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AN ANALYSIS OF THE PRICE SUPPORT PROGRAM FOR PEANUTS

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The federal government is an active participant in the peanut industry; it restricts acreage, supports prices and disposes of those peanuts which cannot be sold at the support price through crushing and export markets. Total peanut production has doubled since 1960 although planted acreage has been restricted by the peanut program to a maximum of 1.61 million acres [3]. Due to increasing yields, acquisitions by the Commodity Credit Corporation have increased from 17 percent of total production in 1960 to 36 percent in 1972 [12]. CCC losses have ranged from 16.7 million dollars in 1960 to 97.3 million dollars in 1971 [4]. Although CCC costs for 1973 were less than 5 million dollars [12], such a small loss is not expected to continue indefinitely.

The Administration has cited high CCC costs and acreage restrictions as reasons for changing the commodity program for peanuts. President Ford has asked Congress to remove all remaining acreage limitations on peanuts [6]. Although no major policy change has yet been implemented, the future of the peanut program appears uncertain.

Policy makers need a better understanding of the peanut sector in order to make changes in the present program. Effects of alternative policies on production, government and consumer costs, and farm income are major considerations. The primary objective of this paper is to develop a market model of

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the peanut sector, including CCC operations. Application of the model will be demonstrated by projecting peanut production, consumption and government costs for the period 1975-1980.

Related Literature

Livermore investigated the variables affecting the supply of peanuts in the United States between 1909 and 1958 [5]. The U.S. was divided into three production regions, and acreage, yield and production were estimated for each region. Estimates of supply and demand were compared to determine the prospective surplus of peanuts for the years 1959 through 1965, this quantity being the amount of peanuts which the government should divert from normal trade channels. Although the study integrated supply with demand, further analysis of CCC operations is needed to determine their effect upon farm income, consumer costs, and government costs.

Several studies of the peanut sector have emphasized demand characteristics for peanuts and peanut products [1], [2], [7]. Song recently estimated demand for peanuts separately for edible uses and crushing purposes, using data from 1947 to 1967. He found that price elasticity ranged from -.043 to -.119 in the edible market [8]. Song used these estimates of demand to analyze the effect of a direct price support program on farm income, government cost, and peanut consumption.

Market Model of the Peanut Industry

Production

Practically all peanuts in the U.S. are produced in three regions. The Virginia-North Carolina region produces 19.4 percent of the total U.S. production [11]. The southeast region, South Carolina, Georgia, Florida, Alabama,

and Mississippi, produces 57.9 percent of the United States' total production. The southwest region, comprised of Oklahoma, Texas, and New Mexico, accounts for 22.7 percent of the United States' total production.

For the period of analysis (1960-1973), peanut acreage has been restricted by the government, but higher yields have increased total production each year. By supporting prices above market-equilibrium levels, the government commodity programs are partially responsible for the increase; high prices have encouraged farmers to produce peanuts on better land and to adopt progressive farming practices. In addition, improved peanut varieties and high quality seed have also been responsible for much of the increase.

Commercial Market

Each year approximately nine percent of total production is lost or used for feed and seed [4]; the remainder is available for commercial markets or acquisition by the CCC. The CCC purchases peanuts for the support price and diverts its acquisitions away from the commercial market so that the price of edible peanuts is not depressed. Since the CCC buys peanuts at a predetermined support price, processors in the commercial market must offer farmers a comparable price. These processors thus face an almost perfectly elastic supply of peanuts.

Nuts sold in commercial channels are processed as edible peanuts, crushed for oil, or exported. Only the highest grades are used for edible purposes. Damaged and low quality nuts purchased for edible purposes cannot be used for consumption but can be crushed for oil.

CCC acquisitions can be allocated to crushers and exporters, or stored for the following year. Cost of peanut storage is substantial, therefore, the CCC sells, on a bid basis, most of the quantity under its control. The quantity

of nuts which the CCC sells into the crush market depends to a great extent upon the bid price for those nuts. Price of peanuts for crushing is determined within a supply-demand framework, with a major portion of total quantity crushed being CCC sales. Peanuts not sold to crushers or retained as storage are sold to exporters. Although exports depend upon CCC surpluses, the export market does not function solely as a dumping ground for U.S. surplus peanuts. To promote its peanuts in the world market, the U.S. has a self imposed restriction to export only nuts of the highest quality [4]. These nuts are not exported directly to other countries by the CCC, but are sold to exporters. The quantity of U.S. peanuts exported was only 18 percent of total world peanut exports during the 3-year period from 1971-1973 [13]. Therefore, a small change in the quantity of U.S. exports is not expected to measurably affect world prices.

