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**AGRICULTURAL DEVELOPMENT SYSTEMS
EGYPT PROJECT**

UNIVERSITY OF CALIFORNIA, DAVIS

**A WELFARE ANALYSIS OF PRODUCTION AND
CONSUMPTION OF BROADBEANS IN EGYPT**

by

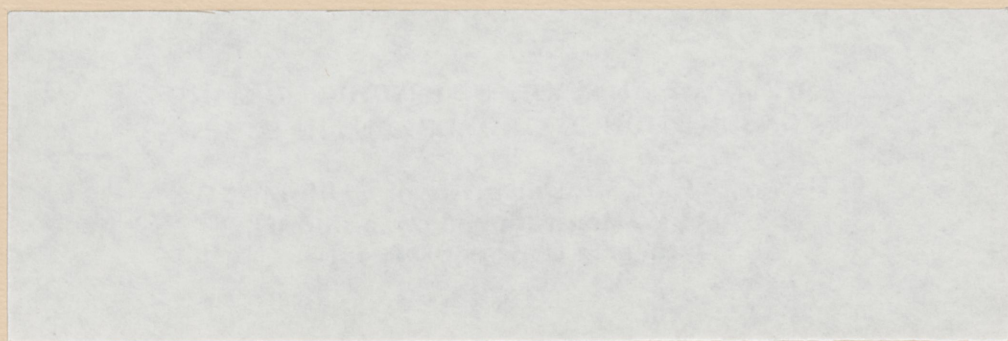
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Agricultural Development Systems:
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A Welfare Analysis of Production and Consumption
of Broadbeans in Egypt

Introduction

The broadbean is one of the most important food items in Egypt and is both heavily subsidized and rationed, although the per family entitlement depends on quantities available. It is the basic staple for breakfast for most Egyptians in both rural and urban areas. The governmental policies that determine the production, marketing, and distribution of broadbeans affect consumers and producers. The government budget is also affected by the subsidy and trade policies. Thus, virtually every Egyptian is touched by policies affecting this crop and consumption commodity.

This paper aims to describe and explain the production, marketing, and trade policies associated with broadbeans (hereafter referred to as beans) and to conceptualize and quantify the basic efficiency and equity impacts of these policies.

The cultivated area in beans was about 237,731 feddans in 1981 (see Table 1), the lowest area cultivated in the last decade. Production also reached a decade low in 1981, because of lower yields as well as less acreage. Beans are primarily a winter crop, and it is often double-cropped with summer crops such as maize, sorghum, and vegetables. About two-thirds of the

cultivated area is concentrated in the governorates of Minia and Beni-Suef in Middle Egypt; Assuit and Qena in Upper Egypt, and Beheira, Kafr El-Sheikh and Sharkia in the Delta.

Because of climatic factors and "low" producer prices, the cultivation of beans has been restricted to a relatively small area, whereas subsidies to consumers has stimulated the demand through time. The result is a shortfall in domestic supply which the government has attempted to fill by importation. The combination of subsidies and government imports has put pressure on the government budget. As a consequence, government prices paid to producers for the mandatory delivered quota prior to 1982 were fixed below the border price for imports. (The mandatory quota on producers was eliminated in 1982.) Compared to a situation where producer and consumer prices would have been established in free and open markets, the policies just described discriminate against producers and favor consumers.

The situation is complicated by the fact that non-quota production was available for consumption by farm families or to be traded by them in open markets. A comparison of prices in this market with border import prices will permit an analysis of the economic efficiency of price, trade, and allocation policies.

The paper is composed of four additional sections. The first describes the quota and marketing system, while the second focuses on bean consumption in Egypt. The third discusses the distribution system, how prices are determined, and the subsidy issue. The final section presents a welfare analysis of Egypt's

price, trade, and quota policy for beans. This section includes a brief discussion of the policy changes required to achieve a more efficient allocation of scarce resources in the agricultural sector.

