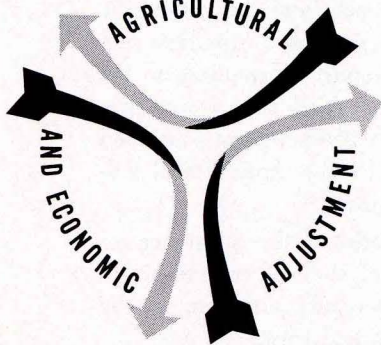# Production, Price and Income Estimates and Projections for the Feed-Livestock Economy Under Specified Control and Market-Clearing Conditions

by Geoffrey Shepherd, Arnold Paulsen, Francis Kutish,
Don Kaldor, Richard Heifner and Gene Futrell

AGRICULTURAL AND ECONOMIC ADJUSTMENT

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FOREWORD

Early in 1959, the Dean of Agriculture's Advisory Committee recommended that Iowa State University make (1) estimates of the prices for feed grains and livestock that would have existed if no price support programs had been in effect over the past 8 or 10 years, and (2) projections of what would happen in the feed-livestock economy during the next few years if the programs were abolished now.

A similar request was made by the Interstate Farmers' Study Group in a meeting sponsored by the Center for Agricultural and Economic Adjustment.

Staff members of the Economics and Sociology Department and the Center for Agricultural and Economic Adjustment prepared a report in response to the first suggestion, (1) above, Oct. 22, 1959. They prepared another report in response to the second suggestion, (2) above, Dec. 1, 1959. In addition, a third report was prepared containing projections for the next few years with the 1959 program continued unchanged. The three reports were presented before the Dean's Agricultural Advisory Committee and the Interstate Farmers' Group in December.

A number of newspapers and weekly magazines reprinted the substance of these reports. Numerous requests for copies of the original studies were received. Therefore, it was decided to bring the three reports together, add a section on the effects on retail prices, and publish the three studies in printed form.

The authors' estimates in this bulletin are not forecasts; they are projections, based upon assumptions, which are specified in the bulletin. Only information published before Dec. 15, 1959, was available to the authors in making the projections. These reports have not been revised in light of more recent information.

The bulletin includes no policy recommendations. The function of an Experiment Station is simply to assemble and analyze the facts related to important economic problems, and publish estimates of the effects of alternative policies, so that the public can most wisely make decisions concerning the policies they want.

Floyd Andre
Dean and Director
College of Agriculture

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SUMMARY

This report includes estimates made for the purpose of answering three questions:

1. *What would the production, prices, and revenues of grains and livestock have been from 1952 to 1958 if feed grain and wheat stocks had been held at their 1952 levels?*

The analysis in this report leads to the following findings: The feed grains that went into stocks would have been fed to livestock. The consumption of feed grains by livestock would have had to be 6.3 percent greater than it was. If the increases in the stocks of wheat had also been fed, the consumption of grains by livestock would have increased 10.3 percent. The estimates of the effects on grain and livestock prices of feeding these extra quantities are given in table A.

TABLE A. UNITED STATES AVERAGE FARM PRICE OF LIVESTOCK AND GRAIN PRODUCTS, ACTUAL, AND ESTIMATED WITH HIGHER LEVELS OF FEED CONSUMPTION, 1952-58.*

	Actual average prices	Estimated average prices with grain consumption increased	
		6.3 percent	10.3 percent
Beef cattle, average price received by farmers, $ per cwt.	18.03	17.15	16.59
Hogs, average price received by farmers, $ per cwt.	18.23	14.77	12.58
Corn, $ per bushel, at a 1:13 ratio to hog prices	1.32	1.13	0.97

*See table 3, page 8, for a more extensive listing of products.

The decreases in prices estimated above would have reduced total agricultural cash receipts about 10.6 percent. Cash expenses would have decreased only about 1.2 percent. Total net cash income from farming would have decreased about 34 percent.

Retail prices for livestock products would have declined, per capita consumption would have increased, and expenditures for these foods by an average family of four would have decreased about 6 percent.

2. *What would happen to prices and incomes over the next few years if the 1959 program were continued unchanged?*

In investigating this question, several assumptions were made. These include continued growth of population and income per capita, average weather, increases in crop yields according to trend, and 37 million acres in the conservation reserve by 1962.

Under these assumptions, it was estimated that production of feed grains would decline in 1960 to about the 1958 level and then expand as yields per acre increased. Livestock production would expand somewhat; grain stocks would increase steadily. Prices of livestock would decline to the levels shown in table B.

TABLE B. UNITED STATES AVERAGE FARM PRICE, 1958-59 ACTUAL AND 1961-62 PROJECTED, WITH CURRENT FARM PROGRAMS CONTINUED.

	1958	1959	1961	1962
Hogs ($/cwt.)	19.00	14.50	16.00	14.50
Beef cattle ($/cwt.)	21.00	22.50	20.00	17.50
Eggs (cents/doz.)	38	32	30	30

Retail prices for livestock would decline and consumption of red meat, poultry and milk per capita would increase considerably. If marketing margins continue to rise as in the past, total expenditures by a family of four on livestock products would remain about constant.

3. *What would happen to production, prices and incomes over the next few years if price supports were abandoned and stocks held at their present levels?*

The assumptions in this case with respect to the general economy, weather and yields were the same as those under question 2. Several other crucial assumptions are listed below:

a. The present stocks of feed grains, wheat, and cotton would not be reduced during the period.

b. Export subsidies on agricultural commodities would be eliminated.

c. The conservation reserve would continue through the 1960 crop year with an additional 5 million acres added in 1960 to bring the total to 28 million acres. No new contracts would be signed for 1961 or later years. Old contracts would not be renewed as they expired.

Under these assumptions, it was estimated that prices would decline to the levels shown in table C.

TABLE C. PRICES OF LIVESTOCK AND GRAIN PRODUCTS, 1957-59 ACTUAL AND 1960-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

	1957-58	1958-59	1960-61	1962-63
Livestock				
Hogs ($/cwt.)	19.00	15.70	14.20	11.00
Beef cattle ($/cwt.)	21.90	23.00	20.90	12.00
Crops				
Corn ($/bu.)	1.12	1.13	.79	.66
Wheat ($/bu.)	1.93	1.72	1.67	.74

Under these assumptions, it was estimated that production of the four traditional feed grains would be below the 1958 and 1959 levels. Wheat and cotton production would expand. Wheat would become a feed grain. Total feed grain production including wheat would expand steadily until 1962. Total feed grain would be about as large, with average weather, as the high production of 1959.

Utilization of feed grains in all outlets would expand. Livestock production and slaughter would expand in response to lower feed grain prices. Since livestock marketings would expand faster than population, prices would fall. The estimated prices of selected livestock and grain are shown in table C. (Table 21 has a more complete listing.)

By 1962-63, the estimated value of all livestock and livestock products marketed would be about 21 percent below the value of all livestock and livestock products marketed in 1958-59.

With marketing margins continuing to rise, retail prices of livestock would decline, total consumption per capita would increase, and expenditures of an average family of four for livestock products would decline 6.7 percent or about $46 per year from 1959 to 1963.

Production, Price and Income Estimates and Projections for the Feed-Livestock Economy Under Specified Control and Market-Clearing Conditions[1]

BY GEOFFREY SHEPHERD, ARNOLD PAULSEN, FRANCIS KUTISH, DON KALDOR,

RICHARD HEIFNER AND GENE FUTRELL

This report presents the findings of three separate but related studies of the feed-livestock economy. Each study focused on prices, production and income under a given set of conditions. However, the conditions assumed for each study differed in important respects.

The first study estimated what livestock production, prices and income would have been during the 1952 to 1958 crop years if the quantity of grain added to stocks in this period had been fed to livestock. The increase in stocks consisted of nearly 45 million tons of feed grains and more than 1 billion bushels of wheat.

The second study projected what prices, production and income would be in the feed-livestock economy from 1960 to 1962 if existing price support-production control programs were continued unchanged and other specified conditions were fulfilled. A continuation of present programs is one possible course of future government action.

The third study projected what prices, production and income would be from 1960 to 1962 if price support—production control programs were abandoned and other specified conditions were fulfilled. A return to free market pricing of farm products is another possible course of future government action.

Many relationships within the feed-livestock economy are known very imperfectly. This is especially true of supply relationships. As a result, it was necessary to make judgments about the characteristics of many of the relationships involved in these studies. While these judgments were based on the best available information, only meager information was available in some instances. For this reason, the estimates and projections are only rough approximations of the "true" values under the conditions specified.

It should be clearly understood that the projections for the 1960-62 period are not forecasts. They are the result of working through the consequences of the assumed conditions and the likely relationships in the feed-livestock economy. If these conditions were altered, the results would be different. While in each case the program condition was imposed, other conditions were selected because they were thought to be more realistic than their alternatives. However, here again a large element of judgment entered the selection. Reasonable people might well disagree about the realism of some of these conditions, and this is to be expected.

THE 1952-58 PERIOD

ESTIMATED EFFECTS OF NO FEED GRAIN STOCK ACCUMULATION FROM 1952 TO 1958 ON THE FEED-LIVESTOCK ECONOMY

A serious imbalance has existed in the domestic markets for feed grains since the end of the Korean War. Output has persistently exceeded market demand at support prices. As a result, there has been a rapid increase in stocks. Expanding feed grain production and a growing stockpile have made for record-breaking supplies of feed concentrates (fig. 1).

Each year from 1952 to 1958, from 4 to 10 million tons of feed grains were added to the carryover. The average addition to carryover was 6.3 percent of average total consumption of grain by livestock over that period. What would have happened if this additional grain had been fed to livestock?

Grain consumption would have increased but not by the same percentage for all classes of livestock. The production of some kinds of livestock is more easily expanded than others. Furthermore, feed grains constitute a different percentage of the total feed for each kind of livestock.

In allocating the additional grain among the different classes of livestock, differences in production response to changes in feed supplies and feed grain costs were
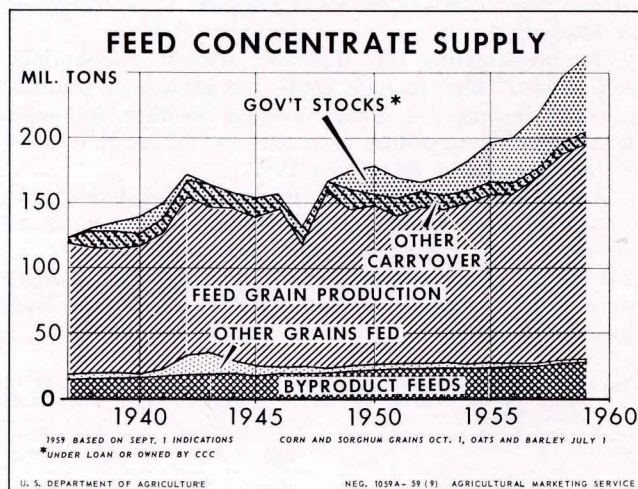

Fig. 1. Supply of feed concentrates, 1937-59.

taken into account. This was done on the basis of judgment, since there was a lack of satisfactory statistical estimates of these production response relationships.