Estimation of the Model[1/]

Planted Acreage

Although the national peanut acreage allotment has remained constant (1.6 million acres) over the period studied, farmers have planted less than their allotment. In the Va.-N.C. production region, planted acreage has steadily decreased. Consequently, planted acreage in this region can be explained best by regressing it on time. However in the other two regions, fluctuations in

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[1/] Due to limited space data sources are not presented here. Prices were obtained from Agricultural Statistics and unpublished ASCS statistics. Quantities were obtained from Agricultural Statistics, unpublished ASCS statistics and The Fats and Oils Situation.

planted acreage can be explained best by expected gross incomes from peanuts versus competing crops. Soybeans in the Southeast and cotton in the Southwest were selected as the most important crops in competition with peanuts. Expected per acre gross incomes for competing crops were measured by lagged values from the previous year, while expected gross income from peanuts were estimated by multiplying the support price in the current year and yields lagged one year. Presented below are the relationships explaining planted acreage along with the standard errors and R^2 for each equation.

$$\text{Va.-N.C.:} \quad A_1 = 289.8791 - 1.508\ T \qquad R^2 = .86 \quad (.174)$$

$$\text{Southeast:} \quad A_2 = 951.908 + .280\ GP_2 - 3.674\ GS_2 \qquad R^2 = .86 \quad (.106) \qquad (.898)$$

$$\text{Southwest:} \quad A_3 = 421.443 + .142\ GP_3 - .818\ GC_3 \qquad R^2 = .63 \quad (.041) \qquad (.530)$$

where

A_i = planted acreage (1,000 acres) in region i

T = time (1960 = 1, 1961 = 2, ...)

GP_i = expected gross income ($/acre) from peanuts in region i

GS_i = gross income ($/acre) of soybeans in region i

GC_i = gross income ($/acre) of cotton in region i

Yields

Yield increases in each region have been non-linear with respect to time and can best be described by using natural logarithms of the variables in the regression analysis. Furthermore, the percent of runners grown in the Southeast is significant in explaining the high yields in the region.[2/] The

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[2/] In 1963, runners yielded 1,513 pounds per acre in Georgia; but by 1973, yields had increased to 2,721 pounds per acre [10].

relationships explaining yields, with R^2's and standard errors, are presented below.

$$\text{Va.-N.C.:} \quad \ln Y_1 = 7.438 + .137 \ln T \qquad R^2 = .52 \quad (.038)$$

$$\text{Southeast:} \quad \ln Y_2 = 5.305 + .304 \ln T + .390 \ln R_2 \qquad R^2 = .91 \quad (.041) \qquad (.141)$$

$$\text{Southwest:} \quad \ln Y_3 = 6.657 + .263 \ln T \qquad R^2 = .79 \quad (.039)$$

where

Y_i = yield (lbs.) in region i

T = time (1960 = 1, 1961 = 2, ...)

R_i = the percentage of runners planted in region i

Loss

Each year a portion of the peanut production is not marketed through the major marketing channels. This quantity is lost, counted as shrinkage, or is used for seed or feed and tends to be directly related to peanut production. As the support price increases, however, the peanut crop becomes more valuable and a smaller percentage of production is used as livestock feed or for other purposes. Therefore, the quantity of peanuts not sold in the edible market or acquired by CCC was regressed on total peanut production and the support price.

$$L = 249.466 + 0.141\ PR - 37.155\ PS \qquad R^2 = .38 \quad (.057) \quad (20.133)$$

where

L = quantity (mil. lbs.) of peanuts disposed of as seed, feed, farm loss and shrinkage

PR = total production (mil. lbs.)

PS = support price (¢/lb.)

Demand for Edible Peanuts

The general demand model for edible peanuts in this analysis specifies that the quantity of peanuts demanded is a linear function of its own price, consumer income, and the prices of related goods. Since the price of edible peanuts is determined by the price support level, there is no simultaneous relationship between price and quantity. Furthermore, after repeated but unsuccessful attempts to specify statistically significant complimentary and competitive products for edible peanuts, it was decided to omit these relationships from the regression analysis. Thus, per capita consumption of edible peanuts was regressed against the price of edible peanuts (the support price) and disposable personal income. Since these two variables are highly correlated (.87), previous data was used to estimate the relationship between the edible quantity and its price. Song's estimate of the price elasticity for edible peanuts, -9.1187, was used with the average support price, 12.123, and the average quantity of peanuts consumed per person, 7.550, to calculate the coefficient for price used in the restricted least squares regression analysis. The equation explaining edible demand for peanuts follows.

$$E = 6.027 - .074\ PS + .086\ DI$$
$$R^2 = .95 \qquad (.006)$$

where

E = quantity (lbs.) of edible peanuts consumed per person

PS = support price for peanuts (¢/lb.)

