the past ten years. This trend is expected to continue. Horses have experienced growth in the past ten years, and future expansion of the horse sector is expected. Previous studies have included sheep, but with the decline in numbers in recent years, grain consumption by sheep is negligible and, therefore, was not included in this study.

Future Feed Consumption

Growth of corn and soybean consumption is expected to continue as we enter the new millennium. This growth will most likely not be as large as the growth experienced in the 1990's. The poultry and horse sectors have both indicated intentions to expand in upcoming years, while the hog and dairy sectors are expected to decline. The declines in these sectors are expected to be gradual and will probably be offset by the increases in the poultry sector. Environmental and zoning regulations will continue to play a part in the growth of hog, poultry, and dairy sectors. Overall, the demand for corn and soybeans by the livestock and poultry sectors is expected to grow in the next decade.

PRODUCTION

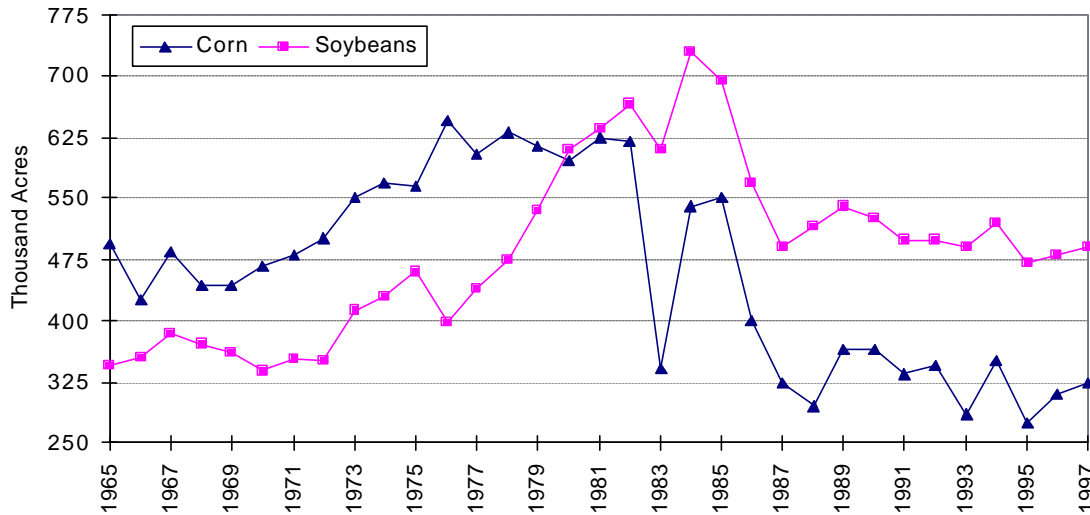
Production of corn and soybeans in Virginia has changed substantially over the past 30 years. Corn acres harvested for grain has declined, while soybean acreage peaked in the mid-eighties and after a sharp drop has remained relatively constant since 1987 (Figure 4).

Almost 300,000 acres of land previously in corn production in the 1970's is no longer in production. The inability of Virginia producers to compete with Midwestern corn producers is the main reason for this decrease. According to *The Economic Position of Virginia Agriculture: Mid-1990s*, the major causes for this lack of competitiveness are 1) weather and soil problems, 2) a national farm policy that puts Virginia producers at a disadvantage, and 3) lack of effort in the state during lean budget years to support research that generates technology appropriate for Virginia conditions (Purcell, p. 23).

The REAP study *Where Have All the Corn Acres Gone?* looks at what has happened to acreage taken out of production rather than why this trend has occurred. Evidence indicates these changes are not due primarily to increased urbanization, rather the majority (47 percent) of the acreage taken out of corn production have historically been placed in government feedgrain programs. The second largest

(28 percent) cause of acreage decline was increased urbanization. The remaining 25 percent decrease in corn acreage is the result of acreage transferred to alternative crops because of poor returns associated with corn production (Thornsbury and Kenyon, p.15).

Figure 4. Corn and Soybeans for Grain: Harvested Acres, 1965-1997



The Thornsbury and Kenyon study also indicates the majority of these reductions have occurred over a 30-county area spread throughout the northern, eastern, and central parts of the state. They account for two-thirds of the total reduction in corn acreage. The study concludes that with higher prices over half the corn acreage taken out of production could be put back into production quickly. The significance of this conclusion is that the reduced corn acreage in Virginia does not have to be a permanent situation. If the economic incentives to produce corn for grain existed, much of the acreage would be put back into production. The growth of the poultry and other sectors in Virginia that use corn for feed could help to produce the economic incentives necessary to increase or stabilize corn for grain production within the state.

Corn (Figure 5) and soybean (Figure 6) production is highly variable in Virginia as the result of yield variations from year to year. Soybean production has been much more stable than corn production.