The additional grain was allocated to classes of livestock as follows: beef, 15 percent; pork, 60 percent; lamb and mutton, 1 percent; poultry meat, 14 percent; eggs, 5 percent; dairy, 5 percent; and other livestock, 0 percent. It was estimated that about 60 percent of the increase in the supply of feed grains would have been fed to hogs. Hogs are the largest users of feed grain and historically have responded most to changes in feed grain supply and price. The next largest share, 15 percent, would have gone to beef cattle. The increase in the production of beef cattle would have been comparatively small, however. Feed grain is a small portion of the total feed required for the nation's beef herd, and the supply of range land where most beef cattle are produced is rather fixed. Even if wheat prices were very low for several years and promised to continue low, so that some wheat land in the West would have been put back into grass, few additional cattle would have been produced on this range land during the 1952-58 period. However, it seems likely that with lower grain prices there would be some substitution of grain for roughage in beef production, mainly through an increase in the number of cattle on feed.

The farm products that would exhibit the greatest response to larger feed grain supplies probably are hogs, broilers and turkeys. The number of hogs and turkeys could be increased within a year and the number of broilers in about 3 months. Feed grains make up a large portion of the total ration of hogs and poultry, so a decline in feed grain prices would quickly stimulate production. It seems likely that a large share of the increase in consumption of feed grains and production of meat would have gone to these classes of livestock.

Once the additional grain is allotted to the various kinds of livestock, the resulting increase in livestock production can be estimated. If rations remained fixed in proportions and the rate of feed conversion did not change, the percentage increase in livestock production would equal the percentage increase in grain consumption. However, fixed rations would imply that consumption of all other feeds—i.e., roughages, by-product feeds, etc.—would have increased by the same percentage as grain consumption. Obviously, there would have been some substitution of grain for these other feeds in the livestock rations. It appears reasonable to assume that the consumption of these other feeds would have remained constant for each type of livestock. On this basis, the increase in total feed consumption resulting from the feeding of the additional grains was computed for each class of livestock and used to estimate production.

It was assumed that the efficiency of feed conversion for total feed would have remained constant over the period for each type of livestock. Therefore, the percentage increase in feed consumption by each type of livestock would bring about an equal percentage increase in production. Actually, in the short run, the efficiency of feed conversion would probably decline, since much of the extra feed would be used to carry livestock to heavier weights where feeding is less efficient. Over a 7-year period, however, farmers would have had time

to increase livestock numbers. It is believed that most of the extra feed would have been fed to extra livestock where feeding efficiency would not have been reduced.

Estimates of the relative levels of livestock production, livestock prices and returns from sales of livestock are shown in table 1. The changes in prices and income depend upon how much prices respond to changes in quantities of livestock products on the market. It seems reasonable to assume that marketings would change by the same percentage as liveweight production over the 7-year period. Prices were estimated using price flexibility estimates by other research workers.[2]

TABLE 1. ESTIMATED RELATIVE PRODUCTION, PRICES AND RETURNS FROM SALES OF LIVESTOCK PRODUCTS RESULTING FROM A 6.3 PERCENT INCREASE IN GRAIN CONSUMPTION, 1952-58.

	Beef and veal	Pork	Lamb and mutton	Poultry meat	Eggs	Dairy products	Other livestock	All livestock
1. Estimated relative production	101.0	107.3	100.5	106.0	101.8	100.3	100.0	102.5
2. Estimated relative price	95.1	81.0	96.6	86.6	87.1	98.1	100.0	....
3. Estimated relative returns from sales	96.1	86.9	97.1	91.8	88.7	98.4	100.0	93.9

(In percentages)

The figures in row 2 show the estimated relative prices for each kind of livestock if the increase in feed grain stocks had instead been fed to livestock.

The prices of all livestock and livestock products would have been lower from 1952 to 1958 if farmers had fed their feed grain stocks. For example, although total beef consumption would have had to increase only 1.0 percent, or less than 1 pound per person per year, the prices of cattle would have been 4.9 percent lower. This is largely because pork supplies would have been larger. Beef prices would have declined, thus preventing a reduction in beef consumption due to a substitution of pork for beef.

Pork prices would have declined 19.0 percent, chiefly because the quantity of pork would have increased sharply (7.3 percent). Prices of eggs and poultry would have declined about 13 percent, largely because all meats would have been in large supply and cheaper than usual. Poultry and eggs apparently are "fill-in" foods for red meat, and their prices decline sharply as "all meat" supplies increase.

The estimated decline in income from the sale of livestock and livestock products is 6.1 percent. Because production would have increased, gross income is not reduced as much as prices.

Estimated Effects of No Feed Grain and Wheat Stock Accumulation From 1952 to 1958 on the Feed-Livestock Economy

So far we have considered only feed grains. It is rather likely, however, that if price supports had not been high enough to increase the stocks of feed grains, price supports for wheat would not have been high enough to increase the stocks of wheat either. That is, if farmers had put all of the current production of feed

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[2]See Appendix A for explanations of the computational procedure and Appendix B for the coefficients employed.

grains on the market from 1952 to 1958, they would have done the same for wheat. In that case, the price of wheat would have declined to feed grain levels, and large quantities of wheat would have been fed.

One way to estimate how much wheat would have been fed would be to assume as with feed grains that all the increase in storage after 1952 would instead have been fed to livestock. This assumption is made because the demand for wheat for human food is inelastic. Hardly any more would have been used for domestic human food even at very low prices. If the United States had cut the price of wheat in foreign markets, Canada, Argentina and Australia probably would have matched our price cuts, and the United States would have sold only a little more abroad. The total world demand for wheat is believed to be rather inelastic. Zero elasticity was used in computations, although this overstates the consumption of wheat by livestock slightly.

ESTIMATED EFFECTS OF 10.3 PERCENT MORE GRAIN CONSUMPTION ON LIVESTOCK PRODUCTION, PRICES AND INCOMES

The effects of combining the net additions to wheat storage from 1952 to 1958 with the 6.3 percent increase in feed grains are shown in table 2. Total grain consumption by livestock would have been 10.3 percent larger than it actually was.

TABLE 2. ESTIMATED RELATIVE PRODUCTION, PRICES AND RETURNS FROM SALES RESULTING FROM A 10.3 PERCENT INCREASE IN GRAIN CONSUMPTION 1952-58.

	Beef and veal	Pork	Lamb and mutton	Poultry meat	Eggs	Dairy products	Other live-stock	All live-stock
	(In percentages)							
1. Estimated relative production	101.6	111.9	100.8	109.8	103.0	100.6	100.0	104.1
2. Estimated relative price	92.0	69.0	94.4	78.1	78.7	96.4	100.0	....
3. Estimated relative returns from sales	93.5	77.2	95.2	85.8	81.1	97.0	100.0	89.5

Hog production would have been about 12 percent larger during the period, and poultry production about 10 percent larger. The nation's farms had the capacity to produce this volume of livestock without difficulty. However, the total value of the larger pig crops would have been about 22.8 percent lower than the value of the smaller actual pig crops that were produced in 1952-58. The total value of all livestock production would have been reduced about 10.5 percent.

The preceding estimates are all expressed in percentage terms. The relative price estimates from row 3 in tables 1 and 2 are converted to dollars and cents in table 3.

The first column in table 3 shows the actual United States average farm prices for the principal livestock and livestock products over the period 1952-58. The second column shows estimates of prices if feed grain price supports had not been in effect (or had been set at substantially lower levels) and feed grain stocks had been maintained at their 1952 levels (the increase in stocks after 1952 having been fed to livestock). The third column shows the effects if wheat stocks had also been

TABLE 3. UNITED STATES AVERAGE FARM PRICE OF LIVESTOCK AND GRAIN PRODUCTS. ACTUAL, AND ESTIMATED WITH HIGHER LEVELS OF FEED CONSUMPTION, 1952-58.

Product	Actual average prices	Estimated average prices with increased grain consumption of	
		6.3 percent	10.3 percent
Beef cattle, average price received by farmers, $ per cwt.	18.03	17.15	16.59
Hogs, average price received by farmers, $ per cwt.	18.23	14.77	12.58
Lambs, average price received by farmers, $ per cwt.	20.07	19.39	18.95
Broilers, ¢ per lb.	.23	.20	.18
Eggs, ¢ per dozen	39.7	34.58	31.24
Milk eligible for fluid market, $ per cwt.	4.73	4.64	4.56
Corn, $ per bushel, at a 1:13 ratio to hog prices	1.32	1.13	0.97

held at 1952 levels, with the increase in wheat stocks also fed to livestock.

ESTIMATED EFFECTS OF NO FEED GRAIN OR WHEAT STOCK ACCUMULATION FROM 1952 TO 1958 ON AVERAGE ANNUAL CASH RECEIPTS, CASH EXPENDITURES AND TOTAL NET INCOME OF UNITED STATES AGRICULTURE

As indicated above, feed grain and livestock prices would have been lower if the stocks of wheat and feed grains that accumulated from 1952 to 1958 had instead been fed to livestock.

Lower grain prices would have reduced the incomes of farmers selling grain and reduced the costs of farmers purchasing grain. Some farmers who normally sell feed grains would have fed the grains instead. Many specialized wheat farmers would have continued to produce wheat for sale, however, and a large proportion of the wheat would still have been sold off the farm where it was raised. Thus, there would have been different effects on the incomes of farmers in the Great Plains and the Corn Belt and on incomes of cash-grain farmers and livestock farmers.

The estimated effect of the increased feed grain consumption on total income and expense in agriculture is indicated in table 4.

Cash receipts from livestock made up 54 percent of total cash receipts in agriculture from 1952 to 1958. Production in this large sector of agriculture would have expanded in volume, but the value of this production would have decreased in absolute terms if farmers had fed the additions to grain stocks from 1952 to 1958. Income from feed and food grains would have decreased sharply and would have contributed about as much to the decline in total cash receipts as would the decline in livestock receipts. Total cash receipts would have averaged about $3,721 million less during the period. This is a decrease of about 11.8 percent.

Total cash expenditures would have changed little from 1952-58 had farmers fed rather than accumulated the stocks. Greater livestock volume would have increased operating costs only slightly. Lower feed grain prices would have reduced the cost of purchased feed. And lower livestock prices would have reduced the cost of purchased livestock. Total cash expenditures shown in table 4 are down about 1.2 percent.

Net income is vulnerable to changes in gross income,

TABLE 4. ESTIMATED CHANGE IN AVERAGE CASH RECEIPTS AND AVERAGE CASH EXPENDITURES OF U.S. AGRICULTURE RESULTING FROM FEEDING 10.3 PERCENT MORE FEED GRAINS.