DI = disposable personal income ($100)

Non-CCC Crush

A portion of the peanuts sold to commercial buyers for edible purposes is of inferior quality or becomes damaged from storage or transportation.

Since these nuts are unfit for processing into edible products, they are crushed for oil. This quantity crushed has amounted to eight percent of edible consumption during the period of the study.

$$CRSHNC = 0.08\ TE$$

where

CRSHNC = quantity (mil. lbs.) of peanuts crushed from non-CCC sources

TE = total edible consumption (E x population)

Purchases from CCC

The CCC acquires peanut production which has not been lost on the farm or sold to domestic buyers for edible purposes. All purchases from the CCC are dependent upon the quantity available for disposition. More specifically, this quantity is determined by the following equation.

$$QAVAIL = PR + STO - L - TE - CRSHNC$$

where

QAVAIL = quantity (mil. lbs.) of peanuts available for CCC disposition

STO = quantity (mil. lbs.) of peanuts stored from the previous year's production

The quantity of peanuts purchased from the CCC is dependent upon the quantity available for disposition, because the CCC holds only a residual of its acquisitions in storage for the following year. The quantity of peanuts purchased for crushing purposes increases as the purchase price for crushing falls and/or as the purchase price for export rises. Similarly, purchases for export are inversely related to prices paid for CCC peanuts for export and directly related to prices paid for crushing. To limit the scope of

the analysis, the export price of peanuts was considered to be predetermined.[3/]

The price paid for peanuts for crushing is negatively related to the quantity of peanuts crushed. The increasing price of soybeans, another major source of oil, has caused the crush price to increase. Also, the upward trend in disposable personal income has increased the demand for peanuts for crushing and has caused the price paid to increase, other things equal.

The quantities purchased from CCC by exporters and crushers are determined simultaneously. A market equilibrium situation exists in which the demand for peanuts by crushers and exporters interacts with the quantity available to the CCC for disposition. The quantity purchased for crushing is determined by the quantity available to the CCC for disposition and by the prices for crushing and export. Similarly, the quantity of peanuts purchased by exporters is dependent upon the availability for CCC disposition along with crushing and export prices. The price paid by crushers also depends upon the total quantity crushed, the price of competing oilseeds (primarily soybeans) and disposable personal income. Finally, the system of equations explaining the purchases from the CCC is completed by the identity in which the total quantity crushed is composed of the quantity purchased for crushing purposes from the CCC and low quality peanuts from the edible market. For the period after 1972 the demand for peanuts for crushing and export increased significantly and is accounted for by a dummy variable. These simultaneously determined relationships as estimated by three stage least squares are presented below.

$$\underset{\text{(0.036)}}{\text{CRSHC} = -361.8 + 0.559\ \text{QAVAIL}} \underset{\text{(8.211)}}{- 59.69\ \text{PCRSH}} + \underset{\text{(12.10)}}{51.89\ \text{PEXP}}$$

[3/] This simplification is reasonable since the United States produces peanuts primarily for the domestic edible market and only recently (1971-73) has the U.S. accounted for 18 percent of total world peanut exports [13]. World export price is thus primarily dependent on factors outside this country.

$$EXP = -38.45 + \underset{(0.033)}{0.429}\ QAVAIL + \underset{(7.475)}{38.31}\ PCRSH - \underset{(11.01)}{38.63}\ PEXP$$

$$PCRSH = -0.449 - \underset{(0.003)}{0.004}\ CRSHT + \underset{(0.395)}{1.505}\ PSOY + \underset{(0.001)}{0.002}\ DI + \underset{(1.352)}{3.759}\ D14$$

$$CRSHT = 1\ CRSHC + 1\ CRSHNC$$

where

CRSHC = quantity (mil. lbs.) of peanuts purchased from the CCC for crushing

PCRSH = price (¢/lb.) paid to CCC for peanuts for crushing

EXP = quantity (mil. lbs.) of peanuts exported

CRSHT = quantity (mil. lbs.) of peanuts crushed from all sources

PSOY = price ($/bushel) of soybeans

D 14 = 0 from 1960-1972
1 beyond 1972

Other CCC Dispositions

Some of the peanuts acquired by the CCC are disposed of in programs under Section 32 of Public Law No. 320. Section 32 uses include disaster relief, needy family programs, and the school lunch program. Thirty percent of custom's receipts are made available for the purchase of agricultural commodities but only a fraction of this amount can be used for peanut purchases [9]. However, the CCC incurs a loss from these sales. Since these peanuts are processed for edible purposes, Section 32 dispositions are similar in quality to export sales. The price paid for peanuts under Section 32 is, therefore, considered to be the same price paid for peanuts for export. Since the quantity bought for exportation is largely determined by the value of all imports and by various needs for food throughout the U.S., the quantity of peanuts disposed of under Section 32 is determined by variables outside of the system and can be treated as an independent variable in the present analysis.