Figure 5. Corn for Grain Production: 1970-1997

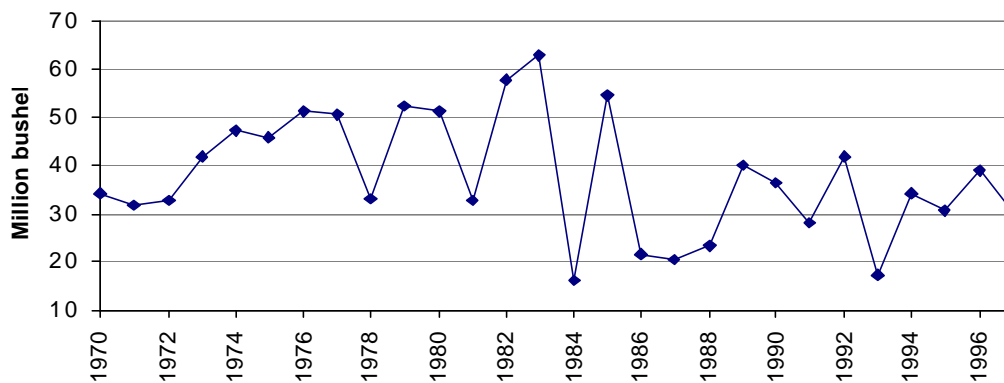
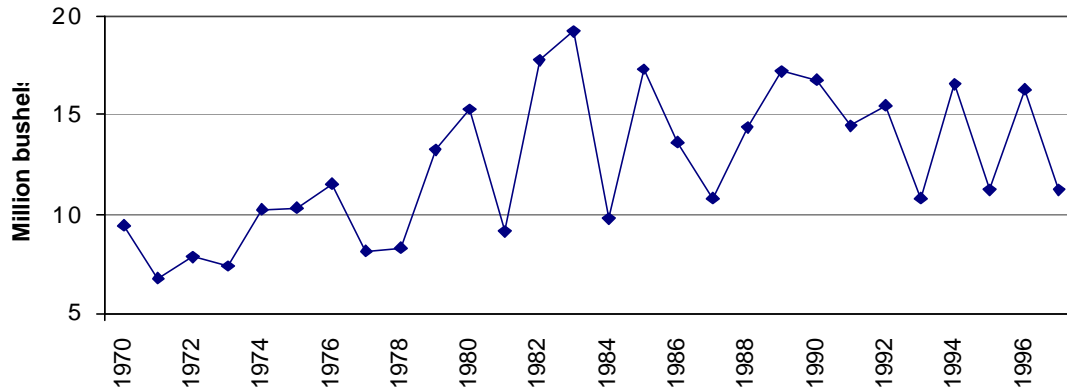


Figure 6. Soybean Production: 1970-1997



Like corn, soybeans have experienced a reduction in acreage over the past decade. Soybean production experienced a peak around 1985, dropped off rather sharply, and has stabilized in recent years. Soybeans tend to be more drought resistant than corn and double-cropping soybeans with wheat has increased per acre returns. With the expansion of the poultry sector within the state, the soybean sector should remain stable in the state. Like corn, if economic incentives existed to increase production or technological advances improved profitability, more soybeans could be produced in Virginia.

FEED DEFICIT

The difference between production and consumption of corn and soybeans in Virginia determines the overall grain deficit. The size of the deficit is important because it determines how much grain is imported from other states, particularly the Midwest. Over the past 25 years, increased corn consumption has caused a general rise in the deficit. During this time period, the average deficit has been 23 million bushels. In the past 10 years, the average deficit has been nearly 40 million bushels, an increase of over 65 percent (Figure 7 and Table 6). Over the past 5 years, the deficit has been between 41 and 58 million bushels. The peak deficit year, 1993, was the result of low yields. Yield and acreage instability accounts for most of the variability in the deficit. The large deficit and the continued deficit growth are important concerns for Virginia agriculture. The fact that animal numbers are increasing while grain production has remained relatively constant in recent years clearly indicates that corn is coming from other states.

