MARKETING QUOTAS AS AN ALTERNATIVE TO THE PRESENT PRICE SUPPORT PROGRAM FOR PEANUTS

Frank N. Fleming and Fred C. White

Use of peanuts in edible products is expected to increase five percent in 1975-76 to 1.9 billion pounds [15]. Despite the increase in consumption, supplies are well in excess of edible requirements. The 1975-76 peanut supply is estimated at a record 5.0 billion pounds, about 20 percent above the previous year [15]. Surplus production is an increasingly important problem for the peanut sector. 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 30-35 percent in 1975 [15].

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 [8]. 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 the peanut sector, including CCC operations. Application of the model is demonstrated for the period 1976-1980 by projecting peanut production, consumption, net farm income and government costs under two policy alternatives: the present price support program and a marketing quota program that would limit production to the 1970-73 average production.

RELATED LITERATURE

Livermore investigated variables affecting the supply of peanuts in the United States between 1909 and 1958 [7]. 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, 9]. Song, Franzmann and Mead recently estimated the free market price for peanuts over the period 1952 to 1972 by separating demand for peanuts into edible and crushing purposes [11]. Song's previous estimates of price elasticity in the edible market ranged from $-.043$ to $-.119$ [10]. He used these estimates of demand to analyze the effect of a direct price support program on farm income, government cost and peanut consumption.

Research analyzing proposed alternative peanut programs has concentrated on considerations of supply response. Freeman developed a linear programming model to determine efficient allocations of peanut production in Alabama, Georgia, Oklahoma

Frank N. Fleming is a Research Assistant and Fred C. White Associate Professor, Department of Agricultural Economics, University of Georgia, Athens.

and Texas [4]. Little, Marshall and Kline evaluated the impact of policy alternatives on 13 representative farms in the Virginia-North Carolina production region [6]. These analyses depicted the impact of government programs on different types of farms at one point in time. However, they did not consider either aggregate peanut demand or Commodity Credit Corporation operations with regard to the peanut program. Only by incorporating supply and demand considerations with government operations can the aggregate impact of alternative government programs be adequately analyzed over a period of time.

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 [12]. 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 country's 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, 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 [5]; 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 [5]. These 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 three-year period from 1971-73 [17]. Therefore, a small change in the quantity of U.S. exports is not expected to measurably affect world prices.

ESTIMATION OF THE MODEL[1]

Production

Peanut production was analyzed by disaggregating production into planted acreage and per-acre yields. The national peanut acreage allotment has remained constant (1.6 million acres) over the period studied. However, plantings have varied slightly from year to year, primarily because of weather conditions. With government restrictions on acreage, rapid increase in production has resulted primarily from the substantial increases in yields.

Yield increases in each region have been nonlinear 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 region's high yields.[2] The estimated

[1] Due to space requirements, data sources are not described in detail. 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*.

[2] In 1963, peanut yields in Georgia averaged 1,546 pounds per acre while 49 percent of the acreage was planted to runners. By 1973, yields had increased to 2,626 pounds and acreage planted to runners had increased to 78 percent.

regression equations explaining yields, with standard errors (in parentheses) and R^2's, are presented below.

Va.-N.C.:

$$\ln Y_1 = 7.438 + .137 \ln T \quad (.038)$$
$$R^2 = .52$$

Southeast:

$$\ln Y_2 = 5.305 + .304 \ln T + .390 \ln R_2 \quad (.041) \quad (.141)$$
$$R^2 = .91$$

Southwest:

$$\ln Y_3 = 6.657 + .263 \ln T \quad (.039)$$
$$R^2 = .79$$

where

Y_i = yield (lbs.) in region i
T = time (1960=1, 1961=2, . . . 1972=13)
R_i = the percentage of runners planted in region i

Loss

Each year a portion of the peanut production is not marketed through major channels. This quantity is lost, counted as shrinkage or is used for seed or feed. It tends to be directly related to peanut production. As 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, quantity of peanuts not sold in the edible market or acquired by CCC was considered a nonlinear function of total peanut production and the support price.

$$\ln FL = -5.784 + 1.983 \ln PR \quad (.764)$$
$$-1.907 \ln PS \quad R^2 = .42 \quad (1.208)$$

where

FL = 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 quanity of peanuts demanded is a function of its own price, consumer income and 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 complementary 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 price (the support price) and disposable personal income. Since these two variables are highly correlated (.87), previous data were used to estimate the relationship between edible quantity and its price. Song's estimate of the price elasticity for edible peanuts, −0.1187, was used with the average support price, 12.123, and 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:

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

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 × population)

Purchased 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.