	Actual	Estimated
	(Millions of dollars)	
Average total cash receipts, 1952-58	31,549	
Change in livestock receipts (—10.5% of $17,189 mil.)		—1,805
Change in feed grain receipts (—27% of $2,501 mil.) (due to price change)		—675
Change in food grain receipts (—44% of $2,265 mil.) (due to price change)		—995
Change in feed grain receipts (240 mil. bu. × $1.01 bu.) (due to volume)		—246
Adjusted average cash receipts (11.8% reduction)		27,828
Average cash expenditures, 1952-58	22,829	
Additional feed grain purchase (144 mil. bu. wheat at $1.11)		+160
Net change in value of feed purchased (—10% of $4,071 mil.)		—407
Change in cost of livestock purchased (—5% of $1,799 mil.)		—90
Change in cost of operating capital items (1.6% of $3,549 mil.)		+57
Change in miscellaneous expenses (5% of $2,217 mil.)		+111
Hired labor (1.0% of $2,921 mil.)		+29
Rent paid to nonfarm landlords (—10% of $1,135 mil.)		—114
Adjusted average cash expenditures (1.2% decline)		22,575
Average total net cash income of farm population from farming including $1,434 million from farm labor, 1952-58	10,154	
Adjusted total net cash income, including $1,434 million from farm labor (34% decline)		6,687

because costs tend to remain constant. Thus, net income must absorb nearly all the change in gross. The decline in total cash receipts of 11.8 percent, with costs decreasing 1.2 percent, would have decreased net income $3,467 million or 34 percent.

EFFECTS OF EXPORT SUBSIDIES ON STOCK ACCUMULATION AND THE LIVESTOCK ECONOMY DURING 1952-58

What would have happened if the export subsidy programs for wheat and feed grains had not been in effect from 1952 to 1958?

This is an especially difficult matter to deal with. If the quantities that were exported under the PL480 and other government export subsidy programs had been fed to livestock, consumption of grain by livestock would have increased by 3.7 percent. This 3.7 percent, added to the 10.3 percent estimated in preceding sections, would have brought the additional feeding up to 14 percent.

Thus, the export subsidy programs held actual accumulation of stocks below what it would otherwise have been. Had stocks also been fed, livestock production would have been larger and livestock prices lower than the figures given in table 3. However, no estimates were made of the effect of a 14 percent increase in grain consumption on the livestock economy.

ELASTICITY OF SUPPLY DURING 1952-58

These estimates are based on the actual 1952-58 production of feed grains and wheat. It was assumed that production would not have changed appreciably in response to lower prices and incomes.

There is some disagreement whether this assumption is realistic. Would lower feed grain and wheat prices have reduced feed grain and wheat production? Would farmers have produced less in response to the lower prices? Or would lower prices and income have increased production? Would farmers instead have produced more in an attempt to offset the lower prices by increasing production?

It is difficult to say what would have happened. Statistical measurements of supply response in prewar periods may not apply. The technological revolution in agricultural production since World War II renders earlier coefficients misleading, and the low prices of the 1930's occurred at the same time as severe drouths, without any causal relation between the two. In addition, total agricultural acreage and production increased during the early years of the depression of the 1930's. This does not have much relevance to the 1950's, which were years of general boom conditions.

Lower prices and incomes in 1952-58 might have decreased the use of fertilizer and thus have reduced the yields of feed grains.

Abolition of acreage restrictions on wheat presumably would have resulted in a considerable increase in wheat acreage. This would have raised wheat production,[3] but it would not all have been a net addition to total grain output. Some wheat would have been grown on acres that had been shifted to feed grains because of wheat allotments. But much of the net increase in wheat would have been fed, in effect increasing the supply of feed grains.

It was not possible to develop a satisfactory basis for estimating in quantitative terms the response of acreage and yield to lower and less certain prices. Accordingly, it was assumed that agricultural production would have been about the same with the lower prices as it was in fact from 1952 to 1958. The subject of supply response in agriculture requires much more research before it will be possible to estimate production effects accurately.

ESTIMATED EFFECTS OF INCREASED LIVESTOCK PRODUCTION ON RETAIL FOOD PRICES, PER CAPITA CONSUMPTION AND CONSUMER EXPENDITURES FOR LIVESTOCK AND LIVESTOCK PRODUCTS DURING THE 1952-58 PERIOD

Retail prices of farm-produced foods consist of two parts—the farm value of the retail unit, minus the value of the by-products, and the marketing margin.

The estimates of the retail prices are given in table 5. These average retail prices were estimated by first converting the average farm prices for these products, both actual and estimated, for the 1952-58 period to a

TABLE 5. UNITED STATES AVERAGE RETAIL PRICE OF BASIC LIVESTOCK FOOD PRODUCTS, ACTUAL AND ESTIMATED, WITH HIGHER LEVELS OF FEED CONSUMPTION, 1952-58.

Products	Unit	Actual average retail price, 1952-58*	Estimated average retail price, 1952-58, with increased grain consumption of	
			6.3 percent	10.3 percent
		(cents)	(cents)	(cents)
Beef (including veal)	lb.	61.0	59.1	57.9
Pork	lb.	58.0	50.7	46.0
Lamb	lb.	68.3	66.7	65.6
Broilers, ready-to-cook	lb.	52.4	48.1	45.5
Eggs	doz.	59.5	54.3	50.8
Milk, fluid, whole	qt.	22.7	22.5	22.3

*Derived from average farm value of retail units and average marketing margins for these products for years 1952-58.

[3] See, for example: Harris C. C. Eisenhower's wheat program. Jour. Farm Econ. November 1959. pp. 815-20. Harris estimates that if wheat loan rates were set at the average market price of the preceding 3 years, wheat acreage would rise from the actual 58 million in 1959 to 77 million, and wheat production with average weather would rise to 1.5 billion bushels.

"net farm value" basis. Then average marketing margins for these products for the 1952-58 period were added on to obtain estimates of retail price.

The lower prices of farm products at the farm, shown in table B (in the summary), would result in lower prices and expenditures for food at retail. Using the procedure outlined above, the greatest price change at retail would occur on pork. Broilers and eggs would each show a sizable drop in price; beef and lamb would be down some; and the retail price of milk would be down only slightly.

Estimates of the change in average annual expenditures for these livestock products by a family of four are shown in table 7. The family expenditures were calculated from the prices and consumption rates given in table 6. These consumption rates were based on the estimated increased livestock production in response to heavier feed consumption.

TABLE 6. ACTUAL AND ESTIMATED PER CAPITA CONSUMPTION OF LIVESTOCK PRODUCTS, 1952-58.

Product	Actual 1952-58 average	With 6.3% increase in grain consumption	With 10.3% increase in grain consumption
Beef (including veal), lbs.	87.6	88.5	89.0
Pork, lbs.	64.6	69.3	72.3
Lamb, lbs.	4.4	4.4	4.4
Broilers, lbs.	23.8*	25.2*	26.1*
Eggs, doz.	30.8	31.4	31.7
Milk, qts.	161.3	161.8	162.3

*Includes consumption of farm chickens.

TABLE 7. ACTUAL AND ESTIMATED AVERAGE ANNUAL EXPENDITURES BY A FAMILY OF FOUR FOR LIVESTOCK PRODUCTS, 1952-58.

Product	Actual 1952-58	Estimated with 6.3% increase	Estimated with 10.3% increase
Beef (including veal)	$213.74	$209.21	$206.12
Pork	149.87	140.54	133.03
Lamb	12.02	11.74	11.55
Broilers	49.88	48.14	47.50
Eggs	73.30	68.20	64.41
Milk	146.46	145.62	144.77
	$645.27	$623.45	$607.38

The major change in consumption would be an 8-pound increase in per capita consumption of pork. Average consumption of each of the other products, except lamb, would increase too, but at a more moderate rate.

The annual expenditure by a family of four, for these food products, would decline over 3 percent under the first set of assumptions (that feed grain consumption would increase 6.3 percent), and would drop nearly 6 percent in the second case (assuming feed grain consumption increased 10.3 percent). Expenditures for each of these foods would be lower, but most of the decrease would result from a reduction in spending for pork, beef and eggs.

Following is an illustration of the entire procedure using the data for beef. The 1952-58 average farm price for cattle, assuming no price support program for feed grains, was $17.15 per hundred. This was converted to a "gross farm value" by multiplying by the factor 2.16—the number of pounds of liveweight beef required

on an average to yield a pound of beef at retail. The average value of by-products, $4.20, was subtracted to give the net farm value. The marketing margin on beef (Choice grade) averaged 26.3 cents per pound for the 1952-58 period. This amount was added to the farm value figure. Thus, $17.15 x 2.16 = $37.04 gross farm value; $37.04 − 4.20 = $32.84 net farm value. On a pound basis, .3284 + .263 = .591 per pound, the estimated average retail price.

Consumption (including veal), based on expected livestock production changes, was estimated at an average of 88.5 pounds per person for the period. For a family of four, this amounts to an average of 354 pounds per year. The total annual consumption, in pounds, by a family of four multiplied by the estimated average retail price for beef gives our estimate of average annual expenditures for beef. Thus, 354 x .591 = $209.21

A similar procedure was followed throughout in obtaining the individual price, consumption and expenditure estimates.

OVER-ALL CONCLUSIONS WITH RESPECT TO THE 1952-58 PERIOD

During the 1952-58 period, feed grain stocks increased persistently. Farm prices and incomes were supported to a considerable extent through this stock accumulation.

A number of factors probably contributed to the size of the production and the carryover of grains during 1952-58. Production was stimulated to an unknown extent by favorable price supports, good weather in 1957-58, and rapid adoption of available new technology. At the same time, production was controlled to an unknown extent by acreage allotments, acreage reserve, conservation reserve, reduced support prices and the Great Plains drouth. The contribution made by each of these factors has never been estimated. Nevertheless, given the amount of grain that was produced, farmers received more income during the period because a portion of the production was stored and not fed to livestock.

The preceding analysis does not mean that the higher prices and incomes resulting from the price supports being set above long-run equilibrium levels during 1952-58 are necessarily a net gain. The answer depends upon what use is eventually made of the stocks.

If the accumulated stocks are eventually released into domestic consumption, they would depress prices and income about as much as they raised prices and incomes when they were originally withdrawn from the market. On that basis, the increase in income in 1952-58 was partially borrowed from the future.

PROJECTIONS FOR THE FEED-LIVESTOCK ECONOMY FOR THE 1960-62 PERIOD WITH CONTINUATION OF THE 1959 PROGRAMS*

The projections in this section are not forecasts of production, prices and incomes in the feed-livestock sector from 1960 to 1962. They are the result of extending current trends and cycles in grain, livestock production and marketing margins for 3 years into the future. Specific assumptions are made about the gen-

*Estimates in this section are based on information published before Dec. 15, 1959.

eral economy, government policies, crop yield trends and planted acreages. The estimates depend upon the assumptions. Many relationships within the feed-livestock economy are known very imperfectly. The estimates presented are approximations of the consequences of continuing the 1959 program for 3 more years.