Figure 7. Virginia Corn Deficit: 1970-1997

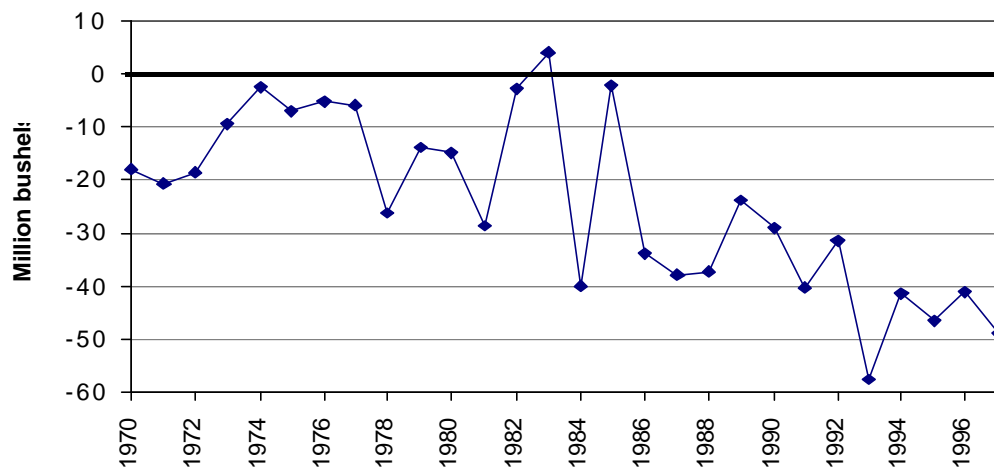


Table 6. Yearly Corn Deficit: 1970-1997

Year	Production	Consumption	Deficit
-----Thousand bushels-----			
1970	34,188	52,032	-17,844
1971	31,756	52,549	-20,793
1972	32,640	51,268	-18,628
1973	41,666	50,876	-9,210
1974	47,299	49,732	-2,433
1975	45,603	52,597	-6,994
1976	51,307	56,597	-5,290
1977	50,311	56,213	-5,902
1978	33,275	59,577	-26,302
1979	52,289	66,086	-13,797
1980	51,071	65,957	-14,886
1981	32,741	61,512	-28,771
1982	57,708	60,363	-2,655
1983	62,896	58,731	+4,165
1984	16,316	56,443	-40,127
1985	54,450	56,548	-2,098
1986	21,600	55,335	-33,735
1987	20,475	58,290	-37,815
1988	23,305	60,391	-37,086
1989	40,150	64,004	-23,854
1990	36,500	65,483	-28,983
1991	28,140	68,450	-40,310
1992	41,794	73,110	-31,316
1993	17,100	74,608	-57,508
1994	34,300	75,658	-41,358
1995	30,525	77,025	-46,500
1996	39,060	80,084	-41,024
1997	30,225	79,342	-49,087

Source: Deficit calculated using VASS production and calculated consumption.

The soybean industry in the state of Virginia has been in a deficit situation for much of the past 25 years as well, averaging around 8.5 million bushels. However, over the past 10 years the average has been close to 13 million bushels which is nearly 35 percent more than the 25 year average. Deficits over the past 5 years have ranged from 12 to nearly 20 million bushels (Figure 8 and Table 7). The deficit reached an all-time high in 1997 at nearly 20 million bushels.