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

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 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 purchase price for crushing falls and/or as that for export rises.[3] 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 predetermined.[4]

The price paid for peanuts for crushing is negatively related to quantity of peanuts crushed. The increasing price of soybeans, another major source of oil, has caused the crush price to increase.[5] Also, an upward trend in disposable personal income has increased the demand for peanuts for crushing and caused the price paid to increase, other things being equal.

Quantities purchased from CCC by exporters and crushers are determined simultaneously. A market equilibrium situation exists in which demand for peanuts by crushers and exporters interacts with quantity available to the CCC for disposition. The quantity purchased for crushing is determined by that available to the CCC for disposition and by 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. Price paid by crushers also depends upon total quantity crushed, 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 total quantity crushed is composed of 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.

$$\begin{array}{l} CRSHC = -361.8 + .559\ QAVAIL \\ \qquad\qquad\quad (.036) \\ \qquad -59.69\ PCRSH + 51.89\ PEXP \\ \qquad\quad (8.211) \qquad\quad (12.10) \end{array}$$

$$\begin{array}{l} EXP = -38.45 + .429\ QAVAIL \\ \qquad\qquad\quad (.033) \\ \qquad +38.31\ PCRSH - 38.63\ PEXP \\ \qquad\quad (7.475) \qquad\quad (11.01) \end{array}$$

$$\begin{array}{l} PCRSH = -.449 - .004\ CRSHT \\ \qquad\qquad\quad (.003) \\ \qquad +1.505\ PSOY + .002\ DI \\ \qquad\quad (.395) \qquad\quad (.001) \\ \qquad +3.759\ D\ 14 \\ \qquad\quad (1.352) \end{array}$$

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

where

CRSHC = quantity (mil. lbs.) of peanuts purchased from the CCC for crushing
PCRSH = price (¢/lb.) paid to CCC for peanuts for crushing
PEXP = price (¢/lbs.) paid to CCC for peanuts for export
EXP = quantity (mil. lbs.) of peanuts exported
CRSHT = quantity (mil. lbs.) of peanuts crushed from all sources
PSOY = price ($/bushel) of soybeans
D14 = 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

[3] The price of peanuts for crushing and the average bid price were obtained from unpublished ASCS data. The export price was calculated from the crushing and average bid prices weighted by the appropriate quantities.

[4] This simplification is reasonable, since the United States produces peanuts primarily for the domestic edible market. Only recently (1971-73) has the U.S. accounted for 18 percent of total world peanut exports [14]. World export price is thus primarily dependent on factors outside this country.

[5] Attempts to disaggregate the price of soybeans into the prices of meal and oil did not statistically improve the model.

only a fraction of this amount can be used for peanut purchases [13]. 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 paid for peanuts for export. Since the quantity bought for this purpose is largely determined by 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 are not included in the analysis of CCC dispositions. It was assumed that quantities disposed of for edible purposes and seed are sold for the support price. The CCC, then, incurs no losses on these sales.

SIMULATION RESULTS 1976-1980

Projection Procedure

The above model was used to project peanut production and to estimate its allocation among edible, crushing and export markets from 1976 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: cost of selling below the support price and that of storage and handling. Costs resulting from the price differential were calculated directly from the value of CCC acquisitions and 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.[6] Thus, these costs were assumed constant at 2.19 cents per pound (the historical average) for the 1976-1980 projections.

