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MEASURING THE IMPACTS OF THE DAIRY BUY-OUT PROGRAM ON THE RED MEAT INDUSTRY

Shamsul Alam and Jon A. Brandt*

Introduction

Apparent downward shifts in the demand for beef and pork have become a major concern to those industries. Although the conclusions reached by researchers are hardly unanimous regarding this downward shift, the evidence seems to suggest consumers are purchasing less beef and pork even with higher incomes or lower relative prices. This comes at a time when many producers of livestock commodities are undergoing severe financial stress.

To add another negative element to the already gloomy situation faced by meat producers, the Food Security Act of 1985 includes legislation called the Dairy Termination Program (DTP), which was designed to reduce much of the surplus milk production capacity. To the red meat industry, the bottom line of this program is an increase in the supply of low quality meat (from slaughtered dairy cows and heifers) on the market, likely resulting in a further depression of red meat prices.

But just how much are prices likely to drop at the farm and retail levels if additional dairy cow slaughter enters the market? In addition, will the purchase of additional amounts of beef by the U.S Department of Agriculture soften or negate the impact of dairy cow slaughter on farm and retail beef prices? These questions require answers to help the red meat industry anticipate and plan for the future. Although the beef industry is likely to be affected the greatest, prices in the pork and poultry industries will also be impacted by increased beef supplies.

In this paper, we analyze the effects of the proposed dairy termination program on the red meat industry using an econometric model of U.S. livestock sector. The paper is organized as follows: An outline of the dairy termination program is given. It is followed by a brief description and documentation of the livestock model. Assumptions with respect to macro economic

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factors, feed grain prices, and dairy cow slaughter levels are described. The empirical results of alternative scenario simulations with and without DTP are presented and interpreted. Finally, conclusions and implications are discussed.

Milk Production Termination Program

Provisions of the Food Security Act of 1985 call for the Secretary of Agriculture to operate a milk production termination or "whole-herd buy-out" program during the period April 1, 1986, through September 30, 1987. Under the whole-herd buy-out, producers will receive payments from U.S.Department of Agriculture, based on bids submitted to the Secretary, for the purpose of stopping milk production. All dairy cattle which the producer owns must be sold for slaughter or export. For 3,4, or 5 years (as determined by Secretary) after such sale, producers may not acquire interest in dairy cattle or milk production, nor acquire or make available to others facilities not used by their program. Program participants must provide evidence of their milk marketing history and the past and present size and composition of their herds. A producer who began marketing milk in the 15-month period ending March 31, 1986, is ineligible to participate, except if the entire herd and facilities were transferred to the producer as a result of a gift or inheritance from a family member.

The Secretary must issue regulations specifying marketing procedures to ensure that the greatest number of cattle are slaughtered during April-August 1986 and March-August 1987 and that such sales follow historical seasonal marketing patterns. The total number of dairy cattle marketed for slaughter under this program is limited to 7 percent of the national dairy herd, in addition to the normal culling rate per calendar year. To minimize the effect of the 18-months program on beef and pork producers, the Secretary must purchase 400 million pounds of red meat in addition to those normally purchased and distributed. Of these 400 million pounds of red meat, 200 million pounds will be available for distribution through domestic programs and 200 million pounds for export programs and military commissaries located outside the United States.

Bids for the DTP were accepted from producers who marketed 12.3 billion pounds of milk in 1985 or almost 9 percent of U.S. production. (Government net removals in 1985 were 13.2 billion pound (milkfat basis).) The producers reported inventories of 951,619 cows, 340,789 heifers (over 500 pounds) and 257,995 heifer calves. Whether or not the stated purpose of the program (to remove excess production capacity) is accomplished depends in large part on the increase in milk production from the non DTP participants. In any event, increased dairy cow and calf slaughter (above the normal culling rate) will have occurred in 1986 and 1987. For a good summary of the program and products participation, see Miller.

U.S. Livestock Model

In order to quantify the recent changes in dairy cattle slaughter due to the Dairy Termination Program, an econometric model of the U.S. livestock sector is employed. The livestock model is a part of an annual model of the U.S. agriculture sector maintained at the Food and Agricultural Policy Research Institute (FAPRI), University of Missouri at Columbia. The livestock model includes beef, pork, dairy, chicken, eggs and turkey. Each of the commodity models includes behavioral relationships for production, stocks, consumption, and prices. Each can be operated by itself or integrated with other commodity components to determine market prices and related quantities. The structural design of hog model in Figure 1 illustrates the flow of information signals through the market system and indicates the types of information used or generated in these models. Similar types of structural characteristics constitute the other livestock models. The components of the livestock model are reviewed in Alam et al., 1987, and Brandt et al. 1985a, 1985b.