Also included under CCC disposition of peanuts are nuts used for edible purposes and seed. Since quantities of both edible peanuts and seed were analyzed previously, these quantities are not included in the analysis of CCC dispositions. It was assumed that the quantities disposed of for edible purposes and seed are sold for the support price so the CCC incurs no losses on these sales.

Simulation Results 1975-1980

Projection Procedure

The above model was used to project peanut production and to estimate its allocation among edible, crushing, and export markets from 1975 to 1980. Based on these projections, it was possible to simulate CCC operations which include estimating CCC costs. Projections were based on the following assumptions.

CCC variable costs can be categorized into two components: the cost of selling below the support price and the cost of storage and handling. Costs resulting from the price differential were calculated directly from the value of CCC acquisitions and the proceeds from crushing, export and Section 32 dispositions. Storage and handling costs have varied from 1.4 to 3.5 cents per pound over the period 1960-1973 but showed no statistically significant trend.[4/] Thus these costs were assumed to remain constant at 2.19 cents per pound (the historical average) for the 1975-1980 projections.

Section 32 dispositions of peanuts also showed no significant trend and thus it was assumed these dispositions would not drop below the historical

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[4/] Costs from storage and handling were calculated by subtracting the cost due to the price differential from total CCC costs as reported by [10].

average. However, these dispositions were allowed to increase if peanuts were in surplus. For the period 1972-74 the demand for U.S. peanuts for crushing and export appears to have been approximately 1,300 million pounds at current prices. Inventories which cannot be sold through crushing or export markets at 100 percent of loan value are diverted through the domestic school lunch program and P.L. 480 exports. In 1975, the CCC contracted for toll crushing of 327 million pounds of peanuts to reduce overstocked inventories, leaving 1,300 million pounds for diversion through crushing and export markets [14]. Assuming no new foreign market developments, the limit on the quantity of peanuts demanded at current prices is expected to increase only moderately.

It was assumed that the percentage of acreage planted in runners in the South would asymptotically appraoch 100 percent. The remaining independent variables were increased at constant annual rates from 1973 levels. Historical rates were calculated for the production value of soybeans and cotton, soybean prices and export prices.[5/] Population was projected to increase 0.76 percent annually while per capita disposable personal income was projected to increase 7.9 percent annually.

The support price is of critical importance in determining production, the allocation of production among markets and CCC costs. Since the support price is directly linked to production costs and since such production inputs as machinery, fertilizer and petroleum products have exhibited rapid price increases, the support price is likely to continue to increase for the remainder of the decade. The annual increase in the support price was varied from four to eight percent to measure the impact of this variable on production and its allocation, as well as CCC costs.

5/ Annual percentage increases in prices and production values were calculated from 1960-63 averages to 1970-73 averages.

Projection Results

Simulation results show that production will steadily increase through 1980 as will edible consumption but that only 53.7 percent of the projected production will be used for edible purposes compared to 60.7 percent of historical production. Quantity crushed will decline slightly through 1980 because of a relatively high crush price (Figure 1). Exports are projected to increase steadily primarily because the quantity available for CCC disposition will increase with production.

CCC costs will initially be above average 1970-73 costs because of toll crushing from overstocked CCC inventories. Toll crushing costs are expected to decrease but as the support price continues to increase at a faster rate than the export price, CCC costs are projected to rise further. Magnitude of these changes will be dependent on the rate of increase in support price and are examined for alternative rates of increase in this variable (Table 1). With a four percent annual increase in support price, CCC costs will decline but such a small increase may be unrealistic if inflation continues at present rates. If the support price increases six percent annually, costs will rise to 138 million dollars by 1980. The eight percent rate will produce larger CCC costs by 1980 but if inflation continues at present rates, such costs are likely.

