# 6

## Expenditure Patterns and Demand Potential

THE THREE MAJOR STRUCTURAL ADJUSTMENTS which exist as potentials for lessening the income burden in agriculture have been mentioned. In orthodox economics supposition of competitive conditions throughout the economy, one alternative is that of increasing the supply elasticity of resources. With migration of labor and land from agricultural uses, smaller inputs should result in larger marginal returns. Fewer and larger farms, with more capital per worker and less underemployment, should provide a larger net income per worker. Changes in this vein have been taking place, especially in labor input and farm size. But even while large, this change has not been enough to bring real resource returns to the nonfarm level. U.S. farm policy has never focused on this alternative, however. More frequently it has had opposite orientation, in training farm youth only for return to agriculture. Hence, a second alternative has been employed. It partly assumes that competitive structure is not the dominant form of nonfarm industry organization and that agriculture might appropriately be given mechanisms to control supply and apply price policy in the manner of other sectors. This alternative also assumes that the outmovement of labor cannot be great enough, or is sufficiently inconsistent with the values of rural area citizens, to attain goals of comparable resource returns. Supply and production controls thus have been used, in an attempt to increase commodity prices and factor returns. They have, however, been largely unsuccessful at the national level, apart from commodity storage and nonrecourse loans, because they have failed to control output.

Farmers and farm representatives thus have long looked to demand improvement, the third major alternative, as means or hope for eliminating the price and income problems of agriculture. Review of literature over the past two decades indicates that many agricultural scientists also rest their hopes on this expectation, particularly in respect to the population variable. Quite common is the exhortation by agricultural scientists to themselves: speed the supply of commodities before population increases to the Malthusian subsistence level. It is apparent, of course, that a society as wealthy as the United States will not and need not allow economic retrogression to the level where food is again its first concern. It need not do so because even should the stream of new technical knowledge diminish near zero, resources could be transferred from de luxe trim and zippers—if not from automobiles and clothing—to production of irrigation equipment, fertilizers and other resources representing existing production functions; allowing a greater output from conventional input types. It could use calorie sources of lower cost, both in money and resources. Also, it could manage population magnitude to levels consistent with food supply. More nearly, the task of a wealthy and progressing economy is to see that farm technology progresses so that large quantities of resources need not be diverted from other industries, or that it can use high-cost rather than low-cost calories and proteins rather than to prevent starvation.

Still it is true that demand expansion is the most popular major means of solving the farm problem. It also has widest political acceptance. This is true even if the demand expansion means has to be foreign surplus disposed only a step or two removed from dumping. Demand expansion is popular because it does not require persons to move out of agriculture when their values are otherwise; or does not interfere with the free market in farmers' decisions, where this mechanism is valued as an end per se (although the means to increase demand is likely to involve "nonmarket tampering" with particular quantities), or does not restrict opportunity for individuals to reflect their ability to initiate progress with greater vigor than other farmers. The popularity of this alternative is quantified in the many resolutions of farm groups and the documents of legislative committees, pressing for industrial utilization of farm products, improved nutrition of the American consumer, improvement of food quality, distribution of food to the underprivileged, foreign surplus disposal and improvement of the marketing system to lower costs and expand consumption. The Agricultural Marketing Act of 1947 had orientation in solving the farm problem through demand improvement. Even those provisions for research on improved marketing efficiently implicitly assumed that a reduction in processing costs would be effective in expanding demand and farm income. The fulfillment of these assumptions rests, of course, on (1) competition in food processing and retailing to an extent that cost savings would be reflected in higher prices at the farm level or (2) price elasticities of demand of sufficient magnitude that cost savings extending to consumers would cause sufficient increase in consumption to improve farm revenue.

The efficacy of demand improvement in increasing farm prices and income has been well illustrated in periods of sudden spurts in market expanse. Two recent examples which stick in the minds of farm people and their representatives are those of World Wars I and II. These periods of demand expansion were particularly effective because they were of short duration and supply elasticity of resources was sufficiently small. Accordingly, supply of commodity was sufficiently restrained to cause premium prices and factor returns. But given greater expanse of time and increased factor supply elasticity for new resources drawn into farming, commodity supply expanded sufficiently in both cases, even against the nontransitory elements of demand increase, to eventually cause major decline in farm prices and incomes.

While demand represents the one blade of the Marshallian scissors, determining level of price and resource return, it is not the sole phenomenon relating to these quantities. The world, and particular countries in it, have experienced periods of rapid increase in food demand.[1] This was particularly true of the eighteenth and nineteenth centuries, especially in the United States. Still, the rapid increase in demand did not remove the chronic disparities in relative farm returns illustrated by the global and historic quantities of Chapter 3. Change in consumer demand without parallel and consistent change in factor supply and structure causes an income problem to remain. But equally, sufficient change in demand can lessen the burden of resource adjustment. It is appropriate, therefore, that the potential in demand expansion be examined as a means of alleviating the income and resource returns problems of agriculture. Solution through this avenue is largely the hope of the more commercial segment of agriculture in respect to its secular income problem. It bears little promise for lifting incomes of the poverty segment of the industry to income levels consistent with the growth status of U.S. society. Families in this strata own so few resources that doubling of food demand would still leave family incomes at meager levels. Neither is it the appropriate solution to instability of output and price for individual commodities; problems which rest on high short-run supply elasticity and relatively constant marginal rates of substitution for resources transferred among products.

## MAJOR DOMESTIC VARIABLES

Taking food as an aggregate product, the major variables determining magnitude of its consumption and demand are its own price, the level of per capita income and the size of the population. The relative preferences and the eating habits of consumers, the cross elasticity of demand of one food in respect to price of another, also could be mentioned. However, these explain mainly the mix of food products used, and much less the

[1] For examples of varying rates of growth in a European country see Jan Marczewski, "Some Aspects of Economic Growth in France," *Economic Development and Cultural Change*, Vol. 9.

aggregate food intake. True, food demand would increase if obesity came into high style in economies such as the United States, or if per capita income were to rise sharply in economies such as India. Neither of these alone promise to erase the domestic farm problem of the United States before 1970.

We mention "own price," because it is the elasticity of demand for food in respect to its own price which is the crucial quantity in respect to income crises created by rapid expansion of food output, or by cobweb fluctuations in commodity production. Own price is a crucial quantity because in an economy as wealthy as the United States the cross elasticity of food demand with respect to prices of nonfood consumer goods is insignificant in respect to aggregate food intake. Even in the realm where farm commodities can serve as resources, with potential substitution for resources of nonfarm resources, the cross elasticity of demand in respect to price of industrial substitutes has little near-at-hand importance. As we point out later, farm products must be priced much lower than 1960 prices before they have great potential industrial use as resources. Corn price, as an example, would have to fall to around 40 cents, in the 1960 price environment, before it would be substituted in significant quantities for other resources used in production of motor fuels. When corn declines to this price level, the farm problem will more nearly be solved through exodus of labor and land from agriculture, than through industrial utilization of farm products.

Population growth brings mouths to be fed and is the main source of domestic food demand increase in a wealthy society such as the United States. This magnitude, plus per capita income and related demand elasticities, provides a fragrant future for firms and industries which produce goods of greatest marginal urgency in a wealthy society. In India, considering both the underemployed workers in agriculture and in Bombay, Calcutta and many other towns, goods of high marginal urgency are those whose lack burdens the life of the consumer—food, shelter and primitive medicines. But in the United States and much of the Western world, the opportunity beyond population increase, domestic markets only considered, is not great for food. Marginal consumer urgency is greatest for those services which appeal to psychological wants related to time freed from work, rather than to biological needs in lessening misery. For nonfarm firms and industries, research and resources can be shifted continuously to the complex of developing urgencies or demands which arise less with population and more with level of income; although population growth also allows more consumers with demands rooted in affluence. Agriculture, given its geographic and climatic orientation, is not similarly adapted to continuous shift of resources and production from commodities which fall increasingly in the category of commonplace, to those which have more exotic attraction. Still, it is true that demand elasticities vary among farm commodities. And a review of these magnitudes is necessary in any analysis explaining possible structure and policy for agriculture.

## THE PRICE ELASTICITIES

Agriculturists in public research and educational institutions conventionally have looked to greater output of the individual farm as a major means of income improvement. Price elasticity for the firm is infinite, as is true for any industry of pure competition. But what is true for the firm does not hold for the industry, and farmers in aggregate action are confronted with demand functions having price elasticities much less than unity. Consequently, increased output decreases aggregate revenue, as well as income for the individual who cannot increase output by a greater proportion than the decline in price. As mentioned in Chapter 3, this environment is highly conducive to economic growth, largely because the individual farmer, while realizing less income from greater industry output, is penalized even more by not advancing technology.

That price elasticities for major crops and food in aggregate are low (less than 1.0 with the result that revenue from greater output is less than that from smaller output) has been recognized for several decades by farm leaders and legislative bodies. This knowledge has been reflected in attempts at output control and supply management through public legislation and action of cooperatives and marketing organizations. The hope of production-control legislation has been to reduce output and thus increase farm income, as would certainly have been the case had supply actually been restricted. Supply control has been popular because output for the past decade has exceeded utilization, if we consider some foreign disposal as "surplus," only by around 6–8 percent annually.[2] But because output is so hard to control, given the political strength and log-rolling practices of the various commodity, regional and income groups, demand expansion through advertising and promotion industrial utilization, distribution of food to the needy and others have been popular. To know the effect of these various schemes on individual commodities and food in aggregate, we need to examine the elasticities which relate to the major variables affecting expansion in food consumption.

### Farm and Retail Elasticities

Price or income elasticity is lower at the farm level than at the retail level. This point can be illustrated with the two simple and hypothetical price-quantity demand equations in (6.1) and (6.2) for retail and farm level respectively.

$$P_r = a - 2Q_r \tag{6.1}$$

$$P_f = .8a - 2Q_f \tag{6.2}$$

[2] For example, J. D. Black and J. Bonnen (*A Balanced United States Agriculture in 1965*, Special Report No. 2, National Planning Association, Washington, 1956) placed it at 4 to 6 percent; R. G. Bressler ("Farm Technology and the Race with Population," *Jour. Farm Econ.*, Vol. 39.) placed it at 5 percent in 1954 and 1955; N. Koffsky ("Long-Term Price Outlook and its Impact on American Agriculture," *Jour. Farm Econ.*, Vol. 36) placed it at 8 percent of total production in 1953. Given the magnitude of output in the latter 1950's, excess production appears to be more nearly 8 percent in recent years.

Here, for purposes of simplicity, we suppose a constant marketing margin regardless of quantity. With quantity dependent, the two equations become (6.3) and (6.4). Taking the derivative of quantity with respect to price and multiplying by the price/quantity ratio, we obtain the two elasticities in (6.5) and (6.6). The elasticity at farm level is considerably less than that at retail level. For example, if we let $a=30$ and $Q=10$,

$$Q_r = .5a - .5P \tag{6.3}$$

$$Q_f = .4a - .5P_f \tag{6.4}$$

$$E_r = 1 - .5aQ_r^{-1} \tag{6.5}$$

$$E_f = 1 - .4aQ_f^{-1} \tag{6.6}$$

elasticity at retail level is $-.5$ and elasticity at farm level is $-.2$. (Similarly, other equation forms provide differences in elasticities at the two levels, aside from those which force a given elasticity.) The elasticity at retail level is the significant figure for analyses concerned with consumer expenditures and outlays; that at farm level for interpretations concerned with farm income. The two arithmetic quantities cited above represent about the same relative difference we find in price elasticities at farm and retail levels, with the magnitudes of the example being approximately equal to both the absolute and relative differences found for income elasticities.

### Elasticity Magnitudes

Elasticity magnitudes, as well as rate of population increase, during the first century of U.S. society caused developmental policies to be more consistent with growing farm income than in the first half of the twentieth century. We have few measurements of these elasticity magnitudes, except calculations such as those of Engel leading to qualitative indications for consumers and nations in general. Intensive demand analysis for farm commodities conducted first by Henry Schultz indicated price elasticities generally to be low; sufficiently less than unity so that increased output was expected to be accompanied with diminished revenue in the short run.[3] More recent models and estimating techniques, such as distributed lag and simultaneous equation approaches, would provide estimates of short-run and long-run elasticities differing from these of Schultz. However, recent estimates are consistent with those of Schultz in the important sense; namely, price elasticities are sufficiently low that increase in supply which exceeds shift in demand function will give rise to income problems in agriculture.