ASSUMPTIONS

The projections rest on the assumption of full employment and continued economic progress in the economy as a whole. The assumed population, income, and prices paid by farmers are given in the following tabulation:[4]

	Unit	Actual 1958	Actual 1959	1960	1961	1962	1963
Population	mil.	174.1	177.1	179.8	182.6	185.4	188.1
Disposable income							
Total	bil. dol.	310.8	333.2	345.8	358.6	371.9	385.7
Per capita	dollars	1,785	1,881	1,923	1,966	2,005	2,050
Prices paid	Index						
by farmers	1958=100	100	100	100	100	100	100

With respect to agriculture, the assumptions are:
1. Continuation of the 1959 price support and control programs, with an expansion in the conservation reserve program to 30 million acres in 1960, 34 million acres in 1961, and 37 million acres in 1962.
2. Continuation of surplus disposal programs at levels equal to 1958-59.
3. Average weather.
4. A continuation of the upward trend in feed grain yields per acre which existed from 1940 through 1959.

FEED GRAIN PROJECTIONS

Under these assumptions, estimates of the planted acreage, yield and production of feed grains are shown

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[4]The population and income projections were obtained from the USDA.

TABLE 8. FEED GRAINS: PLANTED ACREAGE, YIELDS PER ACRE AND PRODUCTION, 1957-59 ACTUAL AND 1960-62 PROJECTED, WITH PRESENT PROGRAM.

	Actual			Projected		
	1957	1958	1959	1960	1961	1962
Planted acreage						
corn (mil. acres)	74.0	74.6	85.4	84.0	84.0	84.0
oats (mil. acres)	42.6	38.4	36.3	34.0	33.0	32.2
barley (mil. acres)	16.5	16.3	17.0	16.5	16.3	16.3
sorghums (mil. acres)*	19.5	16.8	16.0	18.5	17.7	17.5
Total feed grains						
(mil. acres)	152.6	146.1	154.7	153.0	151.0	150.0
Yield per planted acre						
corn (bu.)	45.9	50.9	51.9	48.5	49.4	50.3
oats (bu.)	30.4	37.4	29.6	30.3	30.4	30.5
barley (bu.)	26.3	28.7	24.0	27.8	28.2	28.6
grain sorghum (bu.)*	28.9	36.6	35.8	30.3	31.5	32.7
Total feed grains						
(tons)	0.93	1.08	1.08	1.03	1.05	1.08
Production						
corn (mil. bu.)	3,398	3,799	4,429	4,074	4,150	4,225
oats (mil. bu.)	1,309	1,422	470	1,030	1,003	982
barley (mil. bu.)	435	470	408	459	460	466
grain sorghum (mil. bu.)	564	615	573	560	558	572
Total feed grains						
(mil. tons)	142.3	157.7	167.1	157.2	158.9	161.2

*Harvested for grain only.

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in table 8. The data for 1957-59 are given merely for background.[5]

The estimates for corn *acreage* given in table 8 reflect an expectation that there will be a small recession from the high levels reached in 1959.

The corn *yield* estimates are based upon an extrapolation of the trend line fitted mathematically to the data from 1940 to 1958. The original yield data and the

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[5]Planted acreages and yields are used rather than harvested acreages and yields. Harvested acreage is usually lower than planted acreage by amounts that vary from year to year with variations in weather, and these variations are at present unpredictable. Projections in this study are the same as projections based on harvested acreages and yields of harvested acreages with average weather.
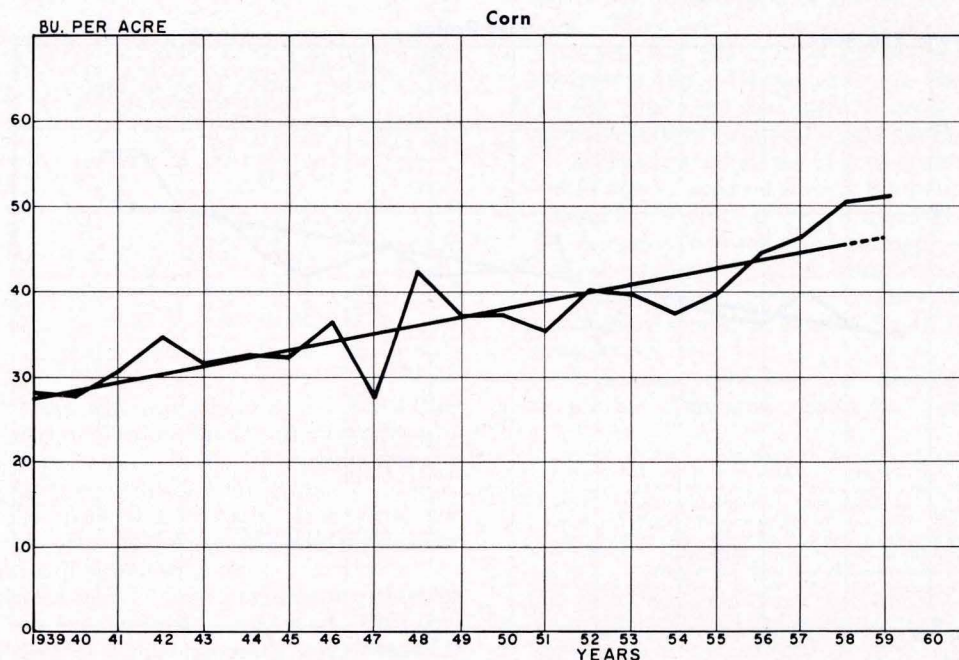

Fig. 2. United States average corn yields per acre, 1939-59, and trend line mathematically fitted to the data, 1939-58, and extrapolated to 1959. (Equation $\hat{Y}=26.9+0.92x$)
(Basic data from the monthly issues of The Feed Situation, AMS, USDA.)

trend are shown in the upper section of fig. 2. The data for 1959 are not included in the fitting of the line.

Discussions with agronomists[6] lead to the conclusion that the straight-line trend shown represents the increase in yields due to technological developments alone. It is worth noting that a line drawn through the dots for the three or four highest yields over the period, 1942, 1948 and 1958 (years of favorable corn weather), is approximately parallel to the straight-line trend fitted to the data as a whole. This suggests that the mathematically fitted trend line represents the influence of technology on yields independent of the influence of weather. The projections of yields for 1960 to 1963 are based on extrapolations of the mathematically fitted trend line. The trend line rises at a rate of about 0.9 bushel of corn per planted acre (about 2 percent of average value) per year.

Figure 3 shows a corresponding chart for feed grains as a whole. The trend line here rises at about 2 percent per year also.

It is believed that projections based upon these trend lines are conservative. Feed grain yields in 1960 may be higher than the trend line value, because of the plentiful subsoil moisture supplies that existed at the beginning of the season. Another factor that will tend to raise yields above the trend line over the next few years is the conservation reserve program, which will take out of production acres that are below average in productive ability. This tends to raise average yield for the remainder of the crop and thus tends to push

yields somewhat above those represented by the trend line, which reflects changes in technology only.[7]

LIVESTOCK PROJECTIONS

The feed grain balance (production, utilization and stocks) projected for each year is shown in table 9.

TABLE 9. FEED GRAIN BALANCE, 1957-59 ACTUAL AND 1960-62 PRO-
JECTED, WITH PRESENT PROGRAMS CONTINUED.
(Million tons)

| Supply | Year beginning October 1 | | | | | | |
	1957	1958	1959	1960	1961	1962	1963
Beginning stocks	48.9	59.1	67.4	82.5	87.5	90.9	95.1
Production	142.9	157.7	166.0	157.3	158.9	161.2	
Imports	1.0	0.4	0.7	0.5	0.5	0.5	
Total supply	192.8	217.2	234.1	240.3	246.9	252.6	
Use							
Livestock feed	111.5	124.5	126.0	127.0	130.0	131.5	
Other	22.2	25.3	25.6	25.8	26.0	26.0	
Total utilization	133.7	149.8	151.6	152.8	156.0	157.5	
Addition to stocks	+10.2	+8.3	+15.1	+5.0	+3.4	+4.2	

The projected production and prices of the chief kinds of livestock are shown in table 10.

The increase in beef projected in this table is a result of the cattle cycle and increased cattle feeding. The increase in cattle feeding is in response to the increased feed grain supply and the lower feed grain prices and the falling prices of feeder cattle. Under the influence of the cattle cycle, cattle production is assumed to continue to increase, but at a slower pace than in 1959.

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[6]Thompson, L. M.; Johnson, I. J.; Pesek, J. T., Jr.; and Shaw, R. H. "Some causes of recent high yields of feed grains." Proceedings of the Iowa State University Feed-Livestock Workshop. pp. 15-38. Iowa State University, Ames. 1959.

[7]A report prepared by the USDA in December 1959—Production prospects for wheat, feed, and livestock, 1960-65, by R. P. Christensen, S. E. Johnson and R. V. Baumann, ARS 43-115, December 1959—contained projections of acreage, yield, and production of feed grains which differ slightly from those in this study. They projected yields at a slightly slower rate of increase than in the past. Their projection of feed grains production in 1962 is 157.2 million tons, while projections in this study indicate 161.2. The figure used in this study is 2.5 percent higher than the USDA's.
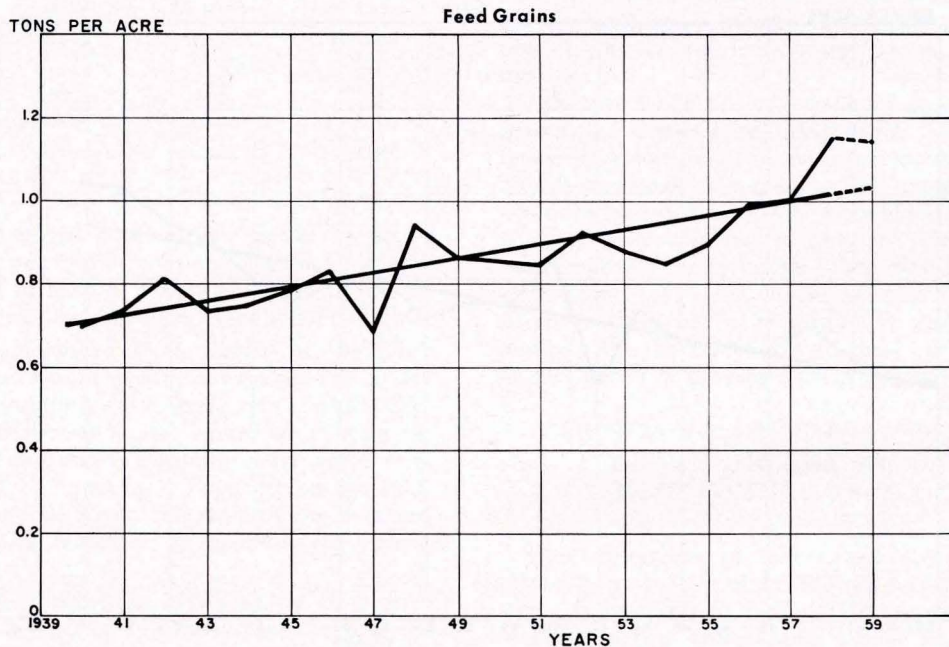

Fig. 3. United States average feed grain yield per acre, 1939-59, and trend line mathematically fitted to the data, 1939-58, and extrapolated to 1959. (Equation $\hat{Y} = 0.683 + 0.017x$.)
(Basic data from the monthly issues of The Feed Situation, AMS, USDA.)