The Quota and Marketing System

The existing marketing system was initiated in June, 1975. Bean prices were escalating rapidly, and the government elected to embark on a rationing program whereby fixed quantities of beans would be allocated to consumers through the Ministry of Supply at subsidized prices.

Prior to 1975 the government required deliveries of bean quotas by producers. These beans were then distributed to consumers throughout the country.

The principal policies governing various aspects of pricing and allocation, established by governmental statutes and decrees, were the following:

1. Bean producers were obligated by law to deliver a specified amount of their production to government collection centers. This quota varied from one governorate to another depending on factors affecting yield, such as soil fertility, water availability, etc. Monetary penalties were imposed on producers who did not deliver the required quota.

2. The quota imposed on local producers was delivered to the credit bank centers where it was placed on the account of the Ministry of Supply which bought the beans from producers.

3. The General Authority of Supplied Commodities then

distributed beans through the official distribution system.

4. The quota in each governorate was integrated with the land allotment system which set cropping patterns and determined the area devoted to bean production. Land allotted to each crop varied by governorate and was administratively determined by the Ministry of Agriculture (MOA) and its offices in the governorates. For example, in 1979 the MOA decided that the

Table 1: Area Cultivated, Total Production, Yields, and Farm Prices--Beans, Egypt, 1971-81.

Year	Area (Feddans)	Total Production (Tons)	Average Yield (Per Feddans)	Government to Farmers (LE Per Ton)	Wholesale Price (LE Per Ton)	Retail Price (LE Per Ton)
1971	261.408	256,226	.980	57.55	--	110
1972	336.646	360.834	1.072	54.65	47.1	84
1973	270.016	272.649	1.010	53.87	66.0	81
1974	234.635	234.130	.961	86.01	92.4	110
1975	245.574	233.735	.952	104.14	113.7	138
1976	259.638	254.482	.980	104.97	116.3	149
1977	291.790	269.697	.924	105.36	123.1	153
1978	238.954	231.223	.968	134.52	147.2	189
1979	249.509	235.801	.945	137.43	--	221
1980	244.746	212.672	.869	199.11	--	--
1981	237.731	207.788	.874	234.72	--	--

quota should be 2.5 ardab (387.5 kg.) of beans for each cultivated feddan in the governorates of Gharbia, Dakahlia, Sharkia, Menufia, Giza, Minia, Assuyt, Suhag, and Qena. In Damietta and Aswan, the quota was 1 ardab, and in the remaining governorates 2 ardabs. The price was fixed at 20 pounds per

ardab, and the maximum amount of the penalty that could be imposed on a producer for non-delivery of quota was 500 L.E.

It is apparent that regulations relating to the land allotment and quota system produce results that are inimical to economic efficiency. The land allotment scheme that dictates the acreage that each producer must plant to the various crops effectively removes the cropping pattern decision from the producer and gives it to Ministry officials. This is highly likely to be inefficient since only the producer has the incentive to collect and analyze the information on relative costs of various crops and apportion acreage to those crops that will maximize his profits. If he departs from the land allotment regulation he must face the imposition of a fine which might be very costly for him. One piece of evidence that indicates that the land allotment scheme is indeed inefficient is the fact that there are many reported cases of producers ignoring the acreage restrictions even though they must pay the fine. They perceive themselves better off in following this course of action, indicating that the profits captured by ignoring the acreage requirement are at least as high as the fine.

A second factor reducing profits for the producer is the policy of fixing the price on the delivered quota at a lower level than could be obtained if the beans were sold in the free market. The free market price is determined by forces of demand and supply, although both are strongly influenced by production, distribution, and trade policies. The facts are that free market prices are higher than the fixed price offered on the quota.

Bean Consumption in Egypt

Beans are especially important in the Egyptian diet as a source of protein in both urban and rural areas. The average annual per capita consumption was 5.98 kg. over the period 1971-79. Bean consumption is declining in per capita terms, however, probably due to supply shortages. In 1972-73 it was 7.8 kg. but by 1979 it had fallen to 4.9 kg.