The relative magnitudes of price elasticities have particular importance in determining how resources within agriculture might be best allocated as differential rate of technical change and supply increase takes

[3] H. Schultz, *The Theory and Measurement of Demand*, University of Chicago Press, Chicago, 1938.

place. However, for purposes of general farm policy, it is not exceedingly important whether the average price elasticity for a particular commodity is −.1 or −.25. The important knowledge is: it is much less than 1.0 and is low. Even for specific policy aimed at reducing output to bring price to a certain level, the variables on the supply side are too elusive in exact quantification and control to cause great needs in reducing the standard error of estimate for the demand elasticities by 20 percent. In this sense, Schultz's quantities, tentatively forthcoming in the 1920's provided forewarning of farm price and income problems to come. Average price elasticities computed by Schultz for three periods approximating 1875–95, 1896–1914 and 1915–29 were respectively −.38, −.27 and −.31 for sugar; −.71, −.61 and −.53 for corn; −.51, −.25 and −.12 for cotton; −.03, −0.15 and −.18 for wheat (but as a more reliable estimate, −.2±.04 for 1921–34 with seed excluded);[4] and −.68, −.54 and −.32 for potatoes.

More significant than the exact magnitudes of these elasticities is the fact that they are less than unity and declining with time. The latter is expected in a rich society, growing wealthier amidst an abundance of food; where per capita food consumption is limited by physical restraint of the consumer, medical considerations and concepts in beauty which lead away from obesity. Looking upon food as an aggregate commodity, as is appropriate where substitution takes place largely within the aggregation and hardly at all with nonfood commodities, Cochrane indicates the price elasticity of farm product also to decline with time.[5] He estimates price elasticity for food in aggregate, at the mean of the periods, to have been −.31 for 1922–41, −.23 for 1929–49, with 1943–46 excluded, and −.10 for 1929–56, with 1943–46 excluded. Other estimates substantiate decline for individual commodities.[6] Based on this trend, a given excess in rate of supply increase over rate of demand increase brings a growing income depression as time progresses. Similarly, the commodity cycle causes a sharper depression in income during the period of large output and a widening relative swing in price and income as supply fluctuates in cobweb fashion.[7] Knowledge that demand elasticities tend to decline with time and income growth is also important for proper interpretation of the coefficients which follow. Most have been computed as average

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[4] Schultz (*ibid.*, p. 400) compares his estimate of −.24±.04 for the period 1921–35 with that of Working ("The Elasticity of Demand for Wheat," *Econometrica*, Vol. 5, pp. 185–86), −24±.09, for the period 1921–34. He also indicates that the demand curve for wheat was already shifting downward in the period 1896–1913.

[5] Willard W. Cochrane, *Farm Prices, Myth and Reality*, University of Minnesota Press, Minneapolis, 1957, p. 38.

[6] For example, see G. W. Dean and Earl O. Heady, "Changes in Supply Response and Elasticity for Hogs," *Jour. Farm Econ.*, Vol. 40, p. 858; G. S. Shepherd, *et al.*, *Economic Analysis in Trends for Beef Cattle and Hog Prices*, Iowa Agr. Exp. Sta. Bul. 405, p. 737; F. V. Waugh, *Graphic Analysis in Agricultural Economics*, USDA Handbook No. 128, p. 30–31.

[7] See Earl O. Heady and G. W. Dean, *Changes in Supply Functions and Supply Elasticities in Hog Production*, Iowa Agr. Exp. Sta. Bul. 471.

elasticities from time series data. Accordingly, they overestimate the elasticities currently existing, or those which will determine the magnitude of income and adjustment problems of the future.

### Recent Estimates of Price Elasticities

The magnitude of elasticities estimated for farm products varies, depending on the period of the time series observations used, the estimating technique and the income level (mean or otherwise) for which they are derived. Hence, for fuller examination and knowledge of these quantities it is essential to examine several sets of more recent estimates, both to find values towards which these converge and to estimate general level to which they decline with time. One of the more recent sets of estimates for livestock products at the farm level are those of Brandow in Table 6.1.[8] The negative elements along the diagonal of the matrix indicate elasticities on the commodity's own price; others represent cross elasticities in respect to the commodity indicated. Except for calves, sheep and vegetable oils, variations likely growing out of "flukes" in the sense of multicollinearity in data for the livestock, all own elasticities are less than unity. This denotes that, other things remainining equal or all commodities increasing jointly in quantity, revenue from the livestock product declines with output. Eggs show an own elasticity of about $-.23$, indicating a 4.4 percent decline in price for a 1 percent increase in output. Hogs, with an own elasticity of $-.46$, indicate a 2.2 percent decline in price for a 1 percent increase in output; although the net effect of increased hog production can be determined only by consideration of the cross elasticities. On the basis of own elasticity alone, cattle price is estimated to decline by 1.5 percent for each 1 percent increase in output. With its more recent popularity and holiday characteristic, turkey has an own price elasticity of $-.92$, while soybean and cottonseed oil, commodities of wide opportunity in substitution with other oils, are indicated to have own elasticities respectively of $-3.99$ and $-6.92$. The last column suggests the rate at which demand for each commodity increases with time (population and change in consumption habits due to income and occupational status being the dominant variables of time). Both eggs and lard show a declining demand with time.

A Minnesota study synthesized elasticity coefficients at retail for the somewhat more aggregative groups of commodities shown in Table 6.2.[9] The estimates are based on past empirical studies, theory and judgment and are "updated" to a 1955 point in time. Fruits in aggregate are estimated to have an own price elasticity as high as unity. Meat products, estimated as 36 percent of expenditures, have an elasticity of only $-.60$

[8] See George Brandow, *Economic Policies for Agriculture in the 1960's*, Implications of Four Selected Alternatives, Joint Economic Committee of the United States, 86th Congress, 2nd Session, Washington, 1960.

[9] J. M. Wetmore, *et al.*, *Policies for Expanding the Demand for Farm Products in the U.S.*, University of Minnesota Tech. Bul. 231.

TABLE 6.1

FARM-LEVEL PRICE ELASTICITIES OF DEMAND AND TREND TERMS FOR LIVESTOCK PRODUCTS AND FATS AND OILS

| Quantity Demanded of— | Farm Prices of: | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cattle | Calves | Hogs | Sheep and lambs | All chickens | Turkeys | Eggs | All milk | Soy-bean oil* | Cotton-seed oil* | Lard* | Time† |
| Cattle | −0.684 | 0.039 | 0.060 | 0.030 | 0.048 | 0.005 | 0.003 | 0.005 | ‡ | ‡ | — | 3.808 |
| Calves | .256 | −1.082 | .110 | .055 | .087 | .009 | .003 | .005 | ‡ | ‡ | — | 1.665 |
| Hogs | .091 | .025 | − .458 | .026 | .042 | .005 | .003 | .005 | ‡ | ‡ | — | 1.680 |
| Sheep and lambs | .421 | .116 | .247 | −1.782 | .136 | .014 | .003 | .005 | ‡ | ‡ | — | .110 |
| All chickens | .157 | .043 | .092 | .032 | − .737 | .081 | .003 | .005 | ‡ | ‡ | — | 1.678 |
| Turkeys | .066 | .018 | .039 | .014 | .317 | − .924 | .003 | .005 | ‡ | ‡ | — | 1.703 |
| Eggs | .011 | .002 | .006§ | .001 | .003 | .001 | − .233 | .006 | ‡ | ‡ | ‡ | − .331 |
| All milk | .009 | .002 | .004§ | .001 | .002 | .001 | .002 | − .416 | 0.016 | 0.010 | 0.004 | 1.180 |
| Soybean oil | .007 | .001 | .003§ | .001 | .002 | .001 | .001 | .143 | −3.988 | 2.736 | .131 | 4.040 |
| Cottonseed oil | .008 | .001 | .004§ | .001 | .002 | .001 | .001 | .176 | 5.577 | −6.921 | .136 | 4.191 |
| Lard | .008 | .001 | .004§ | .001 | .002 | .001 | .001 | .046 | .181 | .094 | − .540 | − .146 |

* Wholesale price.
† Percentage change in quantity demanded per year at constant prices.
‡ Less than 0.0005.
§ Effect of pork price.

TABLE 6.2

RETAIL PRICE ELASTICITIES OF DEMAND FOR SELECTED COMMODITY GROUPS

| Demand Equation for: | Proportion of Expenditure* | Retail Price | | | | | |
|---|---|---|---|---|---|---|---|
| | | Meat | Dairy products | Eggs | Fruits | Vegetables | "Other" |
| Meat | .363 | −.60 | .10 | .04 | .08 | .06 | .03 |
| Dairy products | .171 | .21 | −.50 | .02 | 0 | .06 | .03 |
| Eggs | .045 | .29 | .08 | −.58 | 0 | 0 | .05 |
| Fruits | .088 | .33 | 0 | 0 | −1.00 | .20 | .03 |
| Vegetables | .098 | .22 | .10 | 0 | .18 | −.70 | .02 |
| "Other" | .235 | .05 | .02 | .01 | .01 | .01 | −.10 |

* Proportion of total expenditure on commodity group indicated.

while "other" commodities, accounting for 24 percent, are estimated to have an elasticity of only −.10; both elasticities suggesting a very large decline in price for each unit increase in output. As also suggested by Table 6.1, these data indicate small cross elasticities among commodity categories. Hence, greater technical efficiency in production or processing of one commodity, to lower its price and draw demand away from its competing products, promises only meager gains to producers. A similar set of synthesized farm level quantities are presented in Table 6.3.[10] Like those of Table 6.2, they are useful in the sense that they draw together the most logical estimates from numerous demand studies based on different techniques and periods, although they perhaps refer best to the demand regime of the past two decades. In contrast to previous tables, the elasticity coefficients have been converted to a form showing the percent by which price is estimated to decline at farm level, as the quantity of output of the particular commodity or competing commodities is increased. In this case, the aggregate indicated as "competing commodity" is large enough that increase in the magnitude would lessen price of the

TABLE 6.3

EFFECT OF ONE PERCENT INCREASE IN OUTPUT OF COMMODITIES ON PRICES (PERCENT)

| Commodity | Response of Price to a 1 Percent Increase in Output of: | |
|---|---|---|
| | Particular commodity | Competing commodities |
| Beef and veal | −1.7 | −.5 |
| Pork | −2.5 | −.4 |
| Lamb and mutton | −1.7 | −.7 |
| Poultry meat | −1.7 | −1.0 |
| Eggs | −5.0 | −1.5 |
| Dairy products | −3.3 | −.3 |

[10] G. S. Shepherd, *et al.*, Price and Income Projections Under Free Market Conditions for Feed Grains. Iowa State University Center for Agricultural and Economic Adjustment, Special Report.

particular commodity by important extent. Computed from these figures, for example, the own price elasticity of pork is estimated as $(1) \div (-2.5) = -.40$.

As noted, the figures presented above are consistent with others estimated for time series data of the '30's, '40's and '50's. Fox obtained own price elasticity of $-.41$ for all food livestock products (1922–41) and $-.62$ for meat (1922–41) by least-squares methods at the farm level.[11] At the retail level, Shepherd obtained $-.74$ for meat by least-squares (1920–41); Tintner obtained $-.79$ by reduced form equation (1919–41) and Working obtained $-.67$ by diagonal regression (1922–41).[12] At farm level, Fox obtained (1922–41) $-.84$ for beef, $-.65$ for pork and $-.34$ for eggs by least-squares.[13] At retail level, Wahby[14] obtained $-.77$ (1922–41) for beef by reduced form, and Judge[15] obtained (1921–41) $-.29$ by reduced form and $-.58$ by limited information, for eggs. Using a distributed lag model for meat (1922–41), Ladd and Tedford did not establish own price elasticity for meat at retail to be materially higher in the longrun than in the shortrun, although this type of response is generally expected for price change.[16] Learn, using single equations with observations in first differences (1924–54 with 1942–46 excluded), obtained own price elasticities at farm level of $-.73$ for beef, $-.55$ for pork, $-.86$ for poultry, $-.41$ for eggs and $-.38$ for dairy products.[17] Maki, estimating by first differences over quarters for the period July, 1947 to December, 1956, derived own price elasticity at market level of $-.55$ for beef and $-.59$ for pork.[18] However, distributed lag response might again be expected for periods of this duration. Rojko provides own price elasticities at retail of $-.27$ for fluid milk and cream, $-.25$ for butter and $-.74$ for manufactured dairy products, using first difference and least-squares (1924–41).[19] Using his model II, Gerra obtained (1931–41, 1946–54) own price elasticities for eggs at retail ranging from $-.11$ to $-.40$ respectively, using single and simultaneous equation estimates.[20] Judge, using alternative techniques and periods between 1921 to 1950, obtained own retail

[11] K. Fox, "Factors Affecting Farm Income, Prices and Food Consumption," *Agr. Econ. Res.*, Vol. 3.