Section 32 dispositions of peanuts also showed no significant trend. It was assumed these dispositions would not drop below the historical 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, export and edible purposes averaged approximately 1,359 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 550 million pounds of peanuts to reduce overstocked inventories [15]. 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 percentage of acreage planted in runners in the South would asymptotically approach 100 percent. The remaining independent variables were increased at constant annual rates from 1973 levels. Historical rates were calculated for soybean prices and export prices for peanuts.[7] 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 was assumed to increase at a six percent annual rate, reflecting the anticipated rate of inflation for the remainder of the decade.[8]

Simulation results were projected for two alternative programs: continuation of the current program and implementation of a market quotas program. It was assumed the 70 percent parity provision for the support price remains in effect for both programs. Under the quota system, maximum production was set at 1970-73 averages. This limit on production was accomplished by reducing acreage: Restrictions on planted acreage for each region were determined by dividing permitted production by projected yields.[9]

Aggregate net farm income was calculated using representative budgets for the various production areas [16]. Costs for the remainder of the decade reflected the assumed inflationary rate and the required increase in factor utilization associated with increased yields.[10] Net income under the quota program was determined by adding net income from peanuts on the restricted acreage to net income from competing crops on land diverted from peanut production.

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[6] Costs from storage and handling were calculated by subtracting the cost due to the price differential from total CCC costs as reported by [11].

[7] Annual percentage increases in prices and production values were calculated from 1960-63 averages to 1970-73 averages.

[8] It was assumed that annual changes in prices paid by farmers would be similar to the aggregate rate of inflation.

[9] Although these results were assumed to be deterministic, the procedure can easily be modified to account for production uncertainties.

[10] Part of the reason for the rapid increase in yields has been increased utilization of factor inputs. Therefore, total per-acre costs measured in constant dollars were regressed on yields to determine how production costs have changed with increased yields. The regression results indicated that since 1963 costs have increased 0.4 percent for each 1.0 percent increase in yields.

Projection Results

Simulation results show that, under the present program, production will steadily increase through 1980, as will edible consumption. By that year, only 57.8 percent of production will be used for edible purposes (Table 1). The quantity of peanuts crushed will decline slightly because of a relatively high crush price. Exports are projected to increase steadily, primarily because the quantity available for CCC disposition will increase with production.

CCC costs will initially be above 1970-73 costs, because of toll crushing from overstocked CCC inventories. However, rising demand for edible peanuts will reduce toll crushing requirements over the period. Since toll crushing costs are expected to decrease, CCC costs will decline but will remain above $70 million annually in terms of 1975 dollars. Such substantial costs show a need for the examination of alternative government programs for peanuts.

Thus, the simulation model was used to examine effects of a quota system which would limit 1976-80

TABLE 1. A COMPARISON OF THE CURRENT PRICE SUPPORT PROGRAM AND A MARKETING QUOTA PROGRAM WHICH WOULD RESTRICT ACREAGE TO LIMIT PRODUCTION TO 1970-73 AVERAGES

	1976	1977	1978	1979	1980
Production (Mil. lbs.)					
Current Program	3,708	3,788	3,859	3,925	3,987
Quotas	3,458	3,464	3,470	3,476	3,476
Edible Consumption (Mil. lbs.)					
Current Program	1,965	2,040	2,121	2,209	2,305
Quotas	1,965	2,040	2,121	2,209	2,305
Crushings (Mil. lbs.)					
Current Program	611	608	603	595	565
Quotas	576	500	418	326	216
Exports (Mil. lbs.)					
Current Program	814	859	908	960	1,008
Quotas	799	811	826	842	854
CCC Costs (Mil. dollars)[a]					
Current Program	89.5	88.0	83.8	77.4	72.5
Quotas	50.8	51.0	51.6	52.8	54.1

[a]Reported in constant 1975 dollars

peanut production to 3.47 billion pounds annually by restricting planted acreage. With this limit on production, edible consumption would increase to 66 percent of total production (Table 1). By 1980, crushings under the quota program will be only 38 percent of projected crushings under the present program. Exports will continue to be strong, but by then, they will be 15 percent less than under the current program.

Since edible consumption would account for an increasing proportion of production under the quota system, surplus peanuts for toll crushing would be expected to decline. However, CCC costs would steadily rise to $54 million by 1980, which is slightly under the 1970-73 average. This cost under marketing quotas is still $18 million less—about 25 percent—than project 1980 costs under the current program.