The Family Budget Survey of 1974-75, sponsored and published by the Central Agency for Public Mobilization and Statistics, has been analyzed by Ismail, Gardner, and Abdou (1). (See Table 2.)

Table 2: Annual Per Capita Expenditures for Beans by Income Class in Urban and Rural Areas of Egypt, 1974-75

	Urban Area			Rural Area		
	Income Class, L.E.			Income Class, L.E.		
	0<200	200-800	Over 800	0<200	200-800	Over 800
Granulated beans	2.46	2.08	1.96	1.40	1.51	2.38
Nongranulated beans	1.79	2.06	3.01	2.07	2.69	5.57

The data in Table 2 corroborate that beans are consumed by all income classes in both urban and rural areas. The Survey presents expenditures for granulated beans (usually prepared as

a porridge or fried as a bean cake) and nongranulated (usually boiled). These data presented in Table 2 do not include expenditures for ready-to-eat beans and beancake, which constitute a major portion of bean expenditures.

Since expenditures rise as income increases nongranulated beans were a superior good in both urban and rural areas. Granulated beans, on the other hand, appear to be superior in rural areas but inferior in urban areas.

To appraise the distribution of bean consumption in terms of physical quantities rather than expenditures across income classes, Gini coefficients were calculated. A Gini value of zero would imply an equal distribution across income classes whereas a Gini of 1 would imply perfect inequality. The calculated values for nongranulated beans were 0.09 for urban areas and 0.17 for rural areas. The corresponding values for granulated beans were 0.06 for urban areas and 0.09 for rural areas. All of these coefficients are relatively low, implying relative equality of consumption across income classes.

In recent years Egypt has imported significant quantities of beans: in 1977, 23,000 tons; in 1978, 32,000 tons; in 1979, 26,000 tons; in 1980, 37,000 tons; and in 1981, 92,000 tons. The principal suppliers have been Holland, Poland, United Kingdom, Ethiopia, Canada, and Morocco. Average import prices were \$256 in 1977, \$283 in 1978, \$361 in 1979, and \$434 in 1980-81, all far above prices paid to domestic producers in these years (see fifth column of Table 1).

Another study (2) estimated the utilization of various food

items by Egyptian families in rural and urban areas. Of the total quantity available to the family, an average of about twenty-eight percent of the beans was fed to animals or was unaccounted for in rural areas, the largest fraction for any commodity. In urban areas the corresponding figure was nine percent. Beans are often included in a feed mix for animals, especially poultry, because they are high in protein and sometimes they are susceptible to damage from weevil and are deemed unfit for human consumption.

Distribution System, Pricing, and Subsidies to Bean Consumers

The government abandoned the mandatory quota system in 1980-81 and relied on voluntary delivery by the producers. Because of the disparity between free market and quota prices, however, the expected delivery was only about 40,000 tons for 1980-81. One wonders why even this much should have been expected. Approximately 203,000 tons were needed by the government to meet the consumption requirements of the distribution system and allocations to the security forces. Thus, approximately 163,000 tons must have been imported to fill the gap.

The Ministry of Supply is responsible for the distribution of the available supply to the governorates. In recent years the ration book usually gave an entitlement of about one kg. per month, although precise amounts depended on quantities available. For this reason the term "semi-rationed" is used to describe this rationing system. Since there are approximately 8

million books in use, the annual requirement of the rationing system has been about 96,000 tons. The price of the rationed beans is fixed at 10 p.t. per kg. or 100 L.E. per ton.

Sometimes quantities are available to the government shops (about 22,000 tons in 1980-81) that are above the rationed requirements. Each holder of a ration book may purchase a pro rata share of these beans at 15 p.t. per kilo. These beans generally are in granulated form.

It is estimated that about 18,000 tons were allocated to the security forces in 1980-81. About 67,000 tons in government hands were distributed to the governorates to be sold in private retail shops, restaurants, and government cooperatives at a price of 35 p.t. per kg. Many of these beans are sold unrationed in the form of cooked beans and bean cakes or sandwiches.