Figure 8. Soybean Deficit: 1970-1997

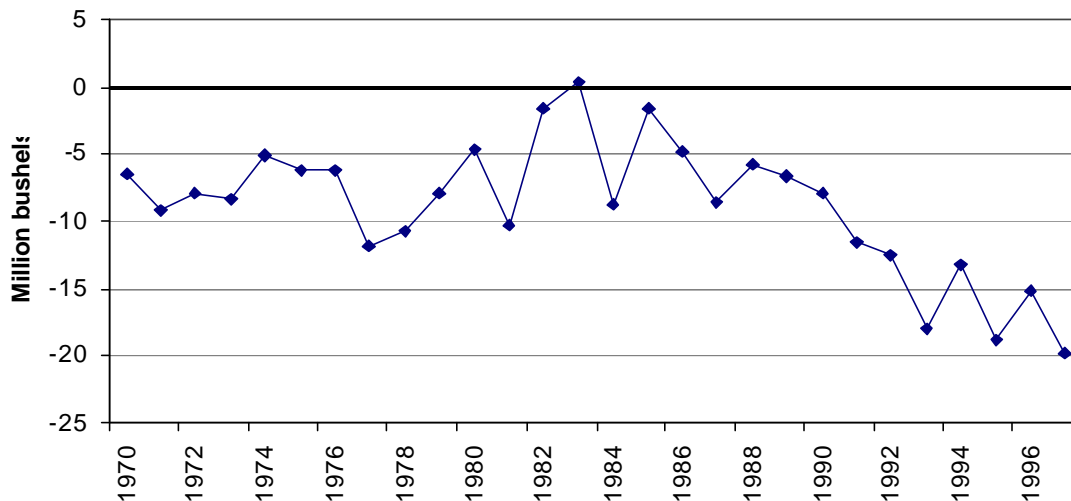


Table 7. Yearly Soybean Deficit: 1970-1997

Year	Production	Consumption	Deficit
	-----Thousand bushels-----		
1970	9,380	15,873	-6,493
1971	6,770	15,939	-9,169
1972	7,834	15,764	-7,930
1973	7,383	15,689	-8,306
1974	10,272	15,358	-5,086
1975	10,305	16,527	-6,222
1976	11,500	17,775	-6,275
1977	8,164	19,939	-11,775
1978	8,352	19,119	-10,767
1979	13,300	21,136	-7,836
1980	15,277	19,979	-4,702
1981	9,156	19,421	-10,265
1982	17,786	19,333	-1,547
1983	19,256	18,890	+366
1984	9,765	18,454	-8,689
1985	17,375	18,963	-1,588
1986	13,680	18,481	-4,801
1987	10,780	19,356	-8,576
1988	14,420	20,275	-5,855
1989	17,280	23,978	-6,698
1990	16,800	24,743	-7,943
1991	14,500	26,007	-11,507
1992	15,500	27,963	-12,463
1993	10,780	28,763	-17,983
1994	16,640	29,902	-13,262
1995	11,280	30,145	-18,865
1996	16,320	31,498	-15,178
1997	11,270	31,116	-19,846

Source: Deficit calculated using VASS production and calculated consumption.

As with corn, the deficit in soybeans has risen since the mid- to late-1980s. A decrease in soybean acreage coupled with an increase in the poultry sector has caused this deficit. The deficit for the soybean industry is not as large as the corn deficit in bushels; however, the deficit for both equals about half the consumption. The lack of Virginia supply means that other states, like Ohio, Indiana, and Illinois, are capturing the economic gains from the demand for feedgrains in Virginia. The increasing deficit is likely to continue in the future unless economic incentives are put in place for Virginia grain producers to increase production.

REGIONAL ANALYSIS

Grain production and consumption is not evenly spread out across the state. To determine what areas were deficit versus surplus, Virginia was divided into seven regions using the Virginia Agricultural Statistics Service (VASS) crop reporting districts (Figure 9 and Table 8). Consumption was calculated based on the percentage of animals in each region according to the 1992 Census of Agriculture for Virginia data and annual county production data from the VASS.