[12] G. S. Shepherd, *Changes in Demand for Meat and Poultry Products*, Iowa Agr. Exp. Sta. Bul. 368; G. Tintner, "Static Econometric Models," *Metroeconomica*, Vol. 2; and Elmer Working, *Demand for Meat*, Institute of Meat Packing, Univ. of Chicago, Chicago, 1954.

[13] Fox, *loc. cit.*

[14] O. Wahby, "Econometric Analysis of the Demands for Pork, Beef and Poultry," *Econometrica*, Vol. 20.

[15] G. Judge, *Econometric Analysis of the Demand for Eggs*, Ph.D. Thesis, Iowa State Univ., Ames, Iowa, 1952.

[16] G. W. Ladd and G. R. Tedford, "Generalization of the Working Method for Estimating Long-Run Elasticities," *Jour. Farm Econ.* Vol. 41.

[17] E. W. Learn, "Demand for Livestock at the Farm Level," *Jour. Farm Econ.*, Vol. 38.

[18] W. Maki, "Economic Effect of Short-Run Changes in Demand," *Govt. Farm Econ.*, Vol. 39.

[19] S. A. Rojko, "Econometric Model for the Dairy Industry," *Jour. Farm Econ.*, Vol. 39.

[20] M. J. Gerra, *Demand, Supply and Price Structure of Eggs*, USDA Tech. Bul. 1204.

TABLE 6.4

PRICE ELASTICITIES (OWN) OF DEMAND AT FARM LEVEL FROM MEHREN FOR 1949

| Commodity | Elasticity |
|---|---|
| Dairy products | −.60 |
| Whole milk (Mfgr.) | −.60 |
| Hogs | −.80 |
| Lamb and mutton | −.80 |
| Beef | −.80 |
| Eggs | −.42 |
| Butterfat | −.75 |
| Chickens | −.89 |
| Turkeys | −.55 |
| Wheat | −.41 |
| Beans, dry | −.12 |
| Potatoes | −.15 |
| Peanuts | −.40 |
| Cotton | −.60 |
| Soybeans | −.60 |
| Burley tobacco | −.20 |
| Flue tobacco | −.45 |
| Barley | −.51 |
| Corn | −.69 |
| Grain sorghum | −.38 |
| Oats | −.55 |
| Rice | −.40 |

price elasticities for eggs ranging from −.30 to −.60.[21] Using his own estimates and those of other studies, Mehren summarized the price elasticities at farm level for prices at 1949 magnitude, included in Table 6.4.[22] These data, like most others cited, are based on time series data of an earlier period in supply, per capita income and location in the price-quantity vector. However, the elasticities are predicted by Mehren to exceed long-run elasticities because demand was so favorable in 1949.

Demand analysts have concentrated their efforts on livestock products. However, those studies available generally indicate inelastic demand for field crops. Meinken, again using an earlier time period (1921–29 and 1931–38) estimated domestic food wheat price elasticity, at Kansas City price, to be −.04; a quantity extremely near zero.[23] For domestic consumption as feed, he estimated the own price elasticity of wheat to range from −.33 to −.40, depending on the estimating procedure. His estimates for feed grains (1922–41) were −.63 for corn, −.49 for oats and −.41 for barley.[24] The Iowa study assumes an elasticity of −.40 at farm

[21] G. G. Judge, *Econometric Analysis of the Demand and Supply for Eggs*, University of Conn. Agr. Exp. Sta. Bul. 307.

[22] G. L. Mehren, "Comparative Costs of Agricultural Price Support in 1949," *Amer. Econ. Rev.*, Vol. 41.

[23] K. W. Meinken, *Demand and Price Structure for Wheat*, USDA Tech. Bul. 1136.

[24] K. W. Meinken, *Demand and Price Structure for Oats, Barley and Sorghum Grains*, USDA Tech. Bul. 1080. Also see G. A. King, *Demand and Price Structure for By-Product Feeds*, USDA Tech. Bul. 1183. His limited information estimate gives −.68 for feed grains in aggregate.

level for feed grains as a more current estimate.[25] An own price elasticity of −.5 at farm level has been projected as a current estimate for rice.[26] Fox summarizes the data in Table 6.5 for miscellaneous fruits and vegetables at farm level.[27] Again, these indications of own price elasticities are for mean price, quantity, income and time of period, 1922–41. Current elasticities and those of relevance for the next decade are expected to be considerably lower. Quantitatively, the important reflection of these data are the differences in price elasticities among commodities.

TABLE 6.5

PERCENT PRICE CHANGES ASSOCIATED WITH 1 PERCENT CHANGE IN PRODUCTION, SELECTED VEGETABLES AND FRUITS

| Commodity | Percent Price Change | Commodity | Percent Price Change |
|---|---|---|---|
| Potatoes | −3.51 | Oranges | −1.61 |
| Onions (summer) | −2.90 | All citrus | −1.32 |
| Lemons (summer) | −2.48 | Winter vegetables | −1.13 |
| Onions (all) | −2.27 | Spring vegetables | − .95 |
| Grapefruit | −1.77 | Apples | − .79 |
| Summer vegetables | −1.72 | All deciduous fruit | − .68 |
| Fall vegetables | −1.67 | Peaches | − .67 |

## Aggregate Food Elasticity

Numerous studies have estimated price elasticity for food in aggregate. The elasticity coefficients, estimated largely for the period 1920–41, with quantities referring to expenditures at retail level, again vary some depending on the estimating technique used. These tend to concentrate on a magnitude −.20 to −.25 at retail level, suggesting a percentage price decline from four to five times a percentage output increase under given conditions. This is the magnitude suggested as most likely by Wetmore.[28] However, numerous studies provide elasticities which are higher for the retail level, perhaps averaging nearer −.40 for all time series studies completed to date, but the distribution of coefficients is skewed in direction of quantities smaller than this.[29] Even on the basis of this magnitude,

[25] Shepherd, *loc. cit.*

[26] Brandow, *loc. cit.*

[27] K. A. Fox, *Econometric Analysis of Public Policy*, Iowa State University Press, Ames, Iowa, 1958, p. 105.

[28] Wetmore, *loc. cit.*

[29] See such studies as the following: M. A. Girshick, and T. Haavelmo, "Statistical Analysis of Demand for Food," *Econometrica*, Vol. 15; I. Tobin, "Statistical Demand Function for Food in the U. S.," *Jour. Royal Stat. Soc.* Series A, 1B; G. Kuznets, "Measurement of Market Demand for Food," *Jour. Farm Econ.*, Vol. 35; L. N. Shores, *Structural Equations Defining Demand for Food*, M. A. Thesis, Univ. of Chicago, Chicago, 1946; M. C. Burk, "Changes in Demand for Food from 1941–50," *Four Farm Econ.*, Vol. 33; W. W. Cochrane, *Analysis of Farm Price Behavior*, Penn. State Univ. Progress Report No. 50.

assuming no decline with time, a price decline of 2.5 percent for each 1 percent increase in output, is implied for a particular environment in respect to population, time and income.

Even if we accepted the mean of these estimates of food price elasticity for the prewar period, the span of nearly all estimates, it would overestimate future elasticity when consumers have higher incomes and food abundance has driven consumption to lower points on the demand curve. It should be noted that the elasticity coefficients quoted are almost entirely mean estimates in respect to time, income and food consumption over the time period 1920–41. In this sense, an estimate of −.25 or less is a more realistic estimate of the current retail price elasticity of food, and even this magnitude is likely on the upper side. Barton and Daly estimate a price elasticity of −.15 to −.20 at the farm level and Daly's estimate is below −.15.[30] Food production in aggregate over the next decade is more likely to "bump against" a price elasticity at farm level of −.15 than of −.4. (The price elasticity of food in aggregate is much lower than for commodities which make up the aggregate because substitution among foods is not then possible.)

In any case, elements of developmental policy to shift supply to the right (whether based on public investment in technical research, lower capital costs or subsidies to encourage improved practices under the guise of soil conservation payments), are likely to have negative effect on farm revenue. Given the price elasticities cited above, rapid shifts in the supply function obviously stand to benefit the consumer rather than the producer, allowing him to acquire his food basket with smaller outlay. This in itself is a noble purpose. Everyone, including farmers, is a consumer. The significant policy questions are whether this transfer of benefits to consumers can be accomplished equitably without undue burden or sacrifice to producers, or whether the rate of change should be managed in order that farm families might better share in the progress which they help to create.

These elasticity figures also suggest the futility of coaxing the American consumer to "eat up the surplus," even if he were willing to abandon a smaller waistline. With consumer food outlay at about 60 billion dollars, a 3 percent increase in aggregate (1.8 billion constant dollars) consumption would entail a price decline of 7.5 percent and a 4.5 billion dollar decline in expenditure at retail (with a price elasticity even as great as −.4). The public of consumers would not be likely to subsidize itself to

[30] G. T. Barton, and R. F. Daly, "Prospects for Agriculture in a Growing Economy," *Problems and Policies of American Agriculture*, Center for Agriculture and Economic Adjustment, Iowa State Univ. Press, Ames, 1959, p. 32. Koffsky and Daly, ("Potential Demand for Farm Products over the Next 25 Years," *Dynamics of Land Use*, Center for Agricultural and Economic Adjustment, Iowa State Univ. Press, Ames, 1961) summarize the price elasticities for broad groups as follows: meat animals, −.30; dairy products, −.05; poultry, −.50; eggs, −.10; fruits and vegetables, −.06; cereals, potatoes and beans, −.002; other crops outside of imports, −.02. Daly, ("Demand for Farm Products at Farm and Retail Level," *Jour. Amer. Stat. Assoc.*, 1958, pp. 656–658.) indicates farm level elasticities in respect to income of less than .15 for farm products in aggregate.

this amount, simply to coax itself to greater feasting (i.e., it would consume the added food only at the outlay reduction, then would have to compensate farmers for roughly 40 percent of the reduction.)

## INCOME ELASTICITIES

A substantial rise in per capita income would surely increase both physical intake of food and expenditure on foods, given population and point in time, in such nations as Peru, Nicaragua, Bolivia, Jordan, Iran, Tunisia, Libya, Korea, Ceylon, Indonesia, Philippines, India, Pakistan and China (see Figure 17.2). Starting from low levels of income, income elasticity of demand stands to be quite high, particularly for livestock products and less common grains and vegetables, but even for food in aggregate. Commodities with large elasticities in economies of high per capita income fall largely outside the food category, however. Investors searching out growth stocks for investment turn rather to recreational commodities, appliances, travel services, amusement and services or conveniences incorporated with foods, rather than to food production per se. Physical intake of food per capita has declined slightly in the United States since 1920, although the grocery mix now includes commodities of higher quality and greater caloric and resource cost.[31] Decline in intake has come about with shift to occupations requiring lower physical exertion, a greater proportion of older persons in the population and a set of values placing premium on "slimness and longer life."

## GROWTH OPPORTUNITY

Consumer expenditures do show some expansion with income growth, even in wealthy societies. However, this rise in expenditure is reflected in purchase of higher quality or more exotic foods and on the services which can be incorporated with foods, rather on aggregate farm products per se. This growing expenditure per capita on food in the United States has been especially concentrated on freezing, packaging and preparation of foods. It also finds allocation in important magnitude to meals away from home, with meals in exotic atmosphere having higher income elasticity than ordinary lunchroom meals. An estimate based on cross-sectional data of urban families in the spring of 1948 showed an elasticity of expenditure in respect to income of .42 for all food, .29 for food consumed at home and 1.14 for that consumed away from home.[32]

In general, the major elements of positive income elasticity expressed in the data which follow are for the services and quality of food, rather

[31] In contrast, demand elasticity for consumer items such as automobiles has been high. Chou (*Demand for Automobiles in the U.S.*, North Holland Publishing Co., Amsterdam, 1957, pp. 68–71, 81–83) reviews price and income elasticities of around −1.5 and −2.1 respectively.