Domestic production we estimated at 207,788 tons in 1980-81 (see Table 1). After the quota of 40,000 tons was subtracted, 167,788 tons were expected to be either consumed at home by the producer family or were traded in the open market. Prices vary among governorates, but no systematic study seems to have been made of these prices. There are unofficial reports however, that the price was approximately 50 p.t. per kg. (500 L.E. per ton) in the open market in 1980-81.

The nominal prices of beans received by producers have increased through time, although it is doubtful if they have increased in real terms since they are shifted according to a cost-of-production index. The quota price per ton was about 58 L.E. in 1971, increased to about 105 L.E. in 1977, and reached

about 235 L.E. in 1981. (Table 1)

Table 1 also contains some wholesale and retail prices for whole beans. Wholesale prices represent the cost to the Ministry of Supply of procuring beans from the farmers (the quota price) and the costs of transportation, storage, and handling as the beans are moved to the final consumer. The retail price is an average of prices paid by consumers. The margin between wholesale and consumer prices is higher than that between quota and wholesale prices.

Several problems exist with using a cost-of-production index to set producer prices for the delivered quota. First, demand-side factors are ignored completely, which has severe economic efficiency implications. If tastes and preferences or incomes shift to increase consumer valuations of a commodity such as beans, a free market would signal an increase in price which would increase the profitability of growing beans relative to other crops and would increase supply. This result would be consistent with efficient resource allocation. If these consumer valuations are excluded from the price-making process, and only cost-of-production supply-side factors are used, signals to producers will be incomplete and likely wrong in a efficiency sense.

Fortunately for allocative efficiency, the bulk of the bean production in Egypt is not affected significantly by the prices paid for quota. Most of the production is consumed at home or is sold in the free market where prices are affected by both supply and demand forces. To the extent that the quota is priced below the free market level, of course, the incomes of bean producers will be lower and the price policy will discriminate against these producers.

Cost-of-production pricing of beans is objectionable for other reasons as well. Costs are classified as fixed and variable, and many estimation problems exist in selecting a value to represent these costs. One of the fixed costs, land rent, for example, is officially established by the Land Reform Law at seven times the land tax. Actual rents paid may be much more and probably are. The result is an understatement of true costs by the index which uses the official rent. Producers also believe some variable costs, such as labor and machinery, are also understated since actual costs are often higher than costs based on "official" prices. The upshot is that quota prices based on understated costs of production do not increase so fast as actual costs do.

As was pointed out in this paper earlier, since 1980-81 retail prices have been 100 L.E. per ton for rationed beans, 150 L.E. per ton for granulated beans purchased at government shops as available, 350 L.E. per ton for beans going to restaurants, shops, hotels, etc. and approximately 500 L.E. in the free market. Given this complex pricing system what is the

subsidy, if any, conferred on bean consumers.

The Ministry of Supply has estimated that the average subsidy received by consumers of imported beans was 219 L.E. per ton in 1980-81, while the subsidy on domestic beans procured through the quota was estimated at 67 L.E. per ton. The reasons for this substantial difference is the higher procurement and handling costs of imported beans. The Ministry has calculated the weighted average subsidy at 189 L.E.

The Egyptian government overvalued the Egyptian pound through the 1970's by fixing the exchange rate below the "shadow" or free market rate. In 1980-81 the official rate was 70 p.t. per US dollar, whereas the shadow rate ranged from about 72 to 86 per dollar (3). If bean imports were purchased at the shadow price then the dollar costs are much higher than the official costs suggest and the subsidy to consumers would be higher than indicated in the previous paragraph.

The Analytical Model and Estimates of Welfare Efficiency Losses

We have demonstrated that setting domestic producer prices for quota deliveries and consumer prices below world border prices discriminates against Egyptian bean producers and favors Egyptian consumers. But what are the implications for efficient resource allocation for the economy as whole?