The commodities are linked together for policy analysis and forecasting purposes. These links between commodity markets reflect the interaction between price and quantity movements across market structures. Accurately reflecting these links across commodities is especially important for policy evaluation and forecasting. Although governmental policies for major U.S. commodity markets historically have been for crops, links to livestock are important to reflect the full impact of the policies across U.S. agriculture. Policies with respect to the dairy industry (specially, milk support prices) are an exception to the crop policy orientation. In this particular analysis, this policy objective of reducing milk production directly impacts red meat supplies.

The dimensions of the FAPRI econometric model are relatively large. More than 1,100 variables, updated annually, are currently maintained in the data base. An extensive set of exogenous variables reflect conditions outside U.S. agriculture, including U.S. and world economic conditions (e.g. GNP, inflation, interest rates, exchange rates), climatic factors, and other exogenous factors affecting U.S. agriculture. Approximately 150 variables are determined or predicted within the livestock models, a similar number for the crop models. Approximately two thirds of these are determined through behavioral relationships, the rest through identities.

The three commodity models considered in this analysis include beef, pork, and chicken. (In this analysis, cow slaughter levels from the dairy model are exogenous observations to the beef model.) Estimated coefficients associated with the variables were based on data over the period 1961 through 1984. The models are linked at the retail demand level through the cross commodity effects between beef, pork and chicken.

Assumptions

Macro economic factors and foreign production and consumption levels are exogenous to the domestic livestock model used in this analysis. Because the evaluation period for this study extends from 1986 through 1992, assumptions regarding the levels of these exogenous factors were necessary. Macro economic variable projections were obtained from Wharton Econometric Forecasting Associates (now Wharton Econometrics). Net foreign trade information (which affects crop commodity movements more so than livestock and meat exchange) is obtained from models maintained by FAPRI at Iowa State University.

Second, assumptions with respect to the types of agricultural policy parameters affecting the crop and livestock sector are needed. Changing farm policies effect changes in crop production and thus crop prices which ultimately impact the livestock sector through higher or lower feedgrain costs. In this analysis, the policies designed in the Food Security Act of 1985 (FSA85) are imposed. Crop policy parameters and macroeconomic and foreign trade assumptions remain the same for each scenario.

Third, the specific objective of the analysis is to quantify and interprets the impact of the DTP on the U.S. livestock sector. Two scenarios are considered, only estimates of dairy cow and calf herd size and slaughter levels differ. In the baseline scenario (I), projected dairy cow numbers on farms and dairy cow slaughter are obtained by solving the dairy model (maintained at FAPRI) as if no DTP were in effect. In the second scenario (II), which includes the DTP, dairy cow numbers on farms are reduced because of the increased cow slaughter for the years 1986 and 1987. Dairy cow slaughter in 1986 associated with the DTP (i.e., above normal cull slaughter levels) is estimated to be 700 thousand head. In 1987, the slaughter levels were estimated at 550 thousand head. Finally, it was assumed that of the additional 400 million pounds of red meat purchased by USDA, 200 million pounds would impact domestic (civilian) consumption and prices whereas the other 200 million pounds (for export and overseas military consumption) would be exogenous to the model.

Results

The results of selected price, quantities and revenue variables of the alternative simulations are presented in Table 1 and Table 2. The last column of the tables reflects the average effects of the two alternative scenarios over the seven year period. During the initial years of the program, beef production was higher in scenario (II) as reflected in Table 1. Though the pork and broiler production were slightly lower in scenario (II) relative to scenario (I), the total meat production was higher in scenario (II) and consumers benefited. In 1986, consumers paid about 5 cents per pound less while consuming about 1.4 pounds per

person more under the DTP as reflected in Table 2. In total, consumer expenditures were reduced by $1.73 billion with the DTP. For the same year, farm prices were reduced by $2.75 per hundred weight for 900-1100 pound steers (Omaha), $.89 per hundred weight for barrows and gilts (seven terminal markets) and 1.0 cents per pound for 12 city broilers (wholesale price). Consequently, farm revenue decreased by $740 million in scenario II relative to scenario I. In 1987, directions of change are similar to those in 1986. Farm revenue is off by $250 million, retail expenditures are $960 million lower under the DTP.