TABLE 10. UNITED STATES PRODUCTION AND AVERAGE FARM PRICE, 1957-59 ACTUAL AND 1960-62 PROJECTED, WITH PRESENT PROGRAMS CONTINUED.

	1957	1958	1959	1960	1961	1962
Combined spring and fall pig crops (million hd.)	87.9	94.8	101.6	93.0	95.0	98.0
Price, $ per cwt.	17.80	19.00	14.50	15.75	16.00	14.50
Number of cattle on farms Jan. 1 (million hd.)	94.5	93.4	96.9	101.5	106.0	110.0
Price, $ per cwt.	17.20	21.00	22.50	21.00	20.00	17.50
Number of laying-type chickens Sept. 1 (million hd.)	421	434	413	420	400	406
Price of eggs (cents/doz.)	36	38	32	34	30	30
Annual milk production (billion lbs.)	125.9	125.2	125.0	127.0	129.0	132.0

A rather sharp increase in dairy production is projected for the latter part of the period in question. This is based upon the earlier experience of 1952-53, when dairy production expanded sharply in the face of the drop in beef cattle prices. Continued supports at 75 percent of parity are assumed to maintain dairy prices. The expected drop in beef cattle over the next few years as the marketings increase is assumed to produce a comparable situation.

The hog cycle is projected through the period. The 1960 spring pig crop is cut 11 percent as indicated by the Dec. 1, 1959, USDA pig survey. A decline in the 1960 fall pig crop and in the 1961 spring pig crop is projected. In line with a normal hog cycle, hog production would be increasing again by 1962.

RETAIL PRICE AND EXPENDITURE ESTIMATES

The projected retail prices and expenditures are shown in table 11. This table shows the estimates of average retail prices and family expenditures for the chief livestock and poultry food products. The retail prices are affected by changes in both the farm value and marketing margins.

TABLE 11. PROJECTIONS OF AVERAGE RETAIL PRICES FOR CERTAIN LIVESTOCK PRODUCTS, OF AVERAGE PER CAPITA CONSUMPTION, AND OF TOTAL ANNUAL EXPENDITURES FOR THESE PRODUCTS BY A FAMILY OF FOUR IN THE UNITED STATES, WITH PRESENT FARM PROGRAMS CONTINUED.

Product	Estimated average retail price, cents per unit				Estimated annual average total expenditure for these products by family of four			
	1959	1960	1961	1962	1959	1960	1961	1962
Beef, lb.	76.6	73.8	72.4	67.8	$265.80	$265.68	$269.33	$263.06
Pork, lb.	53.2	57.0	58.2	55.7	142.58	145.92	140.84	140.36
Lamb, lb.	69.6	72.3	72.2	73.3	12.53	12.44	12.71	12.90
Broilers, lb.	44.1	44.4	43.7	42.4	52.57	52.39	52.96	52.92
Eggs, doz.	51.3	54.5	50.4	50.4	60.53	62.78	59.67	58.06
Milk, qt.	23.2	23.7	23.9	24.3	148.85	152.06	153.72	157.27
Total expenditures					$682.86	$691.27	$689.23	$684.57

Retail price estimates were obtained by converting average farm price projections under the current program to a "net farm value" basis. Marketing margins for the individual commodities were projected ahead, following the trend of the past 10 years. These projected marketing margins were added to the net farm value figures to obtain retail price estimates.

A gradual decline in beef prices is estimated through 1962, while pork prices would rise through 1961 and then decline. Prices of lamb and milk would increase over the period, but broilers would ease down in price. Egg prices would rise rather sharply in 1960 and then drop back to lower levels.

The probable effect on annual family expenditures for these products is also shown. The expenditure totals were obtained by multiplying the retail price estimates by the projections of per capita consumption. The estimated expenditure for a family of four varied only slightly for the 1959-62 period. However, the total quantity of these foods purchased would change considerably. Consumption of red meat, poultry and milk would increase over the period, with a slight drop in per capita consumption of eggs and lamb.

PROJECTIONS FOR THE FEED-LIVESTOCK ECONOMY FOR THE 1960-63 PERIOD WITH FREE PRICES AND NO CONTROLS[8]*

The projections presented in this section are an evaluation of utilizing all grain that probably would be produced with no crop controls and average weather from 1960 to 1963. Specific assumptions are made about the general economy, government policies, population growth, crop yield trends, livestock feeding rates, export demand and other factors.

Again the estimates obtained depend upon the particular choice of assumptions: other assumptions would produce different estimates. Many relationships within the feed-livestock economy are known very imperfectly. The estimates presented are approximations of the consequences of free markets and the other conditions assumed.

GENERAL ASSUMPTIONS

The same assumptions with respect to population and income are used here as in the preceding section.

AGRICULTURAL POLICY ASSUMPTIONS

1. The price support provisions for feed grains would end with the 1959 crop. Cotton acreage allotments and price supports also would end with the 1959 crop. Dairy price supports would end in January 1960. Since the full wheat crop already was planted, acreage allotments and price supports for wheat would continue for the 1960 crop and then be dropped. Tobacco allotments and price supports would continue.

2. The present stocks of feed grains, wheat and cotton would not be reduced during the period. They might be rotated but would not be increased or decreased in total. All demands, domestic and foreign, would be met from current production, or if some export needs were met from CCC holdings for convenience of shipping, current production would be bought by CCC to maintain constant stocks.

3. Export subsidies on agricultural commodities would be eliminated. Sales for foreign currency, or

[8]For a similar study, see: 86th Congress, Report from the United States Department of Agriculture, and a statement from the Land-Grant Colleges IRM-1, Advisory Committee on Farm price and income projections, 1960-65, under conditions approximating free production and marketing of agricultural commodities. Senate Document No. 77, Jan. 20, 1960.

Their projections differ from those of this study according to the somewhat different assumptions made at various points. The net result of the differences in assumptions regarding the conservation reserve, projected yields, stock liquidation, etc., is that this study projects around 4 percent more grain fed to livestock in 1962-63 than they do; also substantially greater increases in production of beef, milk and broilers. USDA prices for hogs in 1962-63 differ from those used here by only 20 cents, but their prices for beef cattle, milk, corn and wheat are significantly higher. At least a part of the differences for beef cattle and milk can be attributed to the higher level of production and marketings in projections used here. In addition, they appear to have used somewhat higher price elasticities than those used here.
*Estimates in this section are based on information published before Nov. 15, 1959.

barter, could be continued, but all commodities shipped would come from current production.

4. The conservation reserve would continue through the 1960 crop year with an additional 5 million acres added in 1960 to bring the total to 28 million acres. No new contracts would be signed for the 1961 or later years. Old contracts would not be renewed as they expired.

RELATIONSHIPS IN THE FEED-LIVESTOCK ECONOMY

1. Crop acreages would be at about the 1959 levels. They would be decreased through additional conservation reserve contracts in 1960. After that, total acreage available for crops would increase as old contracts expired. Not all the land coming out of the conservation reserve would return to cultivation.

2. The trend to continuous corn would tend to increase corn acreage and reduce oats and hay.

3. Yield trends are those obtained from using average yield per planted acre between the years 1940 and 1958. Grain sorghum yield trend is yield per harvested acre from 1940 to 1956 plus an addition of 7 bushels[9] per harvested acre for the effect of adoption of hybrid sorghum.

4. Feeding rates for livestock are about the average of 1957-59 feeding rates. For some classes of livestock, recent trends to higher rates of feeding were projected.

PROJECTIONS OF CROP ACREAGE, YIELD, AND CROP AND LIVESTOCK PRODUCTION AND UTILIZATION

The estimates of acreage, yield and production based on the foregoing assumptions are given in table 12. The feed concentrate balance each year, based on these production estimates, is given in table 13; the wheat balance is given in table 14.

[9]Estimate of 1960 normal yield of grain sorghum and implied impact of hybrid sorghum obtained by private communication from an Agricultural Research Service technician.

TABLE 13. FEED CONCENTRATE BALANCE, 1957-58 ACTUAL AND 1959-62 PROJECTED UNDER FREE MARKET CONDITIONS.

| | Year beginning October 1 | | | | | | |
	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64
	(Millions of tons)						
Supply							
Stocks	48.9	59.1	67.4	85.0	85.0	85.0	85.0
Production	142.9	157.7	167.1	151.5	151.8	155.8	
Imports	1.0	.4	.7	.4	.4	.4	
Wheat and rye fed	1.6	2.3	1.9	4.0	7.5	10.0	
By-product feeds fed	25.9	27.1	25.8	26.7	27.7	28.7	
Total	220.3	246.6	262.9	268.5	273.3	280.8	
Utilization							
Feed grain to livestock	113.9	126.7	126.5	130.2	133.7	139.2	
By-products fed	25.8	27.1	25.8	26.7	27.7	28.7	
Total concentrates fed	139.7	153.8	152.3	156.9	161.4	167.9	
Seed, human food and industry	12.4	12.7	12.6	12.6	12.7	12.7	
Exports	10.5	12.8	13.0	13.1	13.3	14.3	
Total	162.6	179.3	177.9	182.6	187.4	194.9	

TABLE 14. WHEAT BALANCE IN MILLIONS OF BUSHELS 1957-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

| | Year beginning July 1 | | | | | | |
	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64
Supply							
Carryover	908.8	881.0	1,277	1,366	1,560	1,587	1,560
Production	950.7	1,462.2	1,117	1,244	1,365	1,365	
Imports	10.9	7.8	8	8	6	6	
Total	1,870.4	2,351.0	2,402	2,618	2,931	2,958	
Domestic use							
Food	483.7	492.5	500	500	508	508	
Seed	63.2	65.6	66	73	73	73	
Industry	.3	.1	....	....	1	1	
Feed	39.3	73.1	60	60	272	301	
Total	586.5	631.3	626	633	906	883	
Exports	402.9	443.0	410	425	490	515	
Total disappearance	989.4	1,074.3	1,036	1,058	1,371	1,398	

TABLE 12. PLANTED ACREAGE, YIELD PER PLANTED ACRE AND PRODUCTION OF THE FOUR PRINCIPAL FEED GRAINS PLUS WHEAT, COTTON AND SOYBEANS, 1957-59 ACTUAL AND 1960-62 PROJECTED, UNDER FREE MARKET CONDITIONS.