The conceptual apparatus for the welfare analysis which follows is found in Figure 1. S_d is the domestic supply curve and represents the marginal opportunity costs for supplying beans to the economy by domestic producers. D is the demand

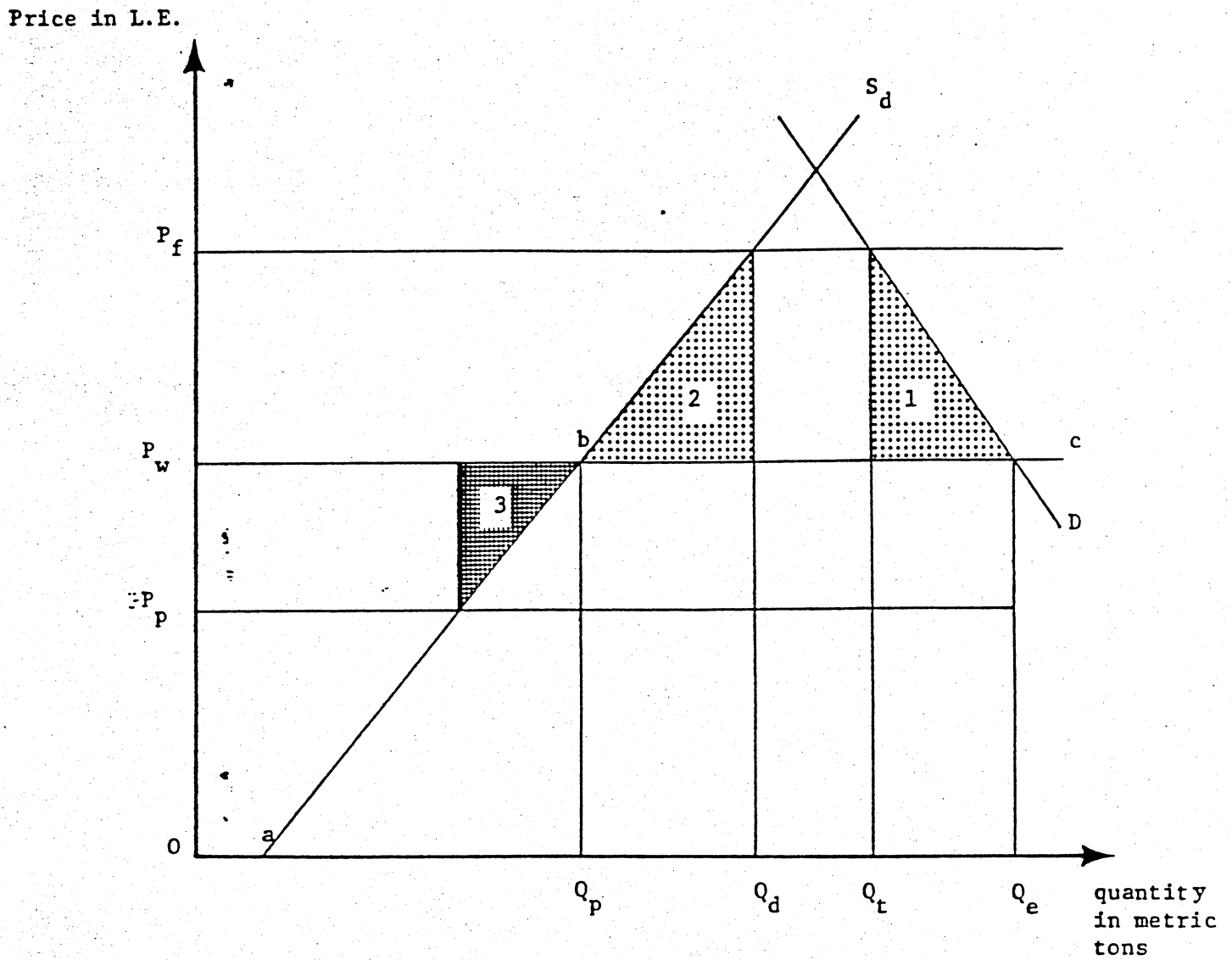


Figure 1 Resource Misallocation Costs
for Beans

curve and represents the marginal valuations of Egyptian consumers for beans. As discussed earlier in this paper in the second and third sections, P_p represents the government fixed price paid to producers for the delivery of quota (approximately 235 L.E. per ton in 1980-81). P_w represents the border price of imports. To obtain this pound price, the cif dollar prices from foreign suppliers in 1980-81 were averaged, weighted by the quantities procured, and converted to Egyptian pounds at both the official exchange rate of 70 p.t. per dollar and the assumed shadow rate of 85.5 p.t. per dollar. These pound prices were 303 and 371, respectively. As explained earlier, domestic production not delivered under the quota was either consumed at home by the farm family or was sold on the open market. P_f represents the open-market price in 1980-81. Although good data are not available, indications are that this price was approximately 500 L.E. per ton in 1980-81.

Q_d is the quantity domestically produced (in 1980-81 about 208 thousand tons). Q_t represents the total quantity available for consumption and includes domestic production and imports (about 163 thousand tons in 1980-81). This sum was 371 thousand tons. Q_p and Q_e will be explained later.

The minimum-cost supply curve to the economy is abc , composed of domestic supply so long as domestic costs are lower than border import price, and thereafter the border price. We assume that world supplies are available to meet whatever Egyptian demand exists at this border price. This assumption may be open to some doubt if the world market for beans is

shallow relative to Egyptian international demand. If Egypt must pay higher prices for incremental quantities, the segment bc would slope upward.