Subsequent to the termination of the program, the analysis shows an immediate increase in per capita consumption of the baseline solution relative to the DTP scenario. Price and expenditure paths reverse as well, baseline levels being lower for both series. Beef consumption share increases as expected during the first two years of the analysis under the DTP. Over the seven years however, the average beef consumption share is only modestly higher under the DTP than the baseline.

Over the 1986-1992 period, beef production averaged about 157 million pounds more in the termination program relative to the baseline while pork and poultry production averaged 37 million pounds and 40 million pounds less, respectively. The average meat bundle price per pound was nearly the same in both scenarios ($1.742 in the baseline versus 1.736 in the DTP) but consumers eat a little more (.1 lb/person) on average with DTP. Per capita expenditure annually was estimated to be $.69 under the baseline. This translates to total consumer expenditures under DTP averaging about $160 million per year less relative to the baseline.

Under the DTP, farm prices for cattle drop sharply in the two years of the program. Prices also drop for hogs and broilers, due to increased beef supplies, but to a lesser extent than beef. Under the DTP, cattle price average $.65/cwt lower over the seven year period. Barrow and gilt prices average $.23/cwt. lower and broiler prices, (wholesale) average $.17/lb. lower under the DTP. The figures generate an average of about $120 million less per year in total livestock revenues with all of this loss occurring in the first two years of the analysis (when the DTP is operating).

A closer look at numbers in Tables 1 and 2 illustrates the effect of DTP on the meat industries. As expected beef production is higher during the initial period of the program and over the longer term the beef industry would be expected to adjust to anticipated DTP, showing relatively little change in production for the other years. Figure 2 depicts per capita beef consumption for the years of analysis. Consumers eat more beef with lower prices at the beginning of the program and as the industry adjusts to the program, there is no significant difference in beef consumption for the other years (a little less relative to baseline). Under the dairy termination program, per capita

consumption of pork was .1 pound less and poultry was .2 pound less relative to the baseline. The retail prices of pork and poultry averaged about the same in both scenarios. Figure 3 shows that total per capita meat consumption, like per capita beef consumption, was higher in the initial years of the program, then remained below the baseline. The meat bundle price per pound was less at the beginning of the Dairy Termination Program and stayed higher for the other years which is consistent with expected consumption behavior.

Conclusions

A large econometric model of the U.S. livestock sector was used to assess the effects of increased red meat supplies due to additional dairy cow slaughter on producers and consumers over the period 1986 to 1992. The analysis suggest that due to the additional dairy cow slaughter during the first two years of the simulated period, higher meat supplies reduced farm and retail prices moderately. Beef consumption rose. Pork and poultry consumption and prices were lower.

Over the seven year period, consumers average .1 pound per person more annually under the Dairy Termination Program. Similarly meat bundle prices and per capita expenditures were about the same under the two scenarios over the seven year period. Total farm revenue averaged $120 million less and the aggregate retail expenditure averaged $160 million less annually under the DTP. Relative to the annual production, consumption, and revenue levels observed in the meat sector, the effects of DTP are minor. The analysis suggests that with the exception of the years of the dairy termination program (1986 and 1987), calendar year differences in the beef, pork, and poultry sectors were less than one percent between the two scenarios.