[32] K. A. Fox, "Factors Affecting Farm Income, Prices and Food Consumption," *Agr. Econ. Res.*, Vol. 3.

than for food itself. The income elasticity for food in aggregate and physical form is so near zero in the United States that further growth in per capita income bears no promise for prosperity in the farm industry paralleling that of sectors designated as growth industries by the stockbroker, or even in comparison with the average of the U.S. industry. It is for this reason that the food processing industry grows more rapidly than the food industry, or that the spread between farmer and consumer, the marketing margin, widens with time.

As with price elasticities, those for income vary with the estimating technique used, the period of observation and algebraic form and techniques used in deriving coefficients. A summary of income elasticities has been prepared by Daly, to provide a basis for projecting demand to future points in time.[33] These are included in Table 6.6 and presumably refer to response in farm commodity rather than expenditure at retail.

TABLE 6.6

INCOME ELASTICITIES OF DEMAND FOR PROJECTING PER CAPITA CONSUMPTION

| Commodity | Elasticity | Commodity | Elasticity |
|---|---|---|---|
| Citrus fruits | .65 | Pork | .20 |
| Beef | .40 | Eggs | .15 |
| Tomatoes | .40 | Other fruits | .13 |
| All fruits | .32 | Fluid milk and cream | .12 |
| Chicken and turkey | .30 | Total milk equiv. | .10 |
| Fresh green and yellow vegetables | .25 | Sugar | −.07 |
| All meat | .25 | Wheat and flour | −.20 |
| All vegetables | .25 | Dry beans and peas | −.20 |
| Other vegetables | .20 | Potatoes | −.25 |
| | | Melons | −.40 |

As denoted by the negative coefficients, per capita consumption declines with per capita income growth for commodities such as potatoes, wheat products, and dry beans and peas. Income elasticities are also predicted to be less than zero, with the same implications, for specific products within groups of Table 6.6. This is true for lard, fats and oils, nuts and similar inferior goods, with physical food intake per person declining with income level for this group of inferior goods. Waite and Trelogen estimated the elasticities for particular commodities shown in Table 6.7.[34]

[33] R. F. Daly, "The Long-Run Demand for Farm Products," *Agr. Econ. Res.*, July, 1956. In a parallel set of coefficients based on time series, single equation estimates and presented by Barton and Daly (*ibid.*) include the following income elasticities for expenditure at the farm level: .48 for meat animals, .62 for poultry, .62 for poultry, .47 for eggs, .09 for dairy products, −.24 for grains and dry beans, .16 for all fruits and vegetables and .16 for all other foods. For a somewhat different aggregation of commodities, Koffsky and Daly (*ibid.*) provide the following predictions of income (expenditure) elasticities: Meat animals, .48; Dairy products, .09; Poultry, .62; Eggs, .04; Fruits and vegetables, .16; Cereals, potatoes and beans, −.23; and other crops, .16.

[34] W. C. Waite and H. C. Trelogen, *Introduction to Agricultural Prices*, Burgess Publishing Co., Minneapolis, 1948, p. 25.

TABLE 6.7

INCOME ELASTICITIES OF DEMAND FOR SPECIFIC COMMODITIES

| Commodity | Elasticity | Commodity | Elasticity |
|---|---|---|---|
| Lamb and mutton | 1.77 | Vegetable shortening | .32 |
| Tomato juice | 1.38 | Uncooked cereal | .25 |
| Beef sirloin | 1.32 | Round steak | .21 |
| Asparagus | 1.14 | Canned beans | .09 |
| Cream | 1.12 | Canned peas | .03 |
| Chocolate | 1.04 | White potatoes | −.04 |
| Fresh peas | .90 | Chuck roast | −.04 |
| Prepared cereal | .77 | Rice | −.10 |
| Fresh carrots | .68 | Evaporated milk | −.13 |
| Sliced ham | .61 | Salt side | −.19 |
| Pork chops | .52 | Boiling roast | −.21 |
| Cheese | .50 | White flour | −.24 |
| Milk | .50 | Lard | −.30 |
| Orange | .43 | Canned tomatoes | −.37 |

These estimates, based on 1935–36 cross-sectional expenditure data for households in the North and West are somewhat obsolete for the current demand regime, but do indicate the variance existing among individual food products. Numerous of the products in the inferior goods category, such as wheat and dry beans with negative elasticities, are grown independently. However, others of low elasticity are produced as technical complements with those of high elasticities. Examples are lard, sliced ham and bacon or chuck roast, hamburger and beef sirloin. Hence, the long-term outlook is not as good for beef cattle and hogs as it is for sirloin and sliced ham respectively.

Other income elasticities for cross-sectional studies based on later time periods are shown in Table 6.8. Those by Heifner for 1955 and by Fox for 1948 are compared with the cross-sectional estimates based on a prior period of approximately 1922–41. (Also see the income elasticities shown in Table 17.3.) These data emphasize both the overestimation of economic growth on demand at the farm level when elasticities are measured in consumer expenditure and in earlier period before the tremendous postwar upsurge in income growth.

The data in Table 6.8 partly suggest why supply and price problems have been particularly great for individual commodities in postwar years. Extreme surplus problems have existed at times for wheat, potatoes and eggs—commodities with extremely low price and income elasticities of demand. While agriculture in total could not grow as rapidly as the nonfarm economy, because of general consumer well-being and hence lower income elasticities for food, farm commodities with low demand elasticities could not absorb technical change as readily as those with high elasticities. Too, commodities such as eggs, potatoes and wheat use a relatively small proportion of the feed and soil resources adapted to them. A double threat in surplus thus exists because of supply potential, low income elasticities and slow demand expansion.

TABLE 6.8

ESTIMATES OF INCOME ELASTICITIES BASED ON CROSS-SECTIONAL AND TIME-SERIES DATA

| Commodity | Heifner (1955)* Quantity | Fox (1948)† Expenditure | Fox (1948)† Quantity | Time Series (1922–41) Expenditure |
|---|---|---|---|---|
| Milk and milk products | .01 | .32 | .23 | .16‡ |
| Meat, poultry, fish | .19 | .36 | .23 | — |
| All meat | .17 | — | — | .56§ |
| Beef | .26 | — | — | .80‖ |
| Pork | .09 | — | — | .84‖ |
| Lamb and mutton | .53 | — | — | |
| All poultry | .25 | — | — | .53** |
| Chickens | .23 | — | — | |
| Eggs | .13 | .22 | .20 | .38†† |
| Veal | .35 | — | — | — |
| All livestock products | — | .36 | .23 | — |
| Fruits and vegetables | — | .42 | .33 | — |
| Green, yellow vegetables | — | .37 | .21 | — |
| Citrus | — | .41 | .42 | — |
| Grain products | — | .02 | −.21 | — |
| Fats and oils | — | .13 | −.04 | — |
| Dry beans and peas | — | −.07 | −.33 | — |
| Potatoes | — | .05 | −.05 | — |

* R. Heifner, Unpublished Estimates of Weighted Average Income Elasticities from 1955 Consumer Budget Study, Ames, Iowa, 1959.

† Fox, *op. cit.* (with estimates for 1948 urban families)

‡ Rojko, *loc. cit.*

§ Average of estimates by Shepherd, Tintner and Working in the publications cited earlier.

‖ Average of estimates by Fox and Wahby in publications cited previously.

** J. A. Nordin, *et al. Application of Econometric Procedures to Demand for Agricultural Products*, Iowa Agr. Exp. Sta. Bul. 410.

†† Mean of estimates by Fox and Judge in publications cited previously.

In similar form, problems of surplus have been less in such commodities as beef and citrus where income elasticities are higher and national economic growth has been accompanied with a fairly large increment in demand and sharp rise in per capita consumption for these commodities. Neither of the latter commodities have had the benefit of public price support and production control and have prospered relative to farm commodities in general. However, marketing orders have led to some stability for citrus.

The income elasticities suggest the relative direction in which agricultural resources will need to be reallocated under economic growth in future decades if technical progress is to continue and consumer preference is to serve as the basis for allocation. First, income elasticities are much greater for nonfarm goods and services where consumer satiation is much less near than for foods. In the total food complex, even more resources will be drawn into the services attaching to foods, with relatively more invested in the processing and marketing process. Even within agriculture, the relative shape of resource allocation will be away from products with low income elasticities in those with higher elasticities. In this view, direction is given for research in the experiment stations, such as continued emphasis in shifting the mix of products making up a hog away

from lard as an inferior good towards ham and loin with higher income elasticities of demand. This statement applies broadly to farm commodities. Demand elasticities are certainly greater for the quality than for the quantity aspects of agricultural products but historically research facilities have been concentrated on the former.

### Aggregate Commodity

Individual foods can serve as close substitutes, but food in aggregate is a poor substitute for other goods of an affluent consumer society. Hence, the net growth opportunity for agriculture is best expressed in the income elasticity of demand for food in aggregate. Numerous studies have been made from time series data, mainly for prewar years, suggesting the magnitude of income elasticity with respect to expenditure on food at the retail level. Some of these estimates are summarized below.[35] As the coefficients based on time series data are average elasticities with respect to income over the period included and overestimate elasticity at higher income levels of recent time. Where elasticity is in terms of expenditures at the retail level, they overestimate demand potential at the farm level, apart from processing and marketing services incorporated with food. Girschick and Haavelmo computed elasticities (1922–41) for expenditure averaging .29 for current income and .05 for lagged income.[36] Burke estimated an expenditure elasticity of .24 (1922–41) for current income. Tobin obtained an expenditure elasticity (1913–41) of .45 by one least-squares model and .27 by another at retail. Stone obtained, for prewar years, an elasticity at retail of .59.[37] Fox, using urban family budget data for 1948, obtained a coefficient of .25 for current income with respect to expenditure at point of farm sales, .28 for food consumption based on the BAE index and .42 for food expenditures. The coefficient for farm sales is the best indication of demand potential for farm products since it includes only the shift to higher class and quality of food product with greater income; whereas food expenditure also reflects services incorporated with food. Barton and Daly estimate the income elasticity for expenditure on food at the farm level to be from .15 to .20.[38] In terms of physical quantity of food alone, without consideration of greater expenditure due to shift in quality of food mix, USDA figures for the period 1909–49 indicate an elasticity of zero.[39]

Estimates for current time suggest that the income elasticity coefficient of expenditure for food at the farm level, approximates .15. This

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[35] All references cited are the same as those listed previously for price and income elasticities unless otherwise noted.

[36] All references are the same as those cited previously, unless otherwise indicated.

[37] Richard Stone, "The Analysis of Market Demand," *Jour. Roy. Stat. Soc.*, Vol. 107. His estimate for tobacco alone was .32. His figure for household equipment was 2.07 and for automobiles, 4.16.

[38] Barton and Daly, *loc. cit.*

[39] U.S. Department of Agricultural Economies, *Consumption of Food in the United States*, 1909–48, BAE Misc. Publ. 691.

magnitude is listed by Wetmore and Fox.[40] The 1955 survey of nonfarm families by the Agricultural Marketing survey showed an income elasticity in respect to expenditure on food of .20.[41] Converting this to food purchase only would reduce the elasticity coefficient to .15 or lower. In fact, when the 1955 survey was stratified into income thirds, the elasticity in respect to expenditures for the lower group was .25. The corresponding figures for the middle and upper income groups were .20 and .15 respectively.

Our conclusion is, in terms of demand expansion through the normal domestic market mechanism, that output of the agricultural industry can grow largely at the rate of population growth. More efficient production and lower supply price of farm commodities, against a given income and population, bears little promise in absorbing large supply increase at favorable income since price must decline by four to five times the increase in quantity. Further per capita income growth, given population, will not increase the aggregate physical demand for food but can increase expenditure on foods at the farm level by around .15 percent for each 1 percent increase in income. Agriculture as a shrinking portion of the national economy is thus the prospect for the decades ahead, and the pull on farm children and labor force will be accordingly.

## CHANGES IN UTILIZATION

At stages of economic growth and in particular countries where per capita incomes are low, human energy and hunger satisfaction is derived largely from calories of low-cost sources. The percentage of calories derived from cereals and root crops—low-cost sources of calories—is highly correlated with per capita incomes over the world. In low income countries, it amounts to 60–85 percent of total caloric intake; in advanced countries, only 25–40 percent.[42] At higher income levels, diets shift to calorie sources of plant oils and animal fats which are more expensive in consumer outlay and resource requirements. Should food demand or requirements ever press supply in advanced countries, rise in real cost of diet and minimum nutrition requirements could be attained with some shift back to lower cost calorie sources, with perhaps a windfall in health from lower cholestrol intake.