Summary and Conclusions

A model was developed to describe the operations of the peanut sector; production was calculated by regions and then allocated between edible consumption and CCC disposition. The relationships affecting CCC dispositions into the crushing and export markets were also described and quantified. The

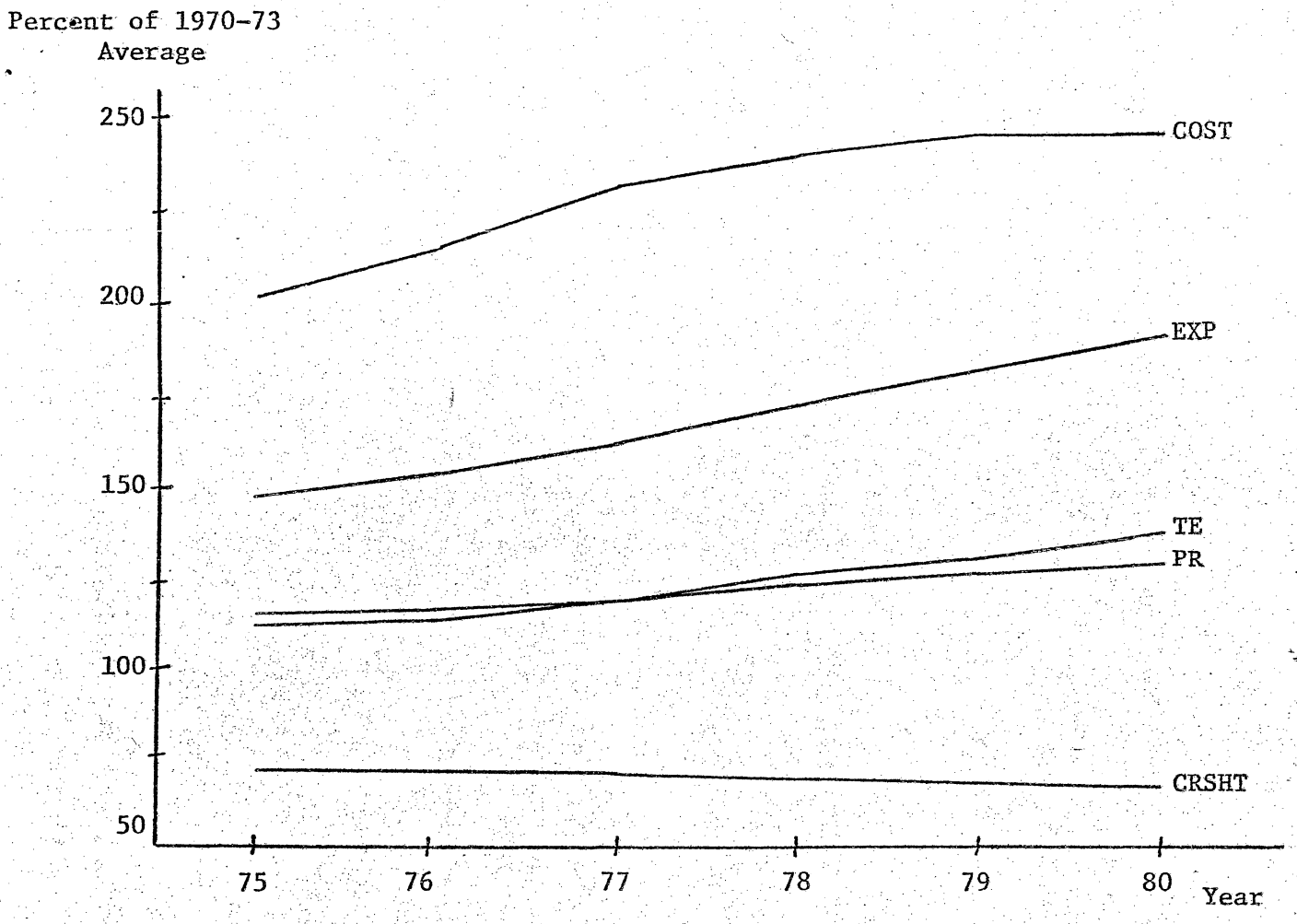

Figure 1. Projected Levels of Peanut Production, Consumption, Quantity Crushed, Quantity Exported and CCC Costs Relative to 1970-73 Average Levels.

Table 1. Projected CCC Costs Under Alternative Rates of Increase in the Peanut Support Price

Year	Annual Increase in Support Price		
	4 Percent	6 Percent	8 Percent
	(Million Dollars)		
1975	115.59	115.59	115.59
1976	115.95	125.39	134.94
1977	112.15	132.55	153.93
1978	104.28	137.17	172.89
1979	92.29	139.23	192.13
1980	76.03	138.58	211.91

model was then used to estimate production, edible usage, quantity crushed, exports and CCC costs from 1975 to 1980. It can further be used to evaluate the effect of the price support program in the past and the findings applied to the future.

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