TABLE 1

Simulated Paths of Selected Livestock Variables Under Two Policy Options

	1986	1987	1988	1989	1990	1991	1992	Avg86-92
PRODUCTION								
Beef (mil. lbs.)								
Baseline	23,300	21,210	20,404	19,809	20,130	20,706	21,266	20,975
Dairy Termination	24,174	22,000	20,240	19,630	20,020	20,620	21,240	21,132
Pork (mil. lbs.)								
Baseline	14,272	13,870	15,084	16,283	17,292	15,900	14,834	15,362
Dairy Termination	14,097	13,815	15,060	16,260	17,310	15,925	14,810	15,325
Broilers (mil. lbs.)								
Baseline	14,357	15,331	16,020	16,428	16,900	17,417	17,942	16,342
Dairy Termination	14,298	15,264	15,934	16,385	16,875	17,415	17,940	16,302
Total Meat (mil. lbs.)								
Baseline	51,929	50,411	51,508	52,520	54,322	54,023	54,042	52,679
Dairy Termination	52,569	51,079	51,234	52,275	54,205	53,960	53,990	52,759
CONSUMPTION								
Beef (mil. lbs.)								
Baseline	25,055	23,132	22,219	21,539	21,794	22,328	22,926	22,713
Dairy Termination	25,829	23,822	22,055	21,360	21,684	22,242	22,900	22,842
Beef (lbs. per cap. ret. wt.)								
Baseline	77.2	70.6	67.1	64.4	64.6	65.6	66.8	68.0
Dairy Termination	79.6	72.7	66.6	63.9	64.3	65.3	66.7	68.4
Pork (mil. lbs.)								
Baseline	14,980	14,725	16,148	17,250	18,068	16,533	15,409	16,159
Dairy Termination	14,805	14,670	16,124	17,227	18,086	16,558	15,385	16,122
Pork (lbs. per cap. ret. wt.)								
Baseline	58.7	57.2	62.1	65.7	68.1	61.8	57.1	61.5
Dairy Termination	58.0	56.9	62.0	65.6	68.2	61.9	57.0	61.4
Broiler (mil. lbs.)								
Baseline	13,707	14,680	15,274	15,628	15,964	16,353	16,859	15,495
Dairy Termination	13,648	14,613	15,188	15,585	15,939	16,351	16,857	15,455
Broiler (lbs. per cap. RTC)								
Baseline	57.1	60.5	62.3	63.2	63.9	64.9	66.3	62.6
Dairy Termination	56.8	60.2	62.0	63.0	63.8	64.9	66.3	62.4
PRICES								
Omaha Steers ($/cwt.)								
Baseline	$60.75	$66.98	$67.90	$69.15	$67.45	$64.35	$60.57	$65.31
Dairy Termination	$58.00	$64.95	$68.55	$70.00	$67.90	$64.60	$60.70	$64.96
Retail Beef Price ($/lb.)								
Baseline	$2.50	$2.76	$2.87	$2.96	$2.87	$2.75	$2.65	$2.77
Dairy Termination	$2.38	$2.66	$2.90	$2.98	$2.89	$2.79	$2.66	$2.75
7-Mkt Barrows & Gilts ($/cwt.)								
Baseline	$52.29	$52.70	$44.95	$37.05	$30.03	$35.01	$39.90	$41.70
Dairy Termination	$51.40	$51.90	$45.00	$37.00	$30.00	$35.00	$40.00	$41.47
Retail Pork Price ($/lb.)								
Baseline	$1.76	$1.81	$1.60	$1.52	$1.49	$1.61	$1.71	$1.65
Dairy Termination	$1.72	$1.78	$1.63	$1.55	$1.49	$1.62	$1.73	$1.65
12-City Whole. Broiler (cents/lb.)								
Baseline	56.2	53.3	48.8	48.3	48.9	49.4	50.0	50.70
Dairy Termination	55.2	52.5	49.0	48.5	49.0	49.5	50.0	50.53
Retail Chicken Price (cents/lb.)								
Baseline	78.8	74.1	71.5	70.0	71.2	73.3	75.0	73.40
Dairy Termination	78.5	73.8	71.6	70.1	71.3	73.5	75.0	73.40

TABLE 2

Aggregate Effects on Meat Consumers and Producers Under Two Policy Options

	1986	1987	1988	1989	1990	1991	1992	Avg86-92
BEEF, PORK & BROILER BUNDLE (PER CAP.)								
Meat Consumption (lbs.ret.wt.)								
Baseline	193.0	188.2	191.5	193.3	196.6	192.3	190.2	192.15
Dairy Termination	194.4	189.8	190.6	192.5	196.3	192.1	190.0	192.24
Total Expenditure (per cap.)								
Baseline	$341.24	$343.02	$336.50	$334.72	$332.45	$329.26	$324.32	$334.50
Dairy Termination	$334.04	$339.08	$338.56	$336.19	$332.79	$330.22	$325.77	$333.81
Meat Bundle Price /lb.								
Baseline	$1.77	$1.82	$1.76	$1.73	$1.69	$1.71	$1.71	$1.74
Dairy Termination	$1.72	$1.79	$1.78	$1.75	$1.70	$1.72	$1.71	$1.73
Total Farm Revenue (bil.)								
Baseline	$43.05	$43.00	$41.22	$39.88	$38.67	$39.20	$39.41	$40.63
Dairy Termination	$42.31	$42.75	$41.24	$39.94	$38.70	$39.22	$39.44	$40.51
Total Retail Expenditure (bil.)								
Baseline	$81.97	$83.22	$82.45	$82.81	$83.03	$82.95	$82.41	$82.69
Dairy Termination	$80.24	$82.26	$82.95	$83.17	$83.11	$83.20	$82.78	$82.53