Figure 9. Virginia Agricultural Statistics Service Crop Reporting District Map

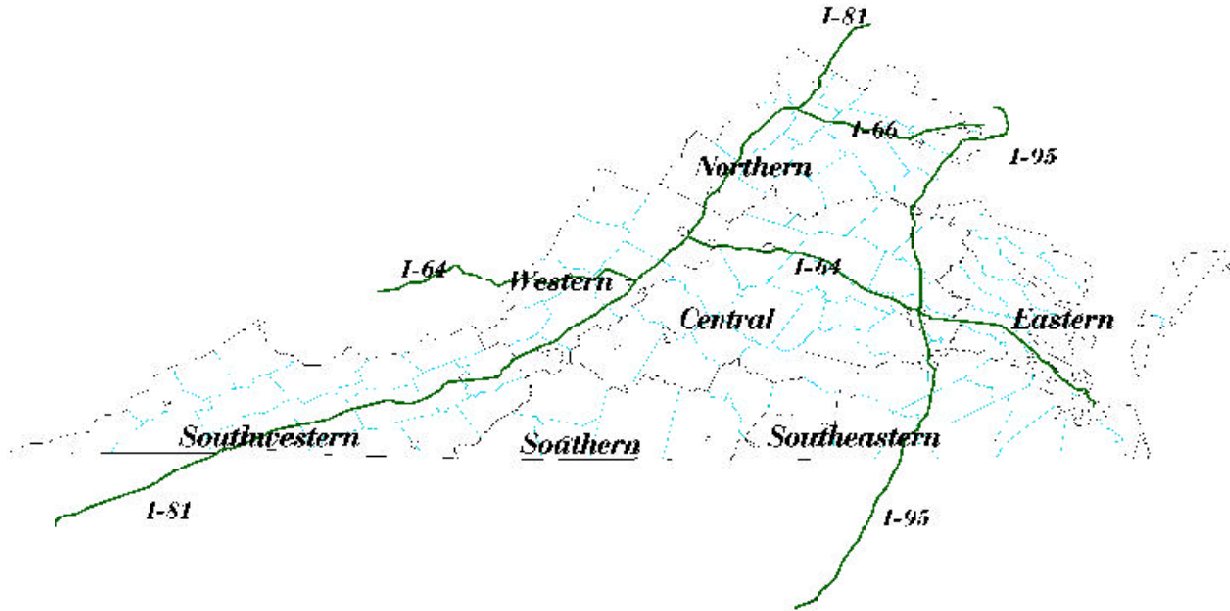


Table 9. Virginia Agricultural Statistics Service Regions

Northern	Eastern	Central	Southeastern	Southern	Southwestern	Western
Clarke	Accomack	Albemarle	Brunswick	Charlotte	Bland	Alleghany
Culpeper	Charles City	Amelia	Dinwiddie	Franklin	Buchanan	Augusta
Fairfax	Essex	Amherst	Greensville	Halifax	Carroll	Bath
Fauquier	Gloucester	Appomattox	Isle of Wight	Henry	Dickenson	Botetourt
Frederick	James City	Bedford	Mecklenburg	Lunenburg	Floyd	Craig
Loudoun	King and Queen	Buckingham	Prince George	Nottoway	Giles	Highland
Madison	King George	Campbell	Southampton	Patrick	Grayson	Roanoke
Page	King William	Caroline	Surry	Pittsylvania	Lee	Rockbridge
Prince William	Lancaster	Chesterfield	Sussex		Montgomery	
Rappahannock	Mathews	Cumberland	Chesapeake		Pulaski	
Rockingham	Middlesex	Fluvanna	Suffolk		Russell	
Shenandoah	New Kent	Goochland	Virginia Beach		Scott	
Warren	Northampton	Greene			Smyth	
	Northumberland	Hanover			Tazewell	
	Richmond	Henrico			Washington	
	Westmoreland	Louisa			Wise	
	York	Nelson			Wythe	
		Orange				
		Powhatan				
		Prince Edward				
		Spotsylvania				

The production, consumption, and deficit data by region in Tables 9 and 10 indicate the regions of the state that are grain deficit. The assumption was made that each region is self-contained and does not export or import any grain from other regions or states. Grain consumption was calculated by region for each livestock, dairy, and poultry sector.

Table 9. Regional Corn Deficits: 1993-97 and 1997

Region	1993-97			1997		
	Production	Consumption	Deficit	Production	Consumption	Deficit
-----Thousand bushels-----						
Northern	6,658	38,428	-31,770	6,524	39,716	-33,192
Western	1,432	8,193	-6,761	1,495	8,514	-7,019
Central	3,638	8,000	-4,362	3,668	7,969	-4,301
Eastern	9,391	4,041	+5,350	9,869	4,047	+5,822
Southwestern	1,185	3,903	-2,718	1,108	3,938	-2,830
Southern	1,108	2,801	-1,693	951	2,811	-1,860
Southeastern	6,830	6,955	-125	6,611	6,728	-117
TOTAL	30,248	72,322¹	42,074	30,255	79,342¹	49,087

¹ Regional consumption is approximately 93% of total state consumption because of disclosure problems in some counties.

Source: Deficit calculated using VASS production and calculated consumption.

Table 10. Regional Soybean Deficits: 1993-97 and 1997

Region	1993-97			1997		
	Production	Consumption	Deficit	Production	Consumption	Deficit
-----Thousand bushels-----						
Northern	741	16,050	-15,309	857	17,224	-16,367
Western	53	3,308	-3,255	51	3,575	-3,524
Central	1,612	2,697	-1,085	1,445	2,695	-1,250
Eastern	6,255	1,579	+4,676	4,806	1,610	+3,196
Southwestern	4	1,163	-1,159	0	1,194	-1,194
Southern	296	950	-654	282	966	-684
Southeastern	4,396	1,840	+2,556	3,825	1,730	+2,095
TOTAL	13,358	27,588¹	14,230	11,270	28,994¹	17,724

¹ Regional consumption is approximately 93% of total state consumption because of disclosure problems in some counties.

Source: Deficit calculated using VASS production and calculated consumption.

The Northern region of the state stands out because of its large deficit. Over the past 5 years, the Northern region has, on average, accounted for 53 percent of total corn consumption and 58 percent of total soybean consumption. This region includes the Shenandoah Valley, where much of Virginia's poultry sector is located. The Western and Central regions have each averaged 11 percent of total Virginia corn consumption. The Western region accounted for 12 percent of soybean consumption in the past 5 years and the Central region 10 percent. Regional consumption of corn and soybeans by sector for years 1989 to 1997 is reported in the Appendix.

Production of corn and soybeans are dominated by the Eastern region. Over the past 5 years, the Eastern region has produced 31 percent of the corn and 47 percent of the soybeans in the state, making it the largest production region for both. The Southeastern region was the second largest producer of corn from 1993 to 1997 with 23 percent, and the Northern region was third with 22 percent. For soybeans, the Southeast region was second in regional production with 33 percent, and the Central region was third with 12 percent.

In the past five years, the Eastern region is the only region which has consistently met its own corn and soybean needs. Consistently, the Southeastern region has met its own needs for soybeans but has had a corn deficit over 100,000 bushels.

SUMMARY AND IMPLICATIONS

The livestock, poultry, and dairy sectors in Virginia consume nearly twice as much corn and soybeans as is produced in the state. In the past decade, the deficit has not only increased, but it has done so at an increasing rate. The deficit will continue to grow as the poultry sector continues to grow and grain production remains constant. In the last ten years, poultry has increased in the state while the number of dairy cows and hogs have decreased. Although the horse sector is one of the smallest, it has increased steadily in the past decade and is expected to continue to increase.