The existence of an open market where prices are relatively free to seek their own equilibrium level is immensely important for purposes of consumer valuation. If P_f is the free price it must mean that at the margin consumers value beans at P_f , otherwise there would be unfulfilled demand and the price would be bid up, or alternatively, markets would not clear of existing supplies and the price would fall. If producers receive P_f in the open market it must mean that at the margin they value home consumption at P_f . Otherwise, they would offer more or less for sale rather than consuming it.

Let us now estimate demand-side and supply-side welfare costs of existing import and pricing policy for the economy as whole.

Demand-side Welfare Losses

The total domestic consumption (Q_t) was estimated earlier at 371 thousand tons in 1980-81. At the assumed open-market price of 500 L.E., a point is established on the demand curve D. (See Figure 1). The marginal valuation by consumers of L.E. 500 at this quantity is higher than the border price of 303 L.E. calculated at the official exchange rate, or 371 L.E. calculated at the shadow rate. Consumers are foregoing consumer's surplus by the failure of the government to import beans to the point where the marginal valuation is equal to the border price. The total quantity consumed where this would occur is represented by

Q_e in Figure 1. If a linear demand curve is assumed, this welfare loss is one-half $(P_f - P_w)$ times $(Q_e - Q_t)$ and can be computed if Q_e can be estimated since all other variables are known.

One way of estimating Q_e , the quantity that would be demanded at the border price, is to assume an elasticity of demand, E_d , that would permit an extrapolation downward of the demand curve to quantity Q_e (4), which can be solved for and plugged into the formula for the welfare loss as described above.

Suppose E_d is assumed to be -0.10 , and the values for Q_t , P_f , and P_w are as indicated above. Solving the arc elasticity formula for Q_e yields 390 thousand tons that would have been demanded if the price had been the border price of 303 L.E., and 382 thousand tons if the border price had been 371 L.E.. Substituting Q_e into the welfare loss equation yields an estimate of foregone consumer's surplus of 1,871,000 L.E. at the official foreign exchange rate of 70 p.t. per dollar and 720,000 L.E. at the shadow rate of 85.5 p.t. per dollar.