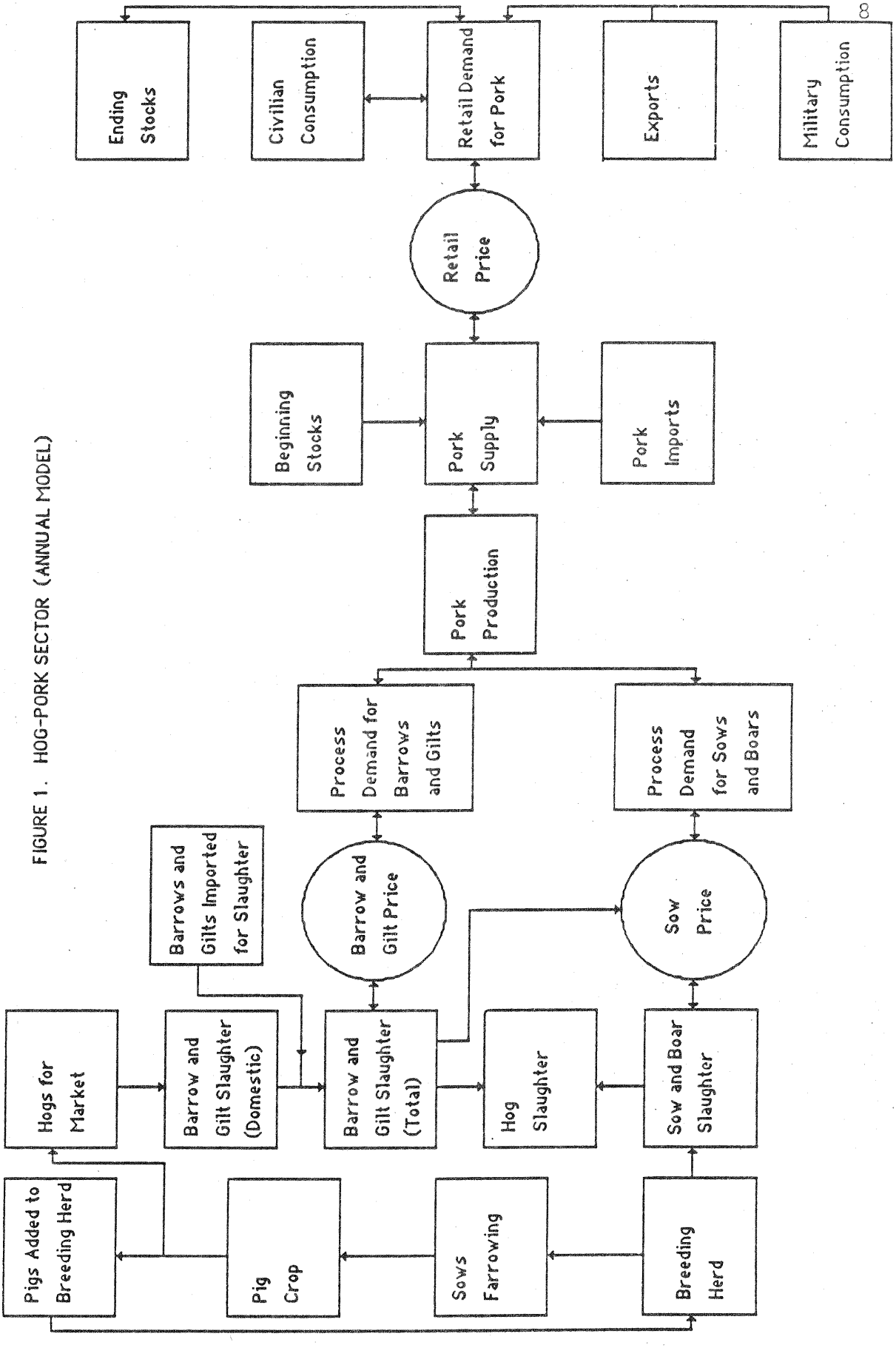


FIGURE 1. HOG-PORK SECTOR (ANNUAL MODEL)