Utilization of farm products in the United States has changed in line with the elasticities summarized above and with the changing occupational and age structure of the population. These magnitudes, plus the size of the population, will determine the structure of domestic food demand over future decades. Consumption will trend in the direction of

[40] Wetmore, *op. cit.*; K. A. Fox, *Demand Expansion and Agricultural Adjustment*, Center for Agricultural and Economic Adjustment, Report 2, Iowa State Univ., Ames, 1950, p. 133. Fox estimates an elasticity of .14 for both quantity of food purchased and product mix, the latter reflecting shift among commodities.

[41] Agr. Marketing Service, USDA, *Food Consumption of Households in the United States*, Report No. 1, Household Food Consumption Survey, 1955.

[42] M. K. Bennett, *The World's Food*, Harper and Brothers, New York, 1954, pp. 212–213.

TABLE 6.9

SOURCES OF CALORIES BY MAJOR FOOD GROUPS FOR U.S. SPECIFIED PERIODS AND RELATIVE RETAIL COST PER CALORIE AT 1947–49 PRICES

| Group | Percent of Calorie Intake From Food Group | | | Relative Calorie Cost at 1947–49 Prices (Average = 100) |
|---|---|---|---|---|
| | 1909–13 | 1947–49 | 1960 | |
| Potatoes, dry beans and peas | 7.5 | 6.6 | 6.3 | 70 |
| Flour and cereals | 37.2 | 23.8 | 21.1 | 30 |
| Sugar, fats and oils | 27.5 | 34.6 | 36.2 | 40 |
| Meat, poultry, fish | 13.5 | 15.2 | 16.4 | 240 |
| Dairy products | 9.6 | 13.5 | 13.9 | 120 |
| Fruits and vegetables | 4.7 | 6.3 | 6.1 | 300 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

food commodities which are more expensive in both cost at retail and farm resources required to produce them. Table 6.9 illustrates how the mix of products has changed in approximately 40 years, the criterion of proportions being caloric content. These data roughly indicate the relative reallocation consumers have made in their diet among major food groups. The shift has been away from foods of low caloric cost to those of higher cost. However, the greater cost of the latter is not represented mainly by greater input requirements of farm resources, but as much by the larger processing and marketing inputs required for meats, vegetables and fruits.

The absolute rise and decline in per capita consumption of different product groups is indicated in Figure 6.1. It is not likely that the same relative shift will occur in the next three decades. Change will still occur, but at a lower rate than over the past three decades. Smaller opportunity for the excess of farm resources to be absorbed in the upgrading or higher cost of diets exists in the future than in the past. In other words, if technical change runs as far ahead of domestic demand as in the 1940's and 1950's, problems of potential surplus would be expected to grow because relatively less productive power could be diverted to foods with higher resource requirements. Income elasticity of expenditure for products at the "farm gate" have come almost entirely from shifts among commodities. With income elasticity for food in aggregate now approximating .15 and declining further with economic growth, the potential for gain from economic development is small. The trend lines in Figure 6.1 already show a "slowing down" and approach to mathematical limit in the rate of shift, as compared to the earliest decade shown. Further findings on health and longevity might, of course, reverse some of these trends, particularly to the extent that diets of lower cholestrol content might be encouraged.

### Population Distribution

One of the more important dynamic elements in the postwar U.S. economy has been the rate of population growth. This variable of demand has been more important for agriculture than for other industries which gain from higher income elasticities, as well as from a greater number of

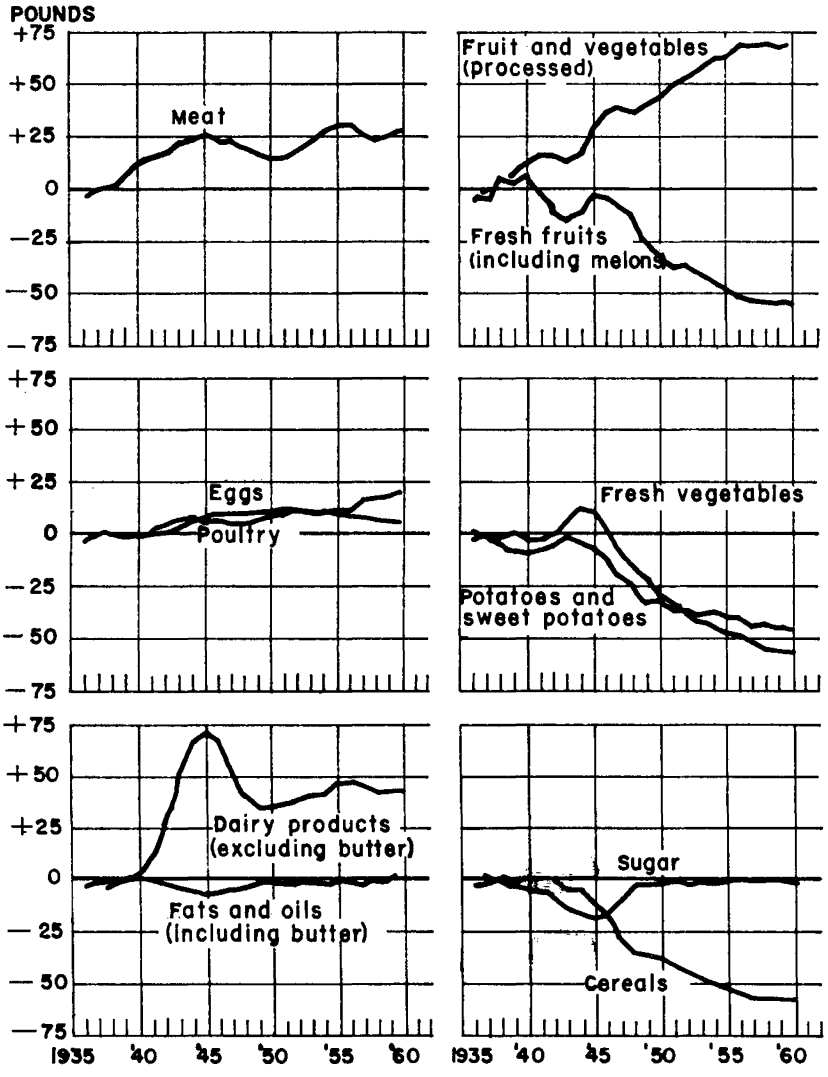


Fig. 6.1. Change in Per Capita Consumption of Particular Food Groups, 1935-60. (Source: Agricultural Marketing Service, USDA.)

consumers. With variance in birth rate between periods separated by the wars and due to improvements in human medicines and health, the age distribution of the population has been changing and is projected to change further as illustrated in Table 6.10. Shift, however, is into age groups both under 19 and over 55 with the net effect of larger caloric requirements for the first group to be offset by lower requirements for the second group. Computed as weighted averages for the various age groups, requirements for 1950, 1960 and 1970 projected amount to 2,340,

TABLE 6.10

POPULATION DISTRIBUTION AND RECOMMENDED DIETARY ALLOWANCES

| Age Group | Population Number* | | | Population Percent | | | Recommended Daily Dietary Allowances† | |
|---|---|---|---|---|---|---|---|---|
| | 1950 | 1960 | 1970 | 1950 | 1960 | 1970 | Calories | Protein |
| | (*mil*) | (*mil*) | (*mil*) | (%) | (%) | (%) | (*Number*) | (*Grams*) |
| All ages..... | 150.7 | 180.1 | 213.8 | 100.0 | 100.0 | 100.0 | — | — |
| 0–4..... | 16.2 | 20.0 | 24.2 | 10.7 | 11.1 | 11.3 | 1,000 | 40 |
| 5–9..... | 13.2 | 19.2 | 22.1 | 8.8 | 10.7 | 10.3 | 1,800 | 55 |
| 10–14..... | 11.1 | 17.2 | 20.9 | 7.4 | 9.6 | 9.8 | 2,600 | 75 |
| 15–19..... | 10.6 | 13.4 | 19.3 | 7.0 | 7.4 | 9.0 | 3,000 | 85 |
| 20–34..... | 35.2 | 34.1 | 42.6 | 23.4 | 18.9 | 19.9 | 2,800 | 60 |
| 35–54..... | 38.8 | 44.8 | 46.6 | 25.7 | 24.9 | 21.7 | 2,500 | 60 |
| 55 and over.. | 25.6 | 31.4 | 38.5 | 17.0 | 17.4 | 18.0 | 2,200 | 60 |

* *Statistical Abstract of the United States*, 1959, p. 27.
† *Recommended Dietary Allowances*, Nat. Res. Counc. Pub. 302, 1953, p. 22.

2,310 and 2,319 calories respectively. (The National Research Council has provided somewhat higher requirements.) Protein requirements computed similarly as a "very minimum" are 60, 61 and 61 respectively. (A more common estimate for the population at large is 65 grams.) On the basis of these data, it again appears that the major coefficient attaching to the population variable, in respect to demand growth, is still magnitude of population itself.

### Nutritional Level

The plane of nutrition in the United States has been upgraded greatly since 1940, due to education and improved knowledge and greater income. This is true even though the public invests considerably more in research and education on animal nutrition than on human diets. Few, if any, U.S. consumers are or need to be hungry. Nutrition surveys indicate the diet in all income classes is sufficient in bulk and calories. Even in crude protein content, this is generally true. Nutritionists and medical experts, if they were to make a blanket recommendation to the nation's consumers, would recommend a smaller, rather than larger, total food intake. They would, of course, recommend less caloric food and more of the essential nutrients. Annual per capita consumption in the U.S. well exceeded 3,000 calories in 1955, against average requirement of 2,640 calories. This compares with the approximately 2,100 calories consumed per person as an average for Asia and the Middle East.

The 1955 Household Food Consumption survey provides fairly current indication of the extent of nutritional deficiencies in U.S. consumer diets. Percentages of families with deficiencies in each of eight nutrient categories is indicated in Table 6.11 by income class and location of dwelling.[43] The figures show the percentage of households falling in the particular

[43] *Food Consumption and Dietary Levels of Households in the United States*, Reports 7–10, Household Food Consumption Survey, 1955, Agr. Marketing Service, USDA.

TABLE 6.11

PERCENT OF HOUSEHOLDS WITH DIETS NOT PROVIDING RECOMMENDED AMOUNTS OF EIGHT NUTRIENTS; BY URBANIZATION AND INCOME GROUP—U.S. 1955

| Nutrient | Recommended Daily Allowances Per Nutrition Unit | Family Incomes of Households of Two or More Persons | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Under $1,000 | $1,000 to $1,999 | $2,000 to $2,999 | $3,000 to $3,999 | $4,000 to $4,999 | $5,000 to $5,999 | $6,000 and over |
| | | Total U.S. percent | | | | | | |
| Protein | 75 gr. | 23 | 15 | 10 | 6 | 3 | 3 | 3 |
| Calcium | 0.8 gr. | 37 | 41 | 34 | 31 | 25 | 23 | 22 |
| Iron | 12 mg. | 15 | 16 | 10 | 9 | 7 | 6 | 7 |
| Vitamin A | 5,000 I.U. | 36 | 30 | 18 | 18 | 12 | 11 | 9 |
| Thiamine | 1.5 mg. | 17 | 19 | 16 | 16 | 13 | 16 | 16 |
| Riboflavin | 1.9 mg. | 32 | 30 | 25 | 17 | 15 | 12 | 14 |
| Niacin | 15 mg. | 17 | 13 | 9 | 6 | 4 | 4 | 3 |
| Ascorbic acid | 75 mg. | 51 | 41 | 30 | 26 | 21 | 19 | 12 |
| | | U.S. nonfarm percent | | | | | | |
| Protein | 75 gr. | 27 | 17 | 11 | 6 | 4 | 3 | 3 |
| Calcium | 0.8 gr. | 43 | 46 | 36 | 32 | 25 | 23 | 22 |
| Iron | 12 mg. | 17 | 19 | 11 | 9 | 7 | 6 | 8 |
| Vitamin A | 5,000 I.U. | 37 | 31 | 17 | 18 | 12 | 11 | 8 |
| Thiamine | 1.5 mg. | 20 | 23 | 17 | 16 | 14 | 16 | 17 |
| Riboflavin | 1.9 mg. | 37 | 34 | 27 | 18 | 16 | 12 | 14 |
| Niacin | 15 mg. | 20 | 15 | 9 | 6 | 4 | 4 | 4 |
| Ascorbic acid | 75 mg. | 52 | 42 | 31 | 26 | 21 | 19 | 12 |
| | | U.S. farm percent | | | | | | |
| Protein | 75 gr. | 18 | 9 | 7 | 6 | 3 | 8 | 3 |
| Calcium | 0.8 gr. | 28 | 23 | 25 | 22 | 24 | 16 | 21 |
| Iron | 12 mg. | 10 | 6 | 4 | 4 | 2 | 4 | 3 |
| Vitamin A | 5,000 I.U. | 35 | 25 | 23 | 17 | 13 | 17 | 13 |
| Thiamine | 1.5 mg. | 12 | 8 | 9 | 9 | 5 | 10 | 7 |
| Riboflavin | 1.9 mg. | 25 | 17 | 17 | 14 | 11 | 12 | 10 |
| Niacin | 15 mg. | 13 | 8 | 7 | 6 | 0 | 4 | 2 |
| Ascorbic acid | 75 mg. | 49 | 35 | 29 | 28 | 20 | 23 | 15 |