Much of the consumption and production of corn and soybeans in Virginia occurs in two regions separated by the Blue Ridge mountains. Consumption occurs mostly in the Shenandoah Valley and production occurs primarily east of Interstate 95 from Fredericksburg to Emporia (Figure 9). These two regions are very different. The consuming region is growing and is characterized by a few, large, integrated poultry firms. The production region is stagnant and consists of many independent producers. Although these two regions are only 100 to 150 miles apart, very little grain moves between them. The Valley region generally finds it more economical to import feed by rail from the Midwest than to buy grain shipped by truck from Eastern Virginia.

Some of the characteristics of these two regions help identify the current situation and suggest some possible opportunities for the future that might benefit both sectors. The consumption sector in the Valley is dominated by the highly integrated poultry sector, which make their own feed. The demand for feed from independent feed dealers is declining because they generally serve sectors that are not growing. These trends are expected to continue in the near future.

The large integrated firms have less than one-week storage capacity for grain. Therefore, the integrators must have a regular, consistent supply of grain, which they import by rail from the Midwest. These large quantities of grain arriving in the Shenandoah Valley mean that a large volume of nutrients, specifically nitrogen and phosphorous, are being imported into the region as well. Sufficient cropland acreage does not exist in close proximity to poultry production to permit the land application of all these nutrients in an environmentally sound way. Hence, these nutrients must be shipped out of the poultry production region to be used as feed, fertilizer, or both. If the poultry sector is to continue to grow in the Valley, an increasingly larger portion of the poultry litter will need to be shipped out of the counties where the poultry is produced.

Grain production in Eastern Virginia in acreage and total bushels produced has declined over the last 20 years. The decline in production provides little incentive to expand or upgrade existing grain handling facilities. In addition, the decline in hog production in the Eastern region has resulted in excess feed manufacturing capacity. Unless these two trends change direction, grain handlers in the Eastern region have little incentive to improve the grain assembly, storage, and distribution system.

The large feed demand and surplus nutrients in the Shenandoah Valley and the surplus of grain in Eastern Virginia would seem to indicate that these two sectors should be able to work together to improve the economic well being of both sectors. The magnitudes and location of the feed deficits and surpluses

have been identified in this study. Additional research needs to be done to determine if a mutually beneficial arrangement of shipping grain from Eastern Virginia to the Valley and litter from the Valley to Eastern Virginia can be designed. Such an arrangement would have to address several key issues. The poultry sector needs to have a regular supply of high quality grain. To be interested in truck shipments from Eastern Virginia, the poultry sector would need a commitment of a consistent weekly supply over a number of years. The poultry sector would need to design a system for accumulating litter to be shipped to Eastern Virginia. Producers would need to know the nutrient content of the litter so that appropriate application rates could be guaranteed. Some storage for litter would be needed since crop producers apply fertilizer at specific times while litter is produced almost continuously. Sanitation considerations could arise from hauling grain and litter in the same trucks. These and other issues are currently being studied to determine if such a system is possible.

The existence of surplus grain manufacturing capacity in the Eastern part of the state would seem to indicate that expansion of the poultry or swine sector in Central or Eastern Virginia could increase the demand for grain, utilize existing excess feed manufacturing capacity, and create additional income opportunities for farmers. With the reduction in tobacco allotments, many producers may be looking for additional income sources. Contract feeding of poultry, swine, or both may be a possibility.

The deficit in corn and soybean production relative to consumption is likely to grow in Virginia in the future. The rate at which the deficit grows will depend on the factors previously mentioned and cooperative efforts to provide solutions to these problems. Identifying these solutions will require cooperation among researchers and the associations representing the poultry and grain sectors, private businesses, and entrepreneurs. It has been said “great opportunities are often brilliantly disguised as unsolvable problems” (anonymous). A cooperative effort between the grain and poultry sectors in Virginia could very well be that “great opportunity.”