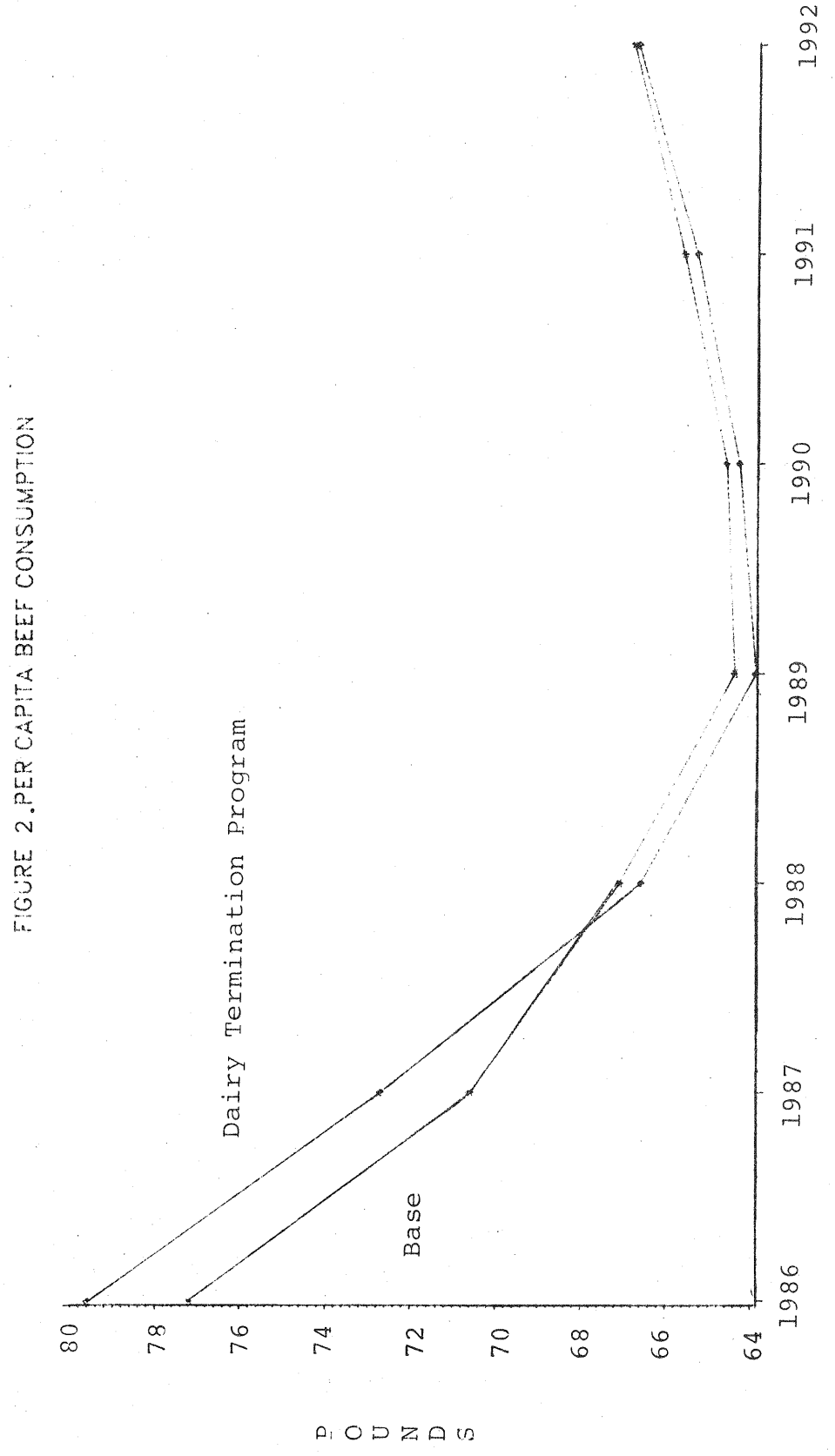
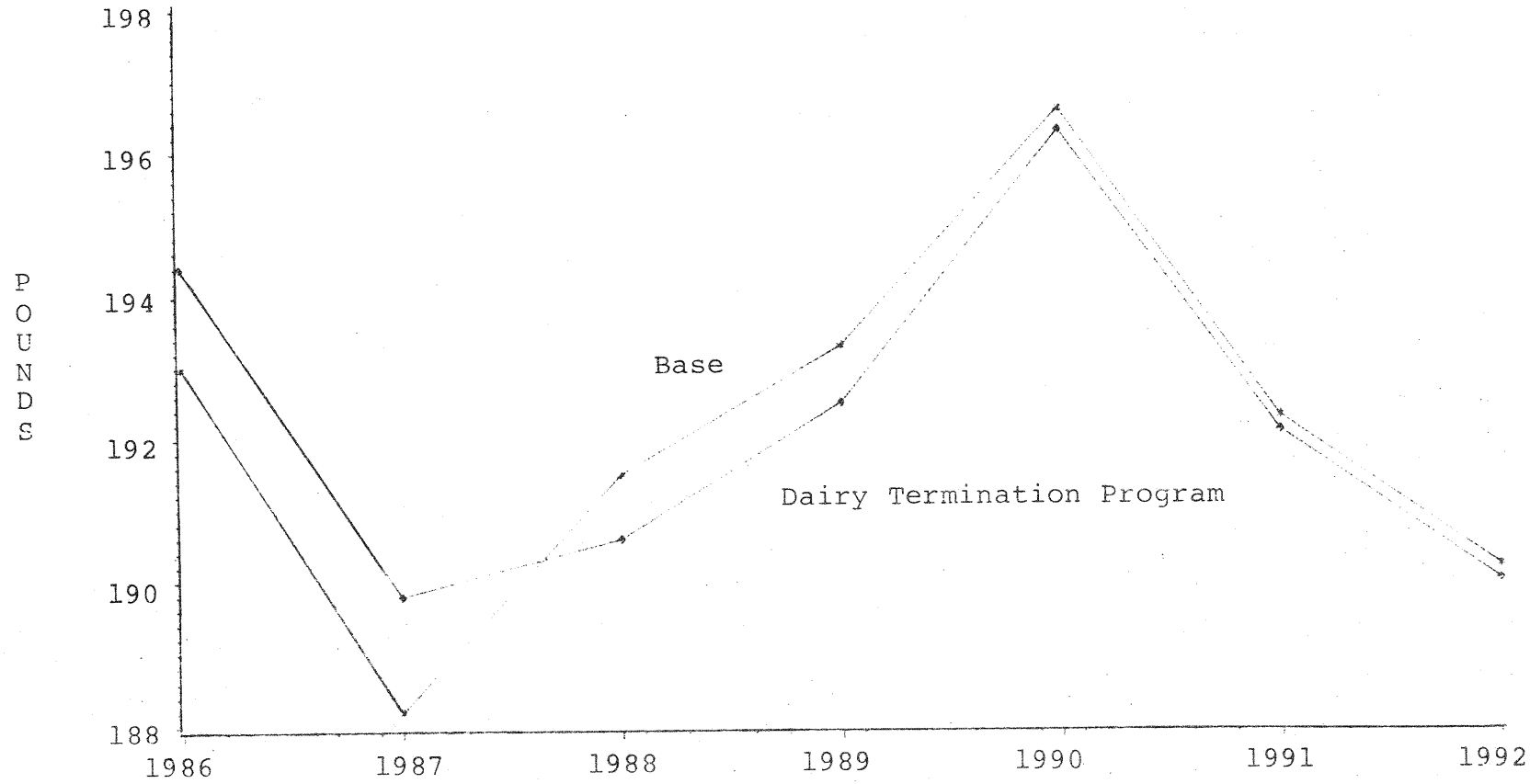


FIGURE 2.PER CAPITA BEEF CONSUMPTION
Dairy Termination Program
Base
POUNDS
80
78
76
74
72
70
68
66
64
1986
1987
1988
1989
1990
1991
1992

FIGURE 3. PER CAPITA MEAT CONSUMPTION



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