income and location group with diets containing less than recommended daily allowances of each nutrient. They do not indicate the percent by which the nutrient is deficient for the particular group. The data show diets to be lowest in calcium, riboflavin and ascorbic acid. Too, deficiencies decline with level of income. Average per family income exceeded $5,000 in 1955 and the skewed stratification of the table by income groups tends to suggest greater deficiencies than actually exist. Actually, only about three in ten of all households had less calcium than was required, and one in four had less ascorbic acid (vitamin C) than was required. Even deficient households used some of these nutrients, often near the

prescribed level. The percentage deficiency in these nutrients is much smaller than the percentage of families with a nutritional deficiency. Thus the national deficiency, as measured from the same source and by the same method, is small. Summary of national deficiencies, at 1955 time, is provided in Table 6.12. (Data in Table 6.11 refers largely to percentages of families with shortage of nutrients. Many consumers have intake exceeding daily requirements of all nutrients.)

TABLE 6.12

DEFICIENCY OF EIGHT NUTRIENTS IN DIETS AS PERCENTAGE OF U.S. TOTAL NUTRIENT CONSUMPTION, 1955

| Nutrient | Percent Deficiency of U.S. Total |
|---|---|
| Protein | 1.1 |
| Calcium | 5.9 |
| Iron | 1.4 |
| Vitamin A | 2.8 |
| Thiamine | 2.8 |
| Riboflavin | 4.0 |
| Niacin | 1.0 |
| Ascorbic Acid | 5.4 |

Any one of these deficiencies could be brought to the prescribed level without absorbing the equivalent of resources which has gone into the 6–8 percent surplus of aggregate production over consumption in the past decade. Just as a relatively small proportion of U.S. consumers uses too little of some nutrients, a greater proportion uses more than requirements of these or others. Some deficiencies exist in all income classes, due to consumer preferences or lack of knowledge of dietary requirements. However, by 1941, average calories available or produced per consumer was 3,408, against daily requirements of 2,640. At the same time, protein available (produced as food) per person was 98 grams—against daily requirement of 65 grams. Even as early as 1930, food supplies in the United States provided an amount of all essential nutrients well exceeding average daily requirements.[44] It has been estimated that less than 10 percent of U.S. households have seriously deficient diets,[45] and these diets are not deficient in calories. U.S. families probably have an "overage" of calorie intake against medical recommendations. The 1958 average daily caloric intake per person was estimated at 3,220 for the U.S.[46] While about 10 percent of the households do not meet the NRC

[44] For discussion of the abundance of food nutrients against requrements, see H. K. Stiebeling, *Family Food Consumption and Dietary Improvement*, Bureau of Human Nutrition and Home Economics, USDA, Oct. 1949. Also see R. P. Christenson, *Efficient Use of Food Resources in the United States*, USDA Tech. Bul. 963.

[45] Willard W. Cochrane, "Demand Expansion Opportunities and Limitations," in *Problems and Policies of Agriculture*, Iowa State Univ. Press, Ames, 1959.

[46] *World Food Deficit, A First Approximation*, Foreign Agricultural Service, USDA, March, 1961.

recommendations for noncalorie nutrients, the deficiency is very small as indicated in Table 6.12.

These data provide sufficient indication that the excess of supply or production capacity over domestic demand of conventional food mix cannot be absorbed by bringing all diets to levels of adequate nutrition. To make these changes in Asia or the Middle East would have large relative effect on food and resource quantity. This is not true in the United States, however, because high per capita incomes allow consumers to attain these levels, if their preferences and knowledge lead them to do so. Because of the wide range of food substitutes available for meeting dietary requirements, most families could do so within the restraints of their present budgets for food.

To test this hypothesis, a Minnesota study derived three diet plans; low cost, moderate cost and liberal cost, with each attaining dietary requirements.[47] Supposing that all persons were shifted to the low cost diet, total national food use, in aggregate value, would decline 21.8 percent. Shifting all consumers to the moderate cost diet would reduce aggregate food intake by 5.5 percent. These declines would come from lower caloric intake or shift in sources, rather than from downgrading of the diet. Use of the liberal cost diet by all consumers would increase all food consumption by 2.3 percent. Again, the latter increase would be too small to absorb the resources represented by the 6–8 percent surplus production over the 1950's. Summary of changes for some individual products is given below under each of the three diets:

| Product | Low Cost | Moderate Cost | Liberal Cost |
|---|---|---|---|
| Milk products | + 2.3 | + 4.1 | +11.1 |
| Meat | −43.1 | − .6 | +11.7 |
| Citrus fruits and tomatoes | −17.2 | + 3.2 | +19.9 |
| Eggs | −18.1 | − 4.7 | − 2.3 |
| Grain products | − .1 | −10.4 | −15.9 |
| Potatoes | +21.4 | + 6.1 | − 5.1 |
| Green and yellow vegetables | + 6.6 | +12.5 | +14.1 |
| Dry beans and peas | +13.3 | −34.0 | −42.3 |
| All food | −21.8 | − 5.5 | + 2.3 |

The Minnesota study group estimated changes in resource requirements if all consumers were to be shifted to each of the three diets specified above. The estimates are given in Table 6.13. The low cost diet, with all consumers shifted to it, would reduce total resource requirements in U.S. agriculture by 21.6 percent, with individual decreases of 27.5 percent for land and 18.0 percent for labor. It is not likely, given the level of affluence and desire for the "more exotic" that consumers would prefer this shift, however. Shift to the moderate cost diet would reduce total resource inputs by .4 percent, with land decreased by .8 percent and labor increased by .8 percent. For the liberal cost diet, but one not all households would wish to buy, total resource requirements would be increased by 7.6 percent, including a 8.6 percent increase in land and a 9.1 percent

[47] Wetmore, *et al.*, *op. cit.*

TABLE 6.13

CHANGE IN RESOURCE REQUIREMENTS TO MEET THREE MINNESOTA DIETS MEETING NUTRITIONAL REQUIREMENTS

| Resource and Product | Low Cost Diet | Moderate Cost Diet | Liberal Cost Diet |
|---|---|---|---|
| Total resources to: | −21.6 | −0.4 | 7.6 |
| Livestock and products | −26.4 | 0.3 | 9.8 |
| Fruits | −15.5 | −0.4 | 12.3 |
| Vegetables | − 6.3 | 5.6 | 14.1 |
| Other foods | 5.9 | −9.2 | −16.3 |
| Land to: | −27.5 | −0.8 | 8.6 |
| Feed grains | −31.2 | −0.3 | 9.5 |
| Fruits | −16.3 | −0.2 | 12.5 |
| Vegetables | − 8.6 | 3.5 | 12.5 |
| Other foods | 1.5 | −11.4 | −17.3 |
| Labor to: | −18.0 | 0.8 | 9.1 |
| Livestock and products | −15.9 | 1.3 | 9.3 |
| Fruits | −15.8 | −0.3 | 12.4 |
| Vegetables | − 8.5 | 3.4 | 12.9 |
| Other foods | 9.0 | −6.9 | −15.1 |
| Feed grains | −33.5 | −0.4 | 9.7 |

Source: Wetmore, *et al.*, *ibid.*

in labor. Total resources to livestock and products decline under the low cost diet, increase by .3 percent under the moderate cost diet and increase by 9.8 percent under the liberal cost diet. Land to feed grains would decrease by 31.2 percent under the low cost diet and increase by 9.5 percent under the high cost.

Actually, the average American diet lies somewhere between the medium and high cost diets specified by the Minnesota group. Largely, the data indicate that the problem of surplus capacity will not be solved during the 1960's by shifting the entire population to the latter dietary level, or that the population will all shift to this diet. Estimates current in 1960 indicated that at least 10 percent of cropland could be diverted to soil bank or other purposes, simply to "break even" on output and utilization and keep prices from further decline. Underemployment of labor in agriculture approached a third of the farm labor force. The data are more assurance that U.S. consumers need not soon go hungry as their numbers increase, if they should shift to a diet of lower calorie and resource cost, than that the surplus capacity problem can soon be solved through dietary improvement—although the latter would help erase surplus capacity problems.

### Production and Consumption Potential

As variances in the estimates discussed previously indicate, it is not possible to predict all demand parameters with certainty. Life would be dull and drab were it possible to do so, since then life of the individual would be purely mechanistic and physical, and perhaps even static, in the sense of the equilibrium of the jungle where some plants emerge and some die but the average shape and magnitude is the same. Still, even though

quantification cannot be perfect, economists feel fairly firm about their ability to forecast demand quantities.

Much less knowledge and predicting ability rests on the side of supply, particularly if we wish to quantify the effect of each behavioral variable related to decisions to produce and invest. If the goal is less that of structural knowledge in motivation and more of forecasting, projections can be made with some degree of confidence. Aside from weather variations, projection of time trends for limited spans can be made in a positive manner. Perhaps more useful are normative projections which indicate possible production in light of present knowledge and technology.

Barton and Daly provide us with estimates of the latter nature, with our confidence quite firm in the sense that they conform quite closely with the trends discussed in Chapter 2.[48] Using estimates of demand parameters outlined above and with projection of the structural variables to 1975, they compared potential demand with potential of production. Demand potential does not consider growth due to industrial utilization, advertising, promotion, etc. Production estimates are in terms of that possible under present knowledge of technology, without consideration of supply functions in the conventional sense or of new technology which might be generated to 1975, the future point of reference. Their projections of farm product utilization are given in Table 6.14.

Total domestic utilization of farm products in this earlier study was predicted to increase by 50 percent over 1956–57 while total output needed for this demand increase is 41 percent. Utilization of livestock products is predicted to increase 52 percent for domestic food purpose, and output increase needed to meet this is 45 percent. Output increases, based on the earlier estimates, needed for crops amount to 32 percent by 1975. Barton and Daly estimate that if only currently known technique were used to best advantage, yield per acre could increase by 50 percent in 1975 over 1956–57. Feed conversion rates also could increase by 10 percent; these two improvements allowing attainment of increased demand or requirements with ease. In a later study, using 1956–58 as a base, Rogers and Barton project a 35 percent increase in volume of farm products to meet domestic demand in 1975, with a 25 percent increase needed for crop production and a 45 percent increase needed in livestock production.[49] Even supposing some limitations on management and economically attainable use of present known technology, Barton and Daly predict that yield per acre could increase by more than 25 percent—an increase coupled with improved conversion rate for all feed which would allow attainment of 1975 food requirements.

It is expected, of course, that new technology will be uncovered and put to use. On this basis, Barton and Daly's estimates would forewarn of supply problems of 1960 magnitude through 1970 in the absence of government policy or market pressure towards alteration of the supply

[48] G. T. Barton, and R. F. Daly, *op. cit.*

[49] R. O. Rogers, and G. T. Barton, *Our Farm Production Potential, 1975*, Agr. Info. Bul. No. 233, USDA.