Table 3 contains estimates of consumer's surplus foregone at assumed elasticities of demand of -0.10 , -0.22 , -0.5 , and -0.75 . The data are presented in this way for two reasons: 1) reliable elasticities of demand have not been estimated econometrically, and 2) it is desirable to show how sensitive the demand-side welfare losses are to the magnitude of the elasticity estimates. As elasticity rises in absolute terms, the quantity response to price reductions increases and

Table 3: Supply-side and Demand-side Welfare
Costs for Beans, Egypt 1980-81

Demand-side Welfare Loss (In L.E.)			
Ed			
-.10	1,871,000 (720,000) *		
-.22	3,447,000 (1,612,000)		
-.50	10,244,000 (3,827,000)		
-.75	16,449,500 (5,982,000)		
Supply-side Welfare Loss (In L.E.)			
Free Market Price to Farmers			
	LE500	LE400	LE235
Es			
.25	2,364,000 (958,000)	697,000 (56,000)	476,000 (1,681,000)
.50	4,432,000 (1,850,000)	1,309,000 (111,000)	952,000 (3,575,000)
.75	6,402,000 (2,682,000)	1,891,000 (165,000)	1,462,000 (5,724,000)

* Number in parentheses represent welfare losses calculated under the assumption that the world price in pounds is valued at the shadow exchange rate rather than at the official rate.

consumer's surplus foregone enlarges. This is clearly evident in Table 3.

It is also evident from Table 3 that the welfare loss is sensitive to the foreign exchange rate utilized in converting the dollar border price into Egyptian pounds. (The numbers in parentheses in Table 3 are the welfare losses calculated at the shadow exchange rate). The effect of using the higher shadow exchange rate is to raise the world price, P_w , and make the difference smaller between the world price, P_w , and the price paid to farmers, P_f . Of course, this reduces the consumer's surplus foregone. Relative to the choice of an exchange rate, we would opt for the shadow rate on theoretical grounds. As an approximation to a free market rate, it represents the real opportunity costs of using scarce foreign exchange to make international purchases.

Two observations appear appropriate. Given the substitutability of lentils and other pulses for beans, it would appear that a price of elasticity of demand for beans of -0.10 , or even -0.22 , may be too low. On the other hand, given the importance of beans in the diet, especially as a breakfast food, it may well be that a price elasticity of -0.75 is too high. Thus, if a choice must be made of those elasticities considered, we would opt for -0.5 .

Supply-side Welfare Losses

As postulated in economic theory, producers are assumed to push production levels of a given crop to the point where the marginal opportunity cost equals expected price. A question

arises when the farmer knows he may receive various prices for his crop. Which price guides his production decision and determines the level of output. In the case under consideration here, the farmer growing beans in 1980-81 received a price of approximately 235 L.E. on his quota delivered to the government and substantially more from his sales in the open market. It seems that the latter is a better reflection of what the farmer expects to receive from production at the margin, although clearly the quota price also will help determine his total income and ability to acquire purchased inputs.

The open market price is a free price and thus is affected by all the factors that influence demand and supply functions. Since the farmer cannot possibly foresee accurately all these factors when making planting and production decisions, he probably perceives the free market price as a stochastic variable. If the farmer is risk averse, he may discount the expected price somewhat in his decisions. Given information available, this discount cannot be evaluated empirically. The most we can say is that for planning purposes the free market price should be considered as an upper limit. Of course, this observation about risk pertains to consumers of beans as well as producers.

Let us assume that the farmer is not constrained in his purchase of inputs that he deems profitable; i.e., he expects marginal benefits of employing inputs to be equal to the input price. Initially, we also assume that the observed 1980-81 price of beans in the open market was the expected price guiding

farmer decisions. It follows that in Figure 1 the farmer would have expected to produce Q_d quantity of beans. If we assume that actual production was equal to expected production, we know this observed output to be about 208 thousand metric tons. This reasoning allows us to establish a point on the supply curve.

It is clear from Figure 1, however, that so long as the open market price is higher than the border import price, more resources will be utilized per unit to produce beans domestically at the margin than would have been expended to import them. This conclusion assumes that government transport and handling costs of imports have been incorporated in the border price.

Conceptually, the misallocation resulting from import restriction is the excess domestic cost above the border price (area 2 in Figure 1). If the supply curve is linear, this welfare loss can be estimated as one-half $(Q_d - Q_p)$ times $(P_f - P_w)$. Since we know precisely what Q_d and P_w were in 1980-81, to solve for the supply-side welfare loss we need to know Q_p and P_f .