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APPENDIX: REGIONAL CORN AND SOYBEAN CONSUMPTION

Regional Corn Consumption by Livestock , Dairy and Poultry Sector: 1989-1997

----- bushels -----									
Northern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	621	551	541	546	549	543	567	602	628
Broilers	13,410	14,659	16,365	17,342	18,601	19,652	19,798	20,579	20,173
COF	613	498	517	536	593	613	613	555	479
Dairy	4,556	4,462	4,689	4,437	4,335	4,172	4,191	4,109	3,922
Hogs	582	587	575	598	568	558	481	468	492
Horses	630	719	807	896	985	1,074	1,162	1,251	1,347
Layers	1,585	1,659	1,659	2,157	1,788	2,074	1,985	2,190	2,045
Turkeys	6,992	6,954	7,112	7,973	8,633	9,000	9,708	10,429	10,631
TOTAL	28,989	30,089	32,266	34,485	36,053	37,685	38,504	40,183	39,716
Western	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	320	283	279	281	283	280	292	310	323
Broilers	911	996	1,112	1,178	1,263	1,335	1,345	1,398	1,370
COF	271	221	229	237	263	271	271	246	212
Dairy	1,641	1,608	1,689	1,598	1,562	1,503	1,510	1,480	1,413
Hogs	126	127	124	129	122	120	104	101	106
Horses	166	189	212	236	259	282	306	329	354
Layers	797	834	834	1,084	899	1,043	998	1,101	1,028
Turkeys	2,439	2,426	2,481	2,781	3,011	3,139	3,386	3,638	3,708
TOTAL	6,670	6,683	6,959	7,525	7,662	7,973	8,211	8,603	8,515
Central	1989	1990	1991	1992	1993	1994	1995	1996	1,997
Beef Cattle	660	585	575	580	584	577	602	640	668
Broilers	1,583	1,731	1,932	2,048	2,196	2,320	2,338	2,430	2,382
COF	445	362	375	389	431	445	445	403	348
Dairy	3,651	3,576	3,758	3,556	3,474	3,343	3,359	3,293	3,143
Hogs	306	308	302	314	298	293	252	246	258
Horses	415	473	531	590	648	707	765	823	886
Layers	220	231	231	300	248	288	276	304	284
Turkeys	0**	0	0	0	0	0	0	0	0
TOTAL	7,280	7,265	7,705	7,777	7,880	7,974	8,037	8,140	7,969
Eastern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	24	21	21	21	21	21	22	23	24
Broilers	1,746	1,908	2,130	2,258	2,422	2,558	2,577	2,679	2,626
COF	26	21	22	23	25	26	26	23	20
Dairy	1,135	1,111	1,168	1,105	1,080	1,039	1,044	1,024	977
Hogs	290	293	287	298	283	279	240	233	245
Horses	71	81	91	101	111	121	131	141	151
Layers	3	3	3	4	3	4	4	4	4
Turkeys	0	0	0	0	0	0	0	0	0
TOTAL	3,294	3,438	3,721	3,809	3,944	4,047	4,042	4,127	4,047

Regional Corn Consumption by Livestock , Dairy and Poultry Sector: 1989-1997 (continued)

----- bushels -----									
	1989	1990	1991	1992	1993	1994	1995	1996	1997
Southwestern									
Beef Cattle	792	702	690	696	701	693	723	768	801
Broilers	722	790	881	934	1,002	1,058	1,066	1,108	1,087
COF	540	439	456	473	523	540	540	628	422
Dairy	932	912	959	907	886	853	857	840	802
Hogs	56	57	56	58	55	54	46	45	48
Horses	359	409	459	510	561	611	661	712	766
Layers	9	10	10	12	10	12	11	13	12
Turkeys	0	0	0	0	0	0	0	0	0
TOTAL	3,410	3,319	3,510	3,591	3,738	3,821	3,906	4,115	3,938
Southern									
Beef Cattle	306	272	267	269	271	268	280	297	310
Broilers	716	782	874	926	993	1,049	1,057	1,098	1,077
COF	237	193	200	208	230	237	237	215	185
Dairy	562	550	578	547	535	514	517	507	484
Hogs	301	303	297	309	293	288	248	241	254
Horses	105	120	135	150	165	179	194	209	225
Layers	185	193	193	251	208	242	231	255	238
Turkeys	25	25	26	29	31	33	35	38	38
TOTAL	2,437	2,439	2,570	2,688	2,725	2,810	2,799	2,861	2,811
Southeastern									
Beef Cattle	134	118	116	117	118	117	122	130	135
Broilers	322	352	393	416	446	471	475	494	484
COF	86	70	73	75	84	86	86	78	67
Dairy	1,282	1,256	1,320	1,249	1,220	1,174	1,179	1,156	1,104
Hogs	5,427	5,473	5,364	5,575	5,290	5,205	4,480	4,360	4,582
Horses	96	109	123	136	150	163	177	190	205
Layers	117	122	122	159	132	153	147	162	151
Turkeys	0	0	0	0	0	0	0	0	0
TOTAL	7,463	7,501	7,511	7,728	7,440	7,370	6,666	6,570	6,728
*All Disclosed	59,542	60,734	64,242	67,602	69,443	71,681	72,165	74,598	73,724
TOTAL	64,004,000	65,483,000	68,450,000	73,110,000	74,608,000	75,658,000	77,025,000	80,084,000	79,342,000

*All Disclosed is not equal to total due to reporting disclosure regulations. All Disclosed is approximately 93% of Total.