Diverting acreage away from peanuts would reduce aggregate net farm income, because peanuts are generally more profitable than competing crops. However, restricting acreage reduces resources devoted to peanut production and allows them to earn a return by producing competing crops. The difference in net incomes between the current program and quotas would increase over time, because the quota program dictates that more and more acreage be diverted from the more profitable peanuts to competing crops. Also, with per-acre yields increasing at a faster rate than input requirements, net income per acre for peanuts would be expected to increase as the support price is regularly adjusted to account for changes in input prices.

The regional impact of the quota program is shown in Table 2. Implementing a quota program would have its greatest impact in the Southeast. This region was projected to show the largest increase in yields through 1980 under the current program. However, actual impact will depend on how quotas are established.

Thus, this study analyzed two quota programs which allowed for the same aggregate production: (1) quotas based on 1960-73 yields and (2) those based on 1970-73 yields. Historical bases established by recent production levels would favor the Southeast, which has recently experienced large increases in yields. This case would also result in a higher aggregate net farm income because peanuts are more profitable in the Southeast. If historical bases were dependent upon a longer time perspective, the Southwest and Virginia-North Carolina production regions would benefit relative to the Southeast.

For the period 1976-1980, aggregate net farm income would be reduced $66-$88 million (depending on historical base used) with the quota system, while $151 million would be saved in CCC losses. Thus, the government could afford to directly supplement farmers' income, allowing the same aggregate net farm income under the quota system as the current program, and still save approximately $63-$85 million in CCC losses over the next five years. This substantial difference is possible because the government bears the entire cost of purchasing and handling surplus peanuts which are donated to domestic school lunch programs and foreign countries through P.L. 480, while farmers would receive only the net profit from production.[11]

SUMMARY AND CONCLUSIONS

A model was developed to describe 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 model was then used to estimate production, edible usage, quantity crushed, exports, CCC costs and net farm income from 1976 to 1980.

Continuation of the present price support program for peanuts will result in rising CCC costs, as production continues to increase at a faster rate than disposition at projected support prices. If marketing quotas were implemented to restrict production, much of the anticipated surplus could be avoided. Restricting production to 1970-73 average levels would eliminate the necessity for toll crushing of those peanuts which could not be sold through commercial markets. Furthermore, over the next five years, CCC costs would be reduced $151 million, compared to only a $66-million reduction in net farm income.

The analysis in this paper supports the viewpoint that the present peanut program is a costly government venture in control of agricultural production. Furthermore, these costs are rising at a time when the government is generally restricting its involvement in agriculture and limiting distortions in free market equilibrium resulting from government intervention. A marketing quotas program could effectively be used to control rising government costs. However, regional economic conflicts will complicate the process of specifying marketing quotas legislation; Southeastern producers have experienced rapidly rising yields which they would like to use in

[11] Further research would be required to measure the net social benefits and costs of changing the peanut program.

TABLE 2. REGIONAL DISTRIBUTION OF PEANUT PRODUCTION AND NET FARM INCOME FROM PEANUT ACREAGE, UNITED STATES 1976-80

Region	Average Peanut Production 1976-80	Average Net Income 1976-80[a]
	(Million Pounds)	(Million Dollars)
Current Program		
Virginia-North Carolina	698	3.16
Southeast	2,410	94.54
Southwest	745	39.24
United States	3,853	136.94
Marketing Quotas Based on 1970-73 Peanut Production[b]		
Virginia-North Carolina	697	3.16
Southeast	2,059	82.88
Southwest	713	37.79
United States	3,469	123.82
Marketing Quotas Based on 1960-73 Peanut Production[b]		
Virginia-North Carolina	853	3.25
Southeast	1,849	76.07
Southwest	767	40.14
United States	3,469	119.46

[a]Reported in constant 1975 dollars.

[b]Aggregate production was the same for both marketing quota programs.

establishing quotas. A marketing quotas program, however, would still retain distortions in peanut production in comparison to a free market situation. Prices would be supported above world market levels and therefore would limit United States exports of peanuts. In addition, efficient producers would have limited access to peanut production rights, while some inefficient producers would be subsidized to remain in peanut production.

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