TABLE 6.14

FARM PRODUCT UTILIZATION AND OUTPUT, 1925–29, 1935–39, 1956–57 AND 1975 PROJECTED (INDICES, 1947–49 = 100)

| Item | Average 1925–29 | Average 1935–39 | Average 1956–57 | 1975 | 1975 Change From 1956–57 |
|---|---|---|---|---|---|
| | | | | | (*Percent*) |
| Population | 81 | 88 | 116 | 157 | 35 |
| Per capita real income | 71 | 69 | 118 | 165 | 40 |
| Utilization of farm products | | | | | |
| Livestock products | | | | | |
| Food, domestic | 72 | 75 | 122 | 186 | 52 |
| Meat animals | 73 | 75 | 124 | 197 | 59 |
| Poultry | 59 | 64 | 162 | 268 | 65 |
| Nonfood, domestic | 102 | 103 | 87 | 105 | 21 |
| Exports | 72 | 26 | 163 | 105 | −36 |
| Imports | 80 | 67 | 93 | 155 | 67 |
| Output | 75 | 77 | 120 | 174 | 45 |
| Crops | | | | | |
| Food | 80 | 88 | 106 | 148 | 40 |
| Cereals and potatoes | 104 | 99 | 102 | 122 | 20 |
| Fruits and vegetables | 74 | 84 | 103 | 155 | 50 |
| Nonfood (excl. feed and seed) | 69 | 78 | 104 | 165 | 59 |
| Feed and seed | 88 | 80 | 109 | 146 | 34 |
| Exports | 90 | 55 | 136 | 135 | − 1 |
| Imports | 88 | 99 | 112 | 160 | 43 |
| Output | 80 | 77 | 106 | 140 | 32 |
| Total domestic use | 74 | 78 | 115 | 172 | 50 |
| Food | 74 | 79 | 117 | 174 | 49 |
| Nonfood | 69 | 76 | 99 | 155 | 57 |
| Exports, total | 87 | 50 | 140 | 130 | − 7 |
| Imports, total | 87 | 93 | 109 | 160 | 47 |
| Output, total | 72 | 74 | 115 | 162 | 41 |

structure in agriculture. Another alternative which would remove the burden from supply structure would be developments leading to change in the demand structure. On the basis of statistics presented thus far, change in demand structure of sufficient magnitude to accomplish this end is not apparent in the domestic economy. If it is to be accomplished, it must come from the outside or world market, from unexpected "break throughs" in lowering the cost of farm products as resources in industrial utilization, or from other "wishing wells." Otherwise, demand for farm products will expand at about the rate of the domestic population variable. This is the 1960 market variable of best prediction, for farmers making decisions in respect to long-term investment and education of their offspring.

## OTHER QUESTS IN DEMAND

Farm products per se provide little grist for the mills of advertising agencies. When consumers are short in supply of food, they are hungry and need no one to tell them that they should eat. Once their stomachs are full, they listen but little to one who tells them to eat more. This is in

contrast to many other goods and services, including those which go with food, which appear in the market as new phenomena, with the consumer convinced of his desire by the most efficient applied psychology known. To add to the weight of cars and housing owned, or of intercontinental travel, suggests to the community that one is affluent and intelligent. But to add to one's own weight tells the community that one is sloppy and destined for early death.

This complex thwarts those who would solve the commercial farm problem through advertising and promotion. The marginal rate of substitution of food in aggregate for other commodities is too near zero, given the vector in consumption space defining diets of U.S. consumers, to allow greatly increased consumption at other than disasterously low and unprofitable food prices. The aggregate farm problem cannot be solved in the 1960's through this approach to demand expansion. The cross elasticities among important commodity groups are large enough that one group of producers might make sizeable inroads into the market of another through lower supply price of a particular product. Developments in broiler productions and utilization over postwar years provide an excellent example. But the investment required to change consumer values and the configuration of the U.S. consumption surface to substitute food for nonfood commodities must be extremely great and of low return, particularly where it does not recognize the main shifter in this process to be per capita income. Mostly it is not an answer to the aggregate farm supply and resource problem because of the inelasticity of the human stomach and the rigid desires of the consumer in respect to weight. Increase input of one food and another is replaced. Advertise one food, and the same is required for another, if it is to "hold its own." Advertising and promotion by state and commodity "improvement groups" thus become neutralized. The return in food demand expansion would likely be greater if these advertising funds, invested in exhorting the consumer to "eat more pork," "eat more beef," and "eat more poultry," were donated to impoverished nations as subsidy in food consumption or for promotion of economic development and human enlightenment.

Walsh[50] estimates the total advertising investment relating to processing and retail of farm commodities and beverages to exceed three billion dollars in 1958, an amount equal to a quarter of annual net income from farming over the period 1956–60. Of course, a major portion of this advertising had objective of increasing demand for a particular brand and retailer of food or other commodity. Its effect was more in respect to this complex, than in increasing demand for food in aggregate. Even at the elementary level, wheat from Wyoming is a perfect substitute for wheat from Kansas and the New York consumer isn't concerned about the source of ingredients for her prepared cake mix. This evidently has not always been apparent to state groups who invest in advertising to increase sales of their local product.

[50] R. M. Walsh, *Increasing Domestic Demand for Farm Products by Advertising and Promotion*, Center for Agricultural and Economic Adjustment, Report No. 2, Iowa State Univ., Ames, 1959.

Advertising or promotion can have two related goals: (1) to shift the demand curve to the right and (2) to make it less elastic. Causing the demand function to decline in elasticity is a main desire for producers of differentiated products. Farm groups probably have had in mind shift of the demand functions, with less concern for changing its elasticity. However, successful commodity advertising would help accomplish the goal of reducing demand elasticity for one product, and allow less inroad from the decrease in supply price and advertising of competing products. Advertising of new products such as frozen orange juice and concentrated lemonade has undoubtedly increased the demand for the farm product resource, citrus fruit, going into them. Research shows that advertisement of other new products such as potato flakes and precooked rice has caused demand for the particular processed product to grow rapidly.[51] In this case, however, gain for potatoes consumed in flake form is loss for potatoes consumed in raw and various other states of preparation. Gain is largely to the producers of services going into production and marketing of flakes, rather than to producers of potatoes.

Advertisement and promotion of some farm commodities undoubtedly has had important effects in improving consumer knowledge of nutritional requirements and possibilities. This was true particularly at lower stages of income and affluence in American society, as consumers were made aware of presence of vitamins and other nutrients of particular foods. It is less so in stage of development where consumers are better educated and informed on nutrition, and income level has allowed them to attain higher cost diets. Hence, the prospective marginal return from investment in advertising and promotion is less in 1960, with product measured both in human well-being and magnitude of farm demand, than it was in 1940.

There is no doubt about the ability of advertisement and special promotion to shift demand from one brand of corn flakes to another, or demand for beef from one store to another. But there is no evidence to indicate that the advertisement for these purposes increases the permanent demand for corn or cattle. The effect from advertising and promotion in the future will be more nearly that of shifting demand elasticities among products, or in shifting demand for one particular form of a product to another processed form of the same product. Also, it will have concentrated effect in shifting demand from one differentiated processed brand to another. It will have little effect in boosting the demand for food in aggregate because of the low marginal rate of substitution of food for nonfood goods and services.

### Quality Improvement

The income elasticity of demand for special services and qualities incorporated into food sold at retail is much higher than the elasticity for

[51] See the following publications: "Potato Flakes, A New Form of Dehydrated Mashed Potatoes. Market Position and Consumer Acceptance in Binghampton, Endicott and Johnson City, New York," Agr. Marketing Service, MR Report No. 186; Super Valu Study, *Progressive Grocer*, New York, 1957, pp. 17–32.

food itself. Food increasingly is a bundle of services, rather than food alone. Part of the services of food, such as prepreparation, is a substitute for other labor in the household and economy; the so-called "built-in maid" being an example. Also, one set of tastes and characteristics of a food item has been substituted for another. For example, consumers substitute the taste and characteristic of frozen peas for canned or dried peas or that of canned fruits for fresh fruits. The quantity of farm product, as the resource leading to the food commodity, itself remains highly constant in this substitution; with the increased consumer demand and expenditure diverted to more of the new characteristic and less of the old, the farm product input remaining constant.

Greater quality and service is desired by the consumer as his income increases and saturation level is approached in commodities which serve mainly a biological function in life. Given this state in economic development, shift of the relative allocation of resources in this direction is consistent with both greater consumer welfare and producer income. The trend has been expressed by the tremendous growth in service industries, and even in the adornment of automobiles and cigarette packages with conveniences and gadgets relating to their psychological appeal rather than their mechanical and biological performance.

With this growing demand and greater income elasticity for services attached to the basic commodity, relative to the basic product itself, it is logical that the economy be adapted in this direction. Public agricultural research institutions could well adapt their activities accordingly. Demand elasticities with respect to quantity per se being low relative to those for quality and services of food, research and education in the experiment stations should be reoriented accordingly (see Chapter 16). This is a logical and realistic step for public investment pointed to increased welfare of food consumers and producers. But while this is true in economic development logic, we need to determine whether it can solve the problem of price and income in agriculture.

Changes in market structure, ranging from vertical integration to other connecting links between farm producer and retailers, are partially a reflection of trend in demand intensity towards quality. The gravitation of farms towards production of market specified qualities will continue, with agriculture becoming more specialized and commercialized. Farm numbers are likely to decline and sizes are likely to increase as a result of this process. In itself, the process is not the answer to the income problem of small commercial farms and poverty groups with meager resources.

The extent to which agriculture in general, given its existing structure, can benefit from the higher income elasticities for products and services represented by food quality depends on the magnitude in which these products can be produced in the farm sector. Many, perhaps the majority, of these qualities and services can be produced more appropriately and at lower cost under factory than under farm conditions. Peas of appropriate size and form are needed for freezing, and farm producers

who adapt their resources accordingly can benefit. However, the main inputs and return from producing frozen peas must come from off-farm production processes. Frozen peas are a direct substitute for canned peas. Similarly, canned ham and frozen, boxed strawberries are substitutes for bulk hams and raw strawberries. Consumption of more canned ham and frozen strawberries can increase greatly the demand for cans and freezing facilities, but increase the demand for hams and strawberries by very little. And this is the main prospect in the realm of improved product quality and service for the bulk of current agriculture. Small gains can be made by the farm industry in adapting resources to the quality product. But the shift will not itself absorb large surplus of resources or boost their returns to levels comparable with the food processing levels. The activity needs to be emphasized, particularly in research of agriculture, as one consistent with higher income and changing consumer preferences of Americans, and as one more consistent with increased returns to commercial farm operators than emphasis on quantity alone. It does not, however, promise to absorb excess labor resources or the extreme poverty found in the industry.

### Marketing Efficiency

Farm groups have long viewed the spread between retail and farm prices, the marketing margin, as a possible source of income which might be redistributed in their direction. This spread or marketing margin has been increasing in both rate and magnitude as illustrated in Figure 6.2 for all farm commodities and in Table 6.15 for specified products. As the latter shows, the spread has tended to widen for farm commodities even in

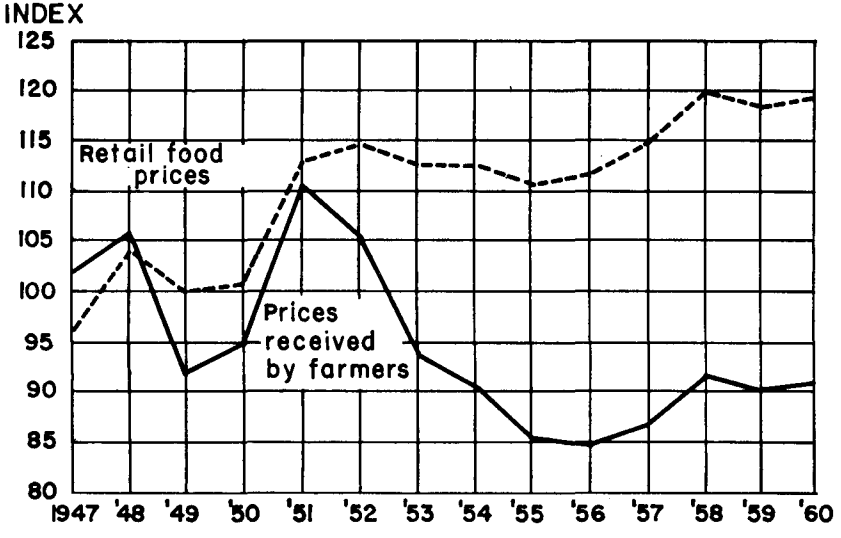


Fig. 6.2. Prices Received by Farmers and Retail Food Prices (1947–49 = 100).