	Corn	Oats	Barley	Grain sorghum	Total 4 feed grains	Wheat	Cotton	Soybeans
	Planted acreage in millions							
1957	74.0	43.0	16.5	19.5	153.0	49.9	14.2	20.7
1958	74.6	38.4	16.3	16.8	146.1	56.4	12.4	23.4
1959	85.4	36.3	17.0	16.0	154.7	58.8	15.9	22.0
1960	83.0	35.5	16.7	13.8	149.0	58.3	18.7	23.0
1961	83.5	33.0	13.5	13.8	143.8	65.0	17.7	24.0
1962	84.2	33.2	13.6	14.5	145.5	65.1	16.5	24.8
	Yield per planted acre							
	bu.	bu.	bu.	bu.	tons	bu.	lbs.	bu.
1957	45.9	30.4	26.3	28.9	.93	19.1	386	23.1
1958	50.9	37.4	28.7	36.6	1.08	25.9	464	24.6
1959	51.9	29.6	24.0	35.8	1.08	19.0	462	24.1
1960	48.2	30.3	27.8	28.8	1.02	21.0	409	23.0
1961	49.3	30.4	28.2	29.0	1.05	21.0	417	23.3
1962	50.3	30.5	28.6	29.2	1.07	21.0	428	23.6
	Production in millions							
	bu.	bu.	bu.	bu.	tons	bu.	bales	bu.
1957	3,398	1,309	435	564	142.3	947	11.0	478
1958	3,799	1,422	470	615	157.7	1,462	11.5	574
1959	4,429	1,075	408	573	167.1	1,117	14.7	530
1960	4,001	1,076	464	397	151.5	1,224	15.3	529
1961	4,107	1,003	381	406	151.8	1,365	14.7	559
1962	4,235	1,007	386	423	155.8	1,365	14.1	585

TABLE 15. UTILIZATION OF FEED GRAINS BY CLASS OF LIVESTOCK IN MILLIONS OF TONS, 1956-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

| | Year beginning October 1 | | | | | | |
	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Hogs	39.7	43.0	48.8	50.4	50.5	51.8	53.0
Grain-fed cattle	9.4	9.7	11.4	11.7	12.2	12.5	13.8
Other cattle	8.4	8.5	9.3	10.1	10.8	11.3	11.6
Sheep	.7	.88	.97	1.0	1.3	1.4	1.5
Milk cows	19.9	21.4	22.2	21.4	22.6	23.2	25.2
Hens and pullets	12.8	13.2	14.1	14.2	14.6	15.1	15.2
Chickens	3.3	4.2	4.2	4.0	4.3	4.2	4.4
Broilers	3.7	4.2	4.5	4.5	4.6	4.6	4.7
Turkeys	2.3	2.4	2.3	2.4	2.4	2.5	2.6
Horses and mules	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Other livestock	3.8	4.3	4.5	4.7	4.8	5.0	5.1
Total	106.0	113.9	124.3	126.5	130.2	133.7	139.2

Tables 15 to 20 give the steps by which the quantities of livestock products are estimated.

Feed grain production and use are shown graphically in fig. 4. The difference between production and total use from 1952 through 1959 went into storage. Under free market conditions, total production would equal total use beginning with 1960. Some wheat would be produced for feed grain and used beginning with 1961. The increase in total feed grain production from 1961 to 1962 is due to increases in yields of grain crops.
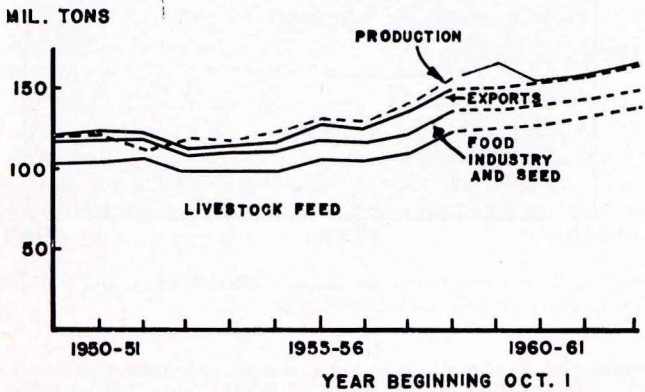
Fig. 4. Feed grain production and use; 1949-58 actual and 1959-62 projected, with free market conditions.

The utilization of grain by livestock class is shown graphically in fig. 5. Hogs are the largest users of feed grains, followed by poultry, dairy and beef. All classes of livestock would increase grain use as larger quantities of grain were produced and used. The increased use
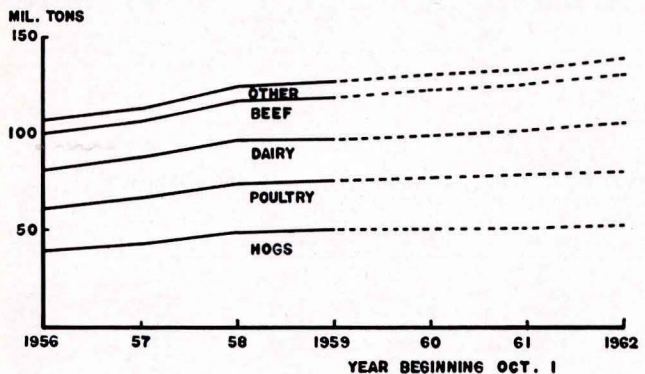
Fig. 5. Utilization of feed grain by livestock class; 1956-58 actual and 1959-62 projected, with free market conditions.
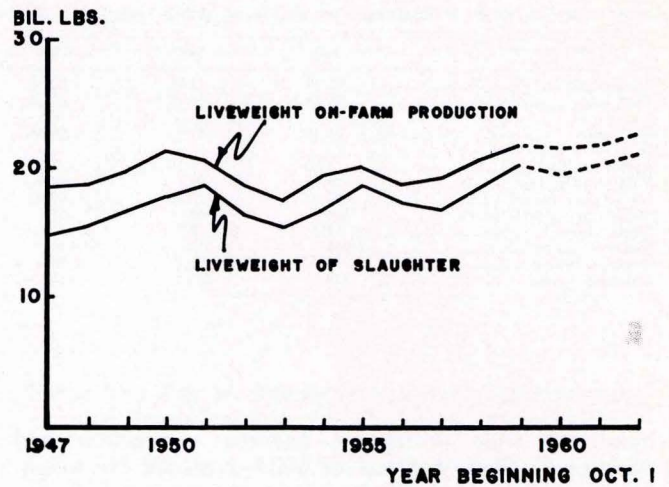
Fig. 6. Liveweight production and slaughter of hogs; 1947-58 actual and 1959-62 projected, with free market conditions.

by beef cattle is as much a result of the increased volume available for feeding during the upward phase of the cattle cycle as of the lower grain prices.

Liveweight production and slaughter of hogs by years are shown graphically in fig. 6. The cyclical nature of hog production is clearly apparent. Feed utilization is associated with liveweight production on farms, the upper line in the graph. The marketings, which are represented by the lower line, influence prices. The two variables tend to move together. The difference between them is lower on the downswing than on the upswing of the cycle. The data for 1960, 1961 and 1962 are projected under free market conditions.

Liveweight production and marketings for cattle and calves are shown graphically in fig. 7. Since cattle have a life span of several years, there is opportunity for

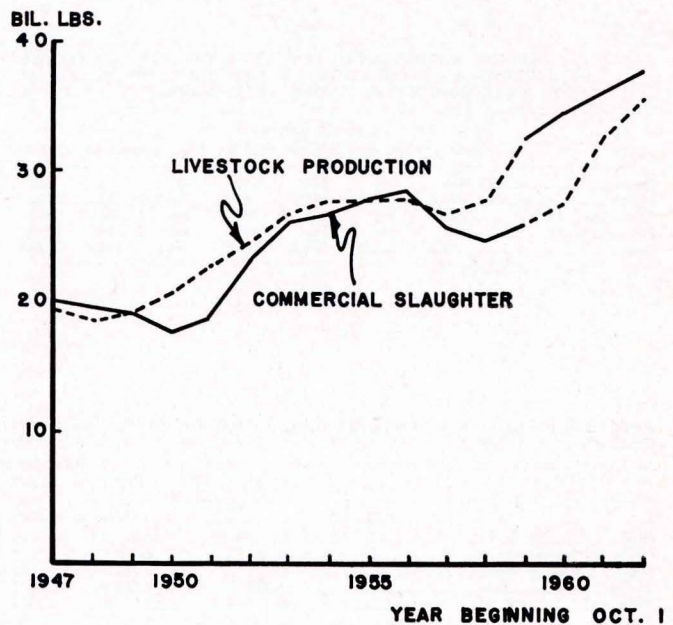Fig. 7. Liveweight production and slaughter of cattle and calves; 1947-58 actual and 1959-62 projected, with free market conditions.

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TABLE 16. LIVESTOCK NUMBERS IN MILLIONS, 1956-59 ACTUAL AND 1960-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

	1956	1957	1958	1959	1960	1961	1962	1963
Spring pigs	53.19	51.81	52.34	58.62	58.00	54.80	59.00	60.00
Fall pigs	36.39	36.15	42.47	44.59	44.30	43.80	49.00	50.00
Total	89.58	87.96	94.81	103.21	102.30	98.60	108.00	110.00
Cattle on feed Jan. 1	5.88	6.10	5.87	6.49	6.92	7.25	7.38	7.74
Total cattle Jan. 1	96.8	94.5	93.4	96.9	102.0	106.0	110.0	113.0
Dairy cows June 1	20.91	20.49	19.80	19.32	19.15	19.65	19.65	20.65
Hens and pullets Jan. 1	360	369	353	363	352	350	359	353
Sheep Jan. 1	31.3	30.8	31.3	33.3	34.0	34.8	35.5	36.4
Broilers raised	1,344	1,448	1,660	1,741	1,741	1,765	1,775	1,825
Turkeys raised	76.9	81.2	78.3	81.9	80.0	83.7	83.7	88.0
Chickens raised	479	397	432	401	400	432	401	420

relatively wide divergence between production and slaughter. Slaughter has actually exceeded liveweight production in some past years.

During the early years of the build-up phase of the cattle cycle, slaughter lags behind liveweight production. If the build-up is slow, the lag is less than if the build-up is fast. In the fourth year after the low point in the last cycle of liveweight production, slaughter increases more rapidly than liveweight production. The exact year varies between cycles, but 3 to 5 years after the low point in each cycle there is a "catch-up" in slaughter relative to liveweight production. These past patterns were used in projecting the marketing of cattle in 1960, 1961 and 1962.

Meat consumption per person is shown graphically in fig. 8. Beef and veal are the largest components of the average meat diet. Pork is second, and poultry third. Per capita meat consumption, which was relatively high in 1956, declined in 1958. The per capita meat consumption projected for 1962 and 1963 with free market conditions would exceed the level of 1956. One important reason for increased meat consumption is the projected increase in cattle slaughter in 1962 and 1963.