Q_p is the domestic production that would have been forthcoming had the border import price been the price received by domestic producers. Q_p can be estimated if the average price elasticity of supply is known over the arc between points (P_w, Q_p) and (P_f, Q_d) in Figure 1. Since we do not have reliable estimates of elasticity of supply for growing beans in Egypt, we simply assumed elasticities of 0.25, 0.5 and 0.75 and calculated corresponding Q_p 's and associated welfare losses.

Given the restrictions of government controlled cropping

patterns, our guess is that a supply price elasticity of 0.75 may be too high even in the long run. It is well known, however, that farmers often opt to violate the cropping pattern restrictions and pay the fine imposed. It is difficult to specify exactly what this implies for selecting a price elasticity of supply for beans.

Similar data problems exist in estimating P_f , the price received by farmers in the open market. We are reasonably confident about an open market price of 500 L.E. per ton to consumers since it was widely observed. Often, however, the producer price was thought to be considerably lower, depending on the quality of beans delivered to retailers, the market power of retailers, and other market imperfections. There is also the risk discount factor discussed earlier. It appeared prudent to assume producer prices at three levels, 500 L.E., 400 L.E., and the quota price of 235 L.E. and see what the welfare losses would be at these three prices.

At the quota price of 235 L.E., the welfare loss is represented as area 3 in Figure 1. Resources would have been wasted by importing beans at higher costs than would have been expended at the margin by domestic producers.

Results and Implications

At a price elasticity of demand at -0.5, the demand-side welfare losses were nearly four million pounds in 1980-81 if imports are valued at the shadow exchange rate, and over ten million if imports are valued at the official rate. At the

assumed price elasticity of supply of 0.5, the supply-side welfare losses are less, although under the assumptions of a producer price at the quota level and valuing imports at the shadow rate, the welfare loss was over three and one-half million pounds. One of the reasons for the larger demand-side losses is that the quantity numbers are higher, since they include both domestic production and imports, whereas the supply-side losses are calculated only on domestic supply.

To put the welfare efficiency losses into perspective, let us assume the elasticity of demand at -0.5, the elasticity of supply at 0.5, the free market price to producers at 400 L.E. per ton, and the shadow foreign exchange rate. These appear to be the most valid assumptions. The demand-side losses in 1980-81 were 3.82 million and the supply-side loss only .111 million L.E. The total is 3.938 million L.E. or approximately 9 p.t. per capita per year for the entire Egyptian population. This does not strike us as a terribly large welfare loss. The loss would have been larger if: 1) the free market price to consumers had been more than 500 L.E. per ton, 2) imports had been valued at the official exchange rate, 3) producers had received more than 400 L.E. per ton in the free market. Of course, the loss would have been even lower under the assumptions utilized if the government had imported more.

It is clear that the existence of the free market has greatly mitigated the kind of welfare losses estimated here, on the demand-side by permitting consumers to have a larger quantity of beans supplied domestically on which they capture

consumer's surplus, and on the supply side by permitting farmers to sell produced beans at higher prices than the value of the beans in home consumption.

We believe these results have the following policy implications:

1) If there is evidence that beans producers receive only approximately the government quota price for free market sales, the quota price should be raised in order to reduce supply-side welfare losses. On equity grounds they should be raised anyway since producer incomes are probably below the national average. If prices were raised to the international level, computed at the shadow rate of exchange, economically efficient signals would be given to bean producers.

2) If domestic open market prices persist at higher levels than border prices valued at the shadow exchange rate, the government should remove import restrictions from private traders, or increase imports itself. Increasing the rationed entitlement, or semi-rationed quantities at the 15 p.t. per kilo price, would shift demand in the open market downward until the open market price coincided with the border price, thus eliminating demand-side efficiency losses.

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(4) If the average price elasticity over the relevant arc of the demand curve is E_d , the formula for arc elasticity is

$$E_d = \frac{\frac{(Q_t - Q_e)}{(Q_t + Q_e)}}{\frac{(P_f - P_w)}{(P_f + P_w)}} .$$