**Zeros indicate less than 1,000 bushels.

Regional Soybean Consumption by Livestock, Dairy and Poultry Sector: 1989-1997

	-----bushels-----								
Northern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	146	144	142	144	144	143	149	158	165
Broilers	6,071	6,636	7,409	7,850	8,420	8,896	8,962	9,316	9,132
COF	96	78	81	84	93	96	96	87	66
Dairy	1,531	1,499	1,576	1,490	1,457	1,401	1,401	1,380	1,318
Hogs	132	132	129	133	126	123	105	102	107
Horses	122	138	155	174	191	209	225	23	261
Layers	606	635	560	825	684	792	722	838	780
Turkeys	3,548	3,529	3,608	4,045	4,380	4,566	4,926	5,292	5,394
TOTAL	12,252	12,792	13,660	14,747	15,496	16,227	16,586	17,196	17,224
Western	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	75	74	73	74	74	74	77	81	85
Broilers	412	451	450	533	572	604	609	633	620
COF	43	35	36	37	41	43	43	39	29
Dairy	552	540	568	537	525	505	505	497	475
Hogs	29	29	28	29	27	27	23	22	23
Horses	32	36	41	46	50	55	59	64	69
Layers	304	319	282	415	344	398	363	421	392
Turkeys	1,237	1,231	1,259	1,411	1,528	1,593	1,718	1,846	1,881
TOTAL	2,684	2,715	2,736	3,082	3,162	3,298	3,395	3,603	3,575
Central	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	156	154	151	153	153	152	158	168	175
Broilers	717	784	875	927	994	1,050	1,058	1,100	1,078
COF	70	57	59	61	68	70	63	63	48
Dairy	1,227	1,202	1,263	1,194	1,168	1,123	1,123	1,106	1,056
Hogs	69	70	68	70	66	65	55	53	56
Horses	80	91	102	114	126	137	148	160	172
Layers	84	88	78	115	95	110	100	116	108
Turkeys	0**	0	0	0	0	0	0	0	0
TOTAL	2,403	2,444	2,595	2,635	2,670	2,707	2,706	2,767	2,695
Eastern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	6	5	5	5	5	5	6	6	6
Broilers	790	864	964	1,022	1,096	1,158	1,167	1,213	1,189
COF	4	3	3	4	4	4	4	4	3
Dairy	381	373	393	371	363	349	349	344	328
Hogs	66	66	64	66	63	61	52	51	53
Horses	14	16	17	20	22	23	25	27	29
Layers	1	1	1	1	1	1	1	1	1
Turkeys	0	0	0	0	0	0	0	0	0
TOTAL	1,262	1,329	1,448	1,490	1,554	1,603	1,604	1,646	1,610

Regional Soybean Consumption by Livestock, Dairy and Poultry Sector: 1989-1997 (continued)

	----- bushels -----								
Southwestern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	187	184	181	184	184	182	190	202	210
Broilers	327	357	399	423	454	479	483	502	492
COF	85	69	71	74	82	85	85	77	58
Dairy	313	307	322	305	298	287	286	282	270
Hogs	13	13	12	13	12	12	10	10	10
Horses	69	78	88	99	109	119	128	138	149
Layers	3	4	3	5	4	5	4	5	5
Turkeys	0	0	0	0	0	0	0	0	0
TOTAL	997	1,012	1,078	1,102	1,142	1,168	1,186	1,215	1,194
Southern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	72	71	70	71	71	71	74	78	81
Broilers	324	354	395	419	449	475	478	497	487
COF	37	30	31	33	36	37	37	34	26
Dairy	189	185	194	184	180	173	173	170	163
Hogs	68	68	66	69	65	63	54	53	55
Horses	20	23	26	29	32	35	38	41	44
Layers	71	74	65	96	80	92	84	98	91
Turkeys	13	13	13	15	16	16	18	19	19
TOTAL	794	819	862	915	929	963	956	989	966
Southeastern	1989	1990	1991	1992	1993	1994	1995	1996	1997
Beef Cattle	31	31	31	31	31	31	32	34	35
Broilers	146	159	178	188	202	213	215	223	219
COF	14	11	11	12	13	14	14	12	9
Dairy	431	422	443	419	410	394	394	389	371
Hogs	1,234	1,235	1,200	1,242	1,172	1,146	979	948	998
Horses	19	21	24	26	29	32	34	37	40
Layers	45	47	41	61	51	58	53	62	58
Turkeys	0	0	0	0	0	0	0	0	0
TOTAL	1,919	1,926	1,929	1,980	1,907	1,888	1,722	1,705	1,730
*All Disclosed	22,311	23,036	24,307	25,950	26,860	27,854	28,155	29,121	28,994
TOTAL	23,978	24,743	26,007	27,963	28,763	29,902	30,145	31,498	31,116

*All Disclosed is not equal to total due to reporting disclosure regulations. All Disclosed is approximately 93% of Total.

**Zeros indicate less than 1,000 bushels.