Fig. 8. Meat consumption per person; 1956-59 actual and 1960-63 projected, with free market conditions.

TABLE 17. FEEDING RATES—TOTAL CONCENTRATES PER 100 POUNDS OF LIVEWEIGHT PRODUCTION OR 1,000 EGGS, 1956-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

	Year beginning October 1						
	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Hogs	460	494	520	510	520	520	516
Milk	40.2	43.6	45.4	43.2	43.8	43.2	42.4
Eggs (per 1,000)	554	564	584	584	596	604	608
Poultry meat	376	380	386	382	380	380	380
Beef	163.2	163.6	171.6	165.4	164.8	163.4	168.4

TABLE 19. LIVEWEIGHT PRODUCTION AND SLAUGHTERINGS FOR HOGS AND CATTLE IN BILLIONS OF POUNDS, UNDER FREE MARKET CONDITIONS; 1955-59 ACTUAL AND 1959-63 PROJECTED.

	Year beginning October 1							
	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Hogs								
Produced	20.0	18.8	19.0	20.5	21.6	21.3	21.8	22.5
Slaughtered	18.7	17.3	16.6	18.5	20.1	19.4	20.1	21.0
Cattle								
Produced	27.8	26.8	27.7	29.7	32.2	34.4	35.9	37.2
Slaughtered	27.9	28.4	25.8	24.7	25.9	27.3	32.5	35.4

TABLE 18. LIVESTOCK LIVEWEIGHT PRODUCTION BY TYPE, 1955-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

	Year beginning October 1							
	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
	(Billions of pounds or billions of eggs)							
Hogs	20.0	18.8	19.0	20.5	21.6	21.3	21.8	22.5
Grain-fed cattle	4.398	4.538	4.778	5.070	5.414	5.674	5.789	6.149
Other cattle	23.373	22.210	22.922	24.668	26.812	28.712	30.142	31.005
Sheep	1.579	1.533	1.595	1.670	1.720	1.755	1.790	1.840
Milk	125.5	125.9	125.2	124.0	126.5	131.2	134.4	143.5
Eggs	60.9	60.4	60.7	62.4	62.6	63.0	64.6	64.6
Broilers	4.275	4.683	5.431	5.660	5.660	5.810	5.860	6.040
Turkeys	1.247	1.342	1.316	1.391	1.400	1.439	1.457	1.538
Farm chickens	1.652	1.427	1.462	1.403	1.300	1.462	1.441	1.430

TABLE 20. PER CAPITA CONSUMPTION OF MEAT AND LIVESTOCK PRODUCTS, 1955-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

| | Year beginning October 1 | | | | | | | |
	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Beef and veal, lbs.	94.9	93.4	87.2	87.3	89.0	91.1	99.2	105.2
Pork, lbs.	66.4	61.5	60.7	68.3	69.6	66.2	67.6	68.8
Lamb and mutton, lbs.	4.4	4.2	4.1	4.5	4.6	4.6	4.6	4.7
Poultry meat, lbs.	29.8	31.4	34.1	34.8	35.0	35.9	35.7	36.0
Total meat, lbs.	195.5	190.5	186.1	194.9	198.2	197.8	207.1	214.7
Eggs, numbers	363	353	348	353	348	346	349	346
Dairy products, milk equivalent, lbs.	747	736	719	701	704	719	725	762

ESTIMATES OF LIVESTOCK PRICES AND VALUES

The per capita quantities of most of the livestock products estimated in the preceding tables are substantially larger than the quantities that have been consumed in recent years. This increase in per capita supplies would depress the retail prices of those products, and this would depress the farm prices of those products substantially.

Estimates of these prices over the next few years are given in table 21. The price elasticities are the same as those used in the preceding sections. The income elasticities and the details of the computations are given in Appendix C.

Table 22 shows the effects of the foregoing estimates of production and prices on the farm value of the output of these products. This value declines from $16.65 billion in 1958-59 to $13.13 billion in 1962-63. This is a decline of 22 percent. Net income would decline 50 percent or more.

ESTIMATED RETAIL PRICES, PER CAPITA CONSUMPTION AND EXPENDITURES FOR LIVESTOCK PRODUCTS

Tables 23 through 29 show projections of average retail prices, consumption and family expenditures for these items that would be expected with free prices and no controls during 1959-63.

Estimates of average farm prices were first converted to a farm value basis, as before. Marketing margins were projected ahead on the basis of the trends in margins on the individual products for the past 10 years. Significant increases in the marketing margins for beef, pork, lamb and milk have occurred, and projections were made at the approximate average rate of recent years. In contrast, marketing margins for poultry products have remained relatively stable, and therefore little change was projected for the 1959-63 period.

The estimated farm value, plus estimated marketing margins for these products, gives the authors' estimates of average retail prices.

TABLE 21. PRICES OF LIVESTOCK, LIVESTOCK PRODUCTS, AND CROPS, 1956-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

| | Year beginning October 1 | | | | | | |
	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Livestock							
Hogs, $/cwt.	17.40	19.00	15.70	13.50	14.20	12.80	11.00
Beef cattle, $/cwt.	17.20	21.90	23.00	22.00	20.90	15.50	12.00
Lambs, $/cwt.	19.90	21.00	19.50	18.90	19.10	17.30	16.20
Broilers, ¢/lb.	18.9	18.5	16.2	16.80	15.90	15.40	13.40
Turkeys, ¢/lb.	23.4	23.9	22.8	22.30	21.80	19.50	17.10
Eggs, ¢/doz.	35.8	38.3	31.5	33.0	33.5	30.0	28.3
Milk, $/cwt.	4.21	4.13	4.05	3.91	3.66	3.43	2.67
Farm chickens, ¢/lb.	13.6	13.9	13.3	13.0	12.60	11.40	10.00
Crops							
Corn $/bu.	1.29	1.12	1.13	1.06	0.79	0.77	0.66
Wheat, $/bu.	1.97	1.93	1.72	1.71	1.67	0.90	0.74
Cotton, $/lb.	0.335	0.344	0.345	0.315	0.21	0.21	0.21

TABLE 22. VALUE OF OUTPUT BY CLASSES OF PRODUCTS IN BILLIONS OF DOLLARS, 1955-59 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

| | Year beginning October 1 | | | | | | | |
	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Hogs	2.69	3.01	3.15	2.90	2.72	2.76	2.58	2.31
Beef	4.16	4.88	5.65	5.68	5.72	5.71	5.04	4.25
Milk	5.03	5.30	5.17	5.02	4.95	4.81	4.62	3.84
Eggs	2.36	1.80	1.94	1.64	1.72	1.76	1.61	1.52
Broilers	0.840	0.885	1.005	0.917	0.951	0.935	0.903	0.810
Turkeys	0.339	0.314	0.315	0.317	0.312	0.314	0.284	0.264
Farm chickens	0.264	0.194	0.203	0.187	0.169	0.184	0.164	0.140
Total	15.68	16.38	17.43	16.65	16.54	16.47	15.20	13.13

TABLE 23. RETAIL PRICES AND VALUES OF BEEF, 1958 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	Estimated U.S. av. farm price	Gross farm value	Value of by-prod.	Net farm value	Farm retail spread	Retail price	Estimated annual per capita consump.	Total exp. family of four
	$/cwt.	¢/lb.	¢/lb.	¢/lb.	¢/lb.	¢/lb.	lb.	$
1958	21.90	47.3	4.4	42.9	31.0	73.9	87.2	258
1959	23.00	49.7	5.1	44.6	31.8	76.4	86.8	265
1960	22.00	47.5	5.1	42.4	32.6	75.0	89.0	267
1961	20.90	45.1	5.1	40.0	33.4	73.4	91.1	267
1952	15.50	33.5	5.1	28.4	34.2	62.6	99.2	248
1963	12.00	25.9	5.1	20.8	35.0	55.8	105.2	235

TABLE 24. RETAIL PRICES AND VALUES OF PORK 1958 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	U.S. av. farm price	Gross farm value	Value of by-prod.	Net farm value	Farm retail spread	Retail price	Est. annual per capita consump.	Total exp. for family of four
	$/cwt.	¢/lb.	¢/lb.	¢/lb.	¢/lb.	¢/lb.	lb.	$
1958	19.00	40.5	6.2	34.3	27.7	62.0	59.4	147
1959	15.70	33.4	4.6	28.8	28.6	57.4	65.0	149
1960	13.50	28.8	4.6	24.2	29.3	53.5	69.6	149
1961	14.20	30.2	4.6	25.6	29.9	55.5	66.2	147
1962	12.80	27.3	4.6	22.7	30.6	53.3	67.6	144
1963	11.0	23.4	4.6	18.8	31.2	50.0	68.8	138

TABLE 25. RETAIL PRICES AND VALUES OF LAMB, 1958 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	Av. farm price	Gross farm value	Value by-prod.	Net farm value	Farm retail spread	Retail price	Est. annual per capita consump.	Exp. for family of four
	$/cwt.	¢/lb.	¢/lb.	¢/lb.	¢/lb.	¢/lb.	lb.	$
1958	21.00	49.8	6.8	43.0	31.7	74.7	4.1	12.3
1959	19.50	46.2	6.8	39.4	32.8	72.2	4.5	13.0
1960	18.90	44.8	6.8	38.0	33.9	71.9	4.6	13.2
1961	19.10	45.3	6.8	38.5	35.0	73.5	4.6	13.5
1952	17.30	41.0	-6.8	34.2	36.1	70.3	4.6	12.9
1953	16.20	38.4	6.8	31.6	37.2	68.8	4.7	12.9

TABLE 26. RETAIL PRICES AND VALUES OF BROILERS, 1958 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	Farm price	Farm value at retail	Farm retail spread	Retail price	Est. annual per capita consump.	Exp. for family of four
	¢/lb	¢/lb	¢/lb	¢/lb	lb.	$
1958	18.5	25.3	21.9	47.2	28.3	53.4
1959	16.20	22.2	21.8	44.0	29.4	51.7
1960	16.80	23.0	21.8	44.8	28.7	51.4
1961	15.90	21.8	21.8	43.6	29.4	51.3
1962	15.40	21.1	21.8	42.9	29.3	50.3
1963	13.40	18.4	21.8	40.2	29.5	47.4

TABLE 27. RETAIL PRICES AND VALUES OF EGGS, 1958 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	Farm price	Farm value at retail	Farm retail spread	Retail price	Est. annual per capita consumption	Exp. for family of four
	¢/doz.	¢/doz.	¢/doz.	¢/doz.	doz.	$
1958	38.3	39.4	19.4	58.8	29.0	68.2
1959	31.5	32.4	19.4	51.8	29.4	60.9
1960	33.0	34.0	19.5	53.5	29.0	62.1
1961	33.5	34.5	19.5	54.0	28.8	62.2
1962	30.0	30.9	19.5	50.4	29.1	58.7
1963	28.3	29.1	19.6	48.7	28.8	56.1

Consumption rates are projected ahead on the basis of expected production and population changes given earlier in this report. These consumption rates, with the estimates of retail prices, are used to estimate expenditures by a family of four for these products.

The procedure used in making the price and expenditure estimates is given in Appendix D.

On this basis, retail prices on each of these foods would decline over the 1959-63 period. Beef, pork, broilers and eggs would show comparatively sharp price drops, while lamb would decline moderately and retail prices on milk would be down only slightly. Consumption of each food would increase, except for eggs, which would be down slightly. Consumption of beef, pork and milk would be considerably higher. Family expenditures for these foods would decline because of smaller amounts spent for beef, pork, broilers and eggs. Expenditures for lamb and milk would show some increase.

TABLE 28. RETAIL PRICES AND VALUES OF MILK, 1958 ACTUAL AND 1959-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	Farm price	Farm value at retail	Farm retail spread	Retail price	Est. annual per capita consumption	Exp. family of four
	$/cwt.	¢/qt.	¢/qt.	¢/qt.	qt.	$
1958	4.13	8.96	13.8	22.8	159.0	145
1959	4.05	8.79	14.2	23.0	161.8	149
1960	3.91	8.48	14.6	23.1	162.2	150
1961	3.66	7.94	15.0	22.9	165.9	152
1962	3.43	7.44	15.4	22.8	167.3	153
1963	2.67	5.79	15.8	21.6	175.6	152

TABLE 29. AVERAGE ANNUAL EXPENDITURES OF A FAMILY OF FOUR FOR LIVESTOCK AND LIVESTOCK PRODUCTS, 1958-59 ACTUAL AND 1960-63 PROJECTED, UNDER FREE MARKET CONDITIONS.

Year	Beef	Pork	Lamb	Broilers	Eggs	Milk	Total
1958	$258	$147	$12.3	$53.4	$68.2	$145	$684
1959	265	149	13.0	51.7	60.9	149	687
1960	267	149	13.2	51.4	62.1	150	693
1961	267	147	13.5	51.3	62.2	152	693
1962	248	144	12.9	50.3	58.7	153	667
1963	235	138	12.9	47.4	56.1	152	641

Appendix A

Table A-1 illustrates the computational procedure used in estimating the relative production, price and returns figures presented in table 1 of the text. The same procedure is used in table 2 except that grain consumption is increased 10.3 percent instead of 6.3 percent.

TABLE A-1. COMPUTATION OF ESTIMATED RELATIVE LIVESTOCK PRICES AND RETURNS FROM SALES OF LIVESTOCK AND LIVESTOCK PRODUCTS RESULTING FROM A 6.3 PERCENT INCREASE IN GRAIN CONSUMPTION, 1952-58.

	Beef & veal	Pork	Lamb & mutton	Poultry meat	Eggs	Dairy products	Other livestock	All livestock
1 Percent of all grain consumed by each type of livestock (1950-55)	11.8	41.2	0.7	9.8	13.0	16.6	6.9	100.0
2 Percent of additional grain allotted to each type of livestock	15.0	60.0	1.0	14.0	5.0	5.0	0.0	100.0
3 Estimated % increase in grain consumption	8.0	9.2	9.0	9.0	2.4	1.9	0.0	6.3
4 Percent of ration composed of grain (1950-55)	11.9	79.5	5.4	66.8	76.0	17.8	....	....
5 Estimated % increase in total feed consumption = estimated % increase in livestock production	1.0	7.3	0.5	6.0	1.8	0.3	0.0	2.5
6 Percent of total livestock products produced by each class of livestock	31.9	18.6	2.0	8.7	10.7	26.4	1.7	100.0
7 Estimated % increase in production of competing livestock products	6.4	2.0	3.7	3.2	2.6	3.3	2.5	....
8 Response of price to a 1% change in quantity product	—1.7	—2.5	—1.7	—1.7	—5.0	—3.3	....	....
9 Response of price to a 1% change in quantity of competing livestock products	—.5	—.4	—.7	—1.0	—1.5	—.3	....	....
10 Estimated relative price	95.1	81.0	96.6	86.6	87.1	98.1	100.0	....
11 Estimated relative returns from sales	96.1	86.9	97.1	91.8	88.7	98.4	100.0	93.9

Appendix B

Coefficients Relating Price Response to Quantity at the Farm Level (Price flexibilities)

BEEF[10] (—1.7)

Maki suggests —0.6 as the most appropriate estimate of demand elasticity of beef at the primary market level for postwar years. Breimeyer has also arrived at the same figure. The coefficient used is the reciprocal of —0.6. Fox and Learn derived price flexibility estimates of —1.19 and —1.37, respectively, from analyses based partly upon prewar data. It is believed that the demand for beef and pork has become somewhat less elastic in recent years. Consequently the higher flexibility coefficient was used.

PORK (—2.5)

Maki and Breimeyer again agree on —0.4 as the postwar elasticity of demand for pork at the farm level. Its reciprocal is used as the price flexibility. Fox and Learn estimated price flexibilities of —1.54 and —1.83, respectively.

LAMB (—1.7)

Fox estimates the price flexibility for lamb as —1.5 using prewar data. This was raised to —1.7 in the belief that elasticity of demand for all meats has declined since the war.

POULTRY MEAT (—1.7)

Barton and Daly estimated the demand elasticity for poultry meat at —.49. This corresponds to a price flexibility of —2.0. Fox's estimate of the price flexibility is —.62 for chickens and —1.21 for turkeys. Learn's estimate is —1.16 for all poultry.

EGGS (—5.0)

Gerra suggests a price elasticity of —0.4 at the retail level. Judge, using three different methods of estima-

tion, arrived at retail elasticities ranging from —.21 to —.61. Fox estimated the price flexibility at the farm level to be —2.91, which he notes is probably too low. Learn's farm price flexibility figure is —2.43. Barton and Daly estimate an elasticity of —0.8 which corresponds to a price flexibility of 12.5.

DAIRY PRODUCTS (—3.3)

Rojko derives elasticity estimates for dairy products ranging from —.25 to —.34 which correspond to price flexibilities of —3.0 to —4.0. Learn's estimate of price flexibility is —2.6. Barton and Daly estimate an elasticity of —0.5.

Coefficients Relating Price Response to Quantity of Competing Livestock Products

BEEF (—.5)

Fox suggests that a 1 percent increase in per capita consumption of competing *meats* reduced the price of a given meat 0.3 to 0.4 percent at retail (p. 118). On page 78 his estimate is —.40 percent as the effect on farm prices of a 1 percent change in supply of competing *meats*. Learn's coefficient for the effect on farm price of beef of a change in quantity of *all other livestock products* is —0.44.

For the sake of uniformity it was first desired to use a coefficient measuring the price effect of a change in quantity of all competing livestock products. However, the increase in other livestock products is not uniform but occurs primarily in pork and poultry meat which are closer substitutes than eggs and dairy products. Consequently a coefficient measuring the response to changes in quantity of competing *meats* was employed. A coefficient of —0.5 was selected, since farm prices vary more with quantity than do retail prices. It is assumed that the small changes in quantity of eggs and dairy products would have a negligible effect on beef price.

[10]A list of specific references is given on the last page of this appendix.

PORK (−.4)

Fox's 1922-41 studies did not indicate a significant response in pork prices to the consumption of other meat. Learn's coefficient is −0.21, much less than its standard error. Fox's suggested value of −0.3 to −0.4 (p. 118) is applied to the change in quantity of other meats. For pork as well as for beef, lamb and poultry meat, the price effects of the changes in egg and dairy product production are assumed to be negligible.

LAMB (−0.7)

Fox's estimate on page 78 is −0.70 for the change in lamb price (farm level) for a 1 percent change in the quantity of competing meats. Learn did not consider lamb.

POULTRY (−1.0)

Fox's estimate is −1.01 (using all other meat). Learn's estimate is −1.16 (using all other livestock products).

EGGS (−1.5)

Fox did not develop an estimate for eggs. Learn's estimate is −1.917 using all competing livestock products. (His standard error is 0.724.) This estimate seems high and was reduced to −1.5. It is believed that eggs are an inferior good in the technical sense (i.e., consumption decreases with increasing income) and the income effect of lower prices for other livestock products, as well as the substitution effect, reduces the demand for eggs.

DAIRY PRODUCTS (−0.3)

Learn's estimate is −0.132 with a standard error of 0.269. The figure of −0.3 was selected in the belief that other livestock products substitute for dairy products to a considerable degree.

References on price flexibility and cross-price flexibility coefficients:

Barton, G. T. and Daly, R. F., Prospects for agriculture in a growing economy. Address, Conference on Problems and Policies of American Agriculture. Iowa State College, Oct. 1958. p. 61.

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Fox, Karl A., Econometric analysis for public policy. Iowa State University Press. pp. 78, 116, 118. 1958.

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Judge, George C. Econometric analysis of the demand and supply relationships for eggs, Storrs Agr. Exp. Sta. Bul. 307, University of Connecticut. 1954.

Learn, Elmer. Estimating demand for livestock products at the farm level, Jour. Farm Econ., Vol. 38, No. 5: 1483-91. 1956.

Maki, Wilbur R., personal comments.

Rojko, Anthony S. The demand and price structure for dairy products, USDA Tech. Bul. No. 1168, pp. 68. 1957.

Appendix C

Procedure for Estimating the Effect of Changes in Consumer Income on Price.

The income elasticities were obtained from the 1955 Household Food Consumption Survey as reported in "Income and Household Size," Marketing Research Report No. 340 (U.S. Department of Agriculture, June 1959). A weighted average of the elasticities for low-, medium- and high-income households is used. The income elasticities were algebraically transformed into coefficients measuring the response of price to income using the following formula:

Change in price for a 1% change in income = − Income elasticity × Price flexibility − Income elasticity of substitutes × Cross price flexibility

Following are the coefficients for response of price to a 1 percent change in income, as determined and used in the projections.

Product	Change in price for a 1% change in income
Beef	0.49%
Pork	0.22
Lamb	0.76
Poultry meat	0.38
Eggs	0.44
Milk	0.04

Appendix D

Procedure Used in Making Retail Price and Expenditure Estimates

1. Estimated average farm price × Conversion factor[11] = Gross farm value (at retail)

2. Gross farm value − Value of by-products = Net farm value

3. Net farm value + Farm-retail spread = Estimated average retail price

4. Estimated average retail price × Estimated annual per capita consumption × 4 = Estimated annual expenditure for this item by family of four

Value of by-products is held constant at 1958-59 levels. The farm-retail spread is a projection of recent trend.

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[11]Conversion factors: beef, 2.16; pork, 2.13; lamb, 2.37; broilers, 1.37; eggs, 1.03; milk, 2.17.