TABLE 6.15
U.S. FARM AND RETAIL PRICES OF DAIRY PRODUCTS, WHEAT, FATS AND OILS AND FRUITS AND VEGETABLES, 1947–58 (1947–49 = 100)

| Year | Farm Prices | | | | Retail Prices | | | |
|---|---|---|---|---|---|---|---|---|
| | Dairy products | Wheat | Fats and oils | Fruits and vegetables | Dairy products | Wheat products | Fats and oils | Fruits and vegetables |
| 1947 | 99 | 112 | 119 | 101 | 96 | 94 | 108 | 98 |
| 1948 | 110 | 97 | 118 | 99 | 106 | 103 | 108 | 100 |
| 1949 | 92 | 92 | 62 | 100 | 98 | 103 | 84 | 102 |
| 1950 | 91 | 98 | 75 | 92 | 97 | 105 | 81 | 97 |
| 1951 | 104 | 103 | 97 | 97 | 108 | 114 | 94 | 105 |
| 1952 | 110 | 102 | 67 | 116 | 113 | 117 | 79 | 117 |
| 1953 | 97 | 100 | 76 | 102 | 111 | 119 | 80 | 114 |
| 1954 | 90 | 103 | 81 | 101 | 107 | 122 | 85 | 113 |
| 1955 | 90 | 97 | 67 | 101 | 107 | 124 | 82 | 114 |
| 1956 | 93 | 96 | 73 | 109 | 110 | 126 | 83 | 119 |
| 1957 | 94 | 95 | 73 | 102 | 112 | 130 | 87 | 118 |
| 1958 | 92 | 84 | 62 | 110 | 114 | 133 | 86 | 120 |

Source: USDA Agr. Marketing Service.

cases where (1) farm prices have gone down and retail prices have gone up (2) farm prices and retail prices have both gone up and (3) both sets of prices have declined.

How can it be explained? Does it represent monopolistic and monopsonistic elements of the food processing and marketing sector of the economy? Statistics and analysis are not available to answer this question fully. However, an important portion of this growing spread is itself economic development phenomena. With growth in income and level of consumption, expenditures turn in the direction of quality and services of food as explained above. The income elasticity of demand for marketing services has been estimated to be five times as large as the elasticity for food itself. Daly estimates the elasticity to be .7 for marketing services and .15 for food.[52]

Hence, as the market basket carried home by the housewife includes an increasing portion of frozen, sliced and packaged services, preconditioned forms of products and other "built-in" labor services, or "exotic characteristics" of food, the proportion of consumer's dollar reaching the farmer's hand will continue to decline. In this sense, growing margin between producer and consumer is one reflection of economic growth and consumer affluence or well-being. The spread could be reduced readily by rolling per capita incomes back to the 1900 level, so that income elasticities of food would rise relative to food services. Farm families who also directly or indirectly use these services of foods, even if in crates purchased for home freezing of products, would not desire this road to a larger slice of a smaller pie.

[52] R. F. Daly, "The Long-Run Demand for Farm Products," *Agr. Econ. Res.*, Vol. 8; and *Demand for Farm Products at Retail and Farm Level*, Mimeo., Oct. 1957.

To the extent that growing spread is due to resource inefficiencies in processing and marketing firms, gain might be reflected back to farmers through creation of experiment stations and extension services which would show these nonfarm units how to use their resources more effectively. This was one general concentration and hope of the Agricultural Marketing Act of 1947. A portion of these research funds were allocated to marketing efficiency studies, in expectation of some gain at the farmer level. It is not likely, however, that the food industry is highly lacking in research or efficiency. It has been nearly as dynamic as any sector of the economy since 1930. Relatively, this sector is quite primitive in less developed countries of Asia and Africa. Further economic growth in these countries will require further public and private encouragement of improvement in processing and marketing industries. Yet inefficiency is not likely to be great enough in these sectors of the U.S. economy to guarantee that improvement will erase the widespread problems of farm surpluses and low incomes.

### Industrial Utilization of Farm Products

Industrial processes represent a production function requiring raw materials as resources, as well as requiring labor and capital in the form of machinery, equipment and buildings. Each of these classes of resources has substitutes, both within the class and between the particular class and other classes. Labor of one class is a substitute for labor of another class, or labor and machinery are substitutes. Similarly raw materials from farm sources and those from other sources of nature are substitutes in producing alcohol, motor fuels, plastics, cellulose and other organic quantities. In the complete industrial process, the optimum combination of resources, ranging from human effort to raw materials, depends on the quantities discussed and illustrated in Chapter 4; namely, the prices of the resources and their marginal rates of substitution. The hope of increased demand for farm products through industrial use depends on the magnitude of these quantities, rather than on new technical discoveries alone. It is likely that materials from farm sources have a near-constant marginal rate of substitution for materials from other sources in fabrication of a given chemical or industrial substance, the product isoquant being linear. Under these conditions, the industrial firm will use only material from farm source, or only that from alternative source. The source selected will depend on the supply price of the material to the industrial plant.

Except during war periods and restricted raw material supplies, farm products have not had large demand in industrial utilization. The reason is that their marginal rate of substitution for substitute materials is too low or the price is too high. Either is a sufficient reason. Thus activity which would expand industrial demand for farm product must either establish a higher rate of substitution of farm products for other chemical compounds or lower the relative supply price of farm products. But the latter does not give positive promise of solving the farm price problem.

Calculation at 1960 price levels indicates that corn and wheat would find demand in industrial production of alcohol only at prices of around 40 cents per bushel for the grains. Prices of grain at this level would drive even the most efficient farmers bankrupt.

Thus, under current market and demand structure for resources and products, the other prospect is in research which increases the marginal rate of substitution as spelled out above. But chemists provide no great hope here. They point out that agricultural production involves complex chemical processes in converting simple elements and compounds of nature into much more complex organic compounds. Utilization of the latter in industrial production requires that the complex molecules be reduced back to more simple form. This process is more costly than starting with molecules of less complex form from nature's direct sources, and converting them into the desired product. As long as this is true, in the sense that simple-form compounds and molecules from nature's direct sources come at lower supply price than those developed through agriculture's biological process, the marginal rates of substitution and pricing of chemical compounds will favor the former source. Currently industrial utilization to result in large expansion in industrial utilization of farm products is one of the less positive hopes in demand expansion.

The avenue needs further exploring, just as do all other alternatives relating to the exploration of the nation's basic resources supplies and their opportunity in product transformation. Yet until stocks of compounds directly from nature dwindle to a point where their supply price rises sharply against materials from farm sources, the opportunity for substitution will remain small. An industry such as the chemical sector wishes a stable supply of raw material. It is not, therefore, well adapted to utilization of periodic farm surpluses. If farm surpluses were readily solved through industrial utilization, the supply of material would dry up as the "higher level" consumer demand had higher price priority on food products. Hence, chemical plants would need to switch periodically from farm to nature's sources of raw materials, or close down intermittingly, if they were to serve as the salvation in solving periodic farm surpluses.

Whereas chemurgy may promise slight increases in demand for farm products, the expansion is most likely to be for minor products representing a small proportion of farm resources. Those used may be mostly derivatives representing by-products from other farm enterprises and commodities. For the major or "bulk" uses and products of chemurgy, the substitute supplies of materials more directly from nature, particularly with opening up of supplies through development of less advanced countries, may cause these sources to decline in real supply price, as against those from farm origin. It is even possible that chemurgy will sooner develop materials which substitute for farm products as foods, than develop efficient means of substituting farm products for other raw materials in synthesizing nonfood consumer commodities. This has been true in textiles and it is not impossible in proteins, carbohydrates and

other materials used for food. While the chemical industry converts grain into starch for industrial use, cotton and wood into cellulose for nonfood fabrication, soybeans into drying oil and corn into butyl alcohol, it also has developed latex-based paints which reduce the demand for vegetable and animal oils. Industrial improvements in fractionation of vegetable oils enhanced the substitution of margarine for butter. It is possible that the chemical and agricultural industries will shift increasingly fron complementary relation to competitive role.

### New Crops and Production Possibilities

Standing at level of industrial uses in hope for demand expansion is development of new crops with alternatives to food use. This is the "new look" in hopes for increased nonfood demands of farm products. In the 1930's, the public established four regional laboratories to do research on new uses of existing farm products. Public Law 540 was passed by the 84th Congress (1958) to invest further in development of new crops. This is a useful direction in emphasis, somewhat in conflict with the core of research in agricultural colleges wherein emphasis has been on increasing yield and output of existing crops; supposing demand to be elastic enough to absorb augmentation of supply at positive revenue increment to farmers. Through new crops which have nonfood uses, the former emphasis would use biological research on the farm production process to extend the magnitude and elasticity of demand for farm output.

The direction is worthy in the sense that it at least reflects refreshing and renewed thought in gearing research to economic development. The obstacles are mainly those discussed above in industrial utilization of existing farm products. New products which use nature to convert simple molecules into compound molecules, with the chemical industry transforming them back to simple form, encounters the same price, cost and substitution processes already discussed. Yet this research and emphasis is relevant for more of research resources in experiment stations, unless they can be allocated more to conventional style research for overcoming problems in underdeveloped nations. Certainly some of these resources would have greater marginal social productivity if they were devoted to improved quality and forms of farm products. Development of the soybean industry and the demand for its products in paints and lubricants is a classic example in the direction of positive-sum outcome among producers and consumers.

There likely are other unexploited opportunities in this direction if research is to come abreast of stage of economic development. Demands which have greater income elasticities than food are those for pulp and paper, gum materials for textile printing, waxes and pharmaceuticals. Even new characteristics of existing crops might be created, or changed, to increase demand outside of the U.S. food market. Consumers in the Middle East prefer poultry with dark color, produced partly through grain of high pigmentation. While this is only an example, social gain

might be greater if some of the plant breeding resources were so adapted, in contrast to concentration on higher yield varieties of the same domestic grain complex.

We should not be overly optimistic in this direction, however. The hope to develop coffee, substituting for that of South America, cannot be successful if it cuts uneconomically into the balance of foreign exchange; or if coffee cannot be mechanized, and labor used in producing it in home plant must compete with labor of lower price in South American countries. Also, in terms of national goals in defense and external economic development, an important question is: are our research resources more effectively deployed in this direction, or in developing products and resources to sell in exchange for coffee, bamboo and mangoes?

### Foreign Market Opportunity

The man from Mars would never understand why two problems exist side-by-side on earth: one of hungry people and one of people with surplus food. Why can the one problem not be solved through elimination of the other? The number of persons in the world who still desire some more food is still larger than the number who worry about overweight, even though the opposite exists in the United States. Physically, one problem effectively could be used to solve the other problem. But economically and politically, the solution is not so simple.

Political and economic mechanisms are the creation of man. They should be his servant and not his master, certainly in those societies where the state exists to serve man. If the world were composed of a single society with economic and political mechanisms created as man's servant, an optimum allocation of resources over the globe would allow resources with high productivity in food at one location to be used in betterment of consumer welfare on other continents. But given the reality of the moment, distinct societies existing with their own particular value and goal orientations, opportunities are not this fluid. International economic goals and purposes of one nation must thus conform to a pattern consistent with those of nations which complement its long-run objectives and goals. This framework prevents unleashing the full productive capacity of U.S. food resources and surplus stocks in alleviating hunger and misery in less developed nations. It is not convenient and practical to substitute U.S. food products for those serving as the market outlet of nations serving in complementary economic and political capacity.

Worldwide, a growing public conscience and concern is developing, placing high value on the freedom from hunger and misery and self determination by all people. This public or social purpose is being given quantitative reflection in liquidation of colonies, and investment in developmental aids even by small nations. While they may be restrained and sometimes set back by international political forces, the broad and long sweep of history is in the direction of minimum well-being and freedom of all nations. Over a shorter period of time, ability to use produc-

tive capacity of U.S. food resources for these purposes will need to be restricted, but the pace may grow.

These are crucial factors: the changing economic and political structure in less developed countries, and the mechanisms and institutions which man can create to cause growth and alleviate hunger through use of surpluses. Hence, the computation, presentation and analysis of demand elasticities and structural demand functions for underdeveloped nations is largely meaningless and obsolete. The large humanitarian and economic opportunities and strides for filling developmental voids will come not from inverting matrices and exacting derivatives in respect to these quantities, but from simple logical analysis of needs and possibilities and refined education of administrators, politicians and publics at large to accomplish these ends.

Physically, it is easy to define ways in which surplus food stocks of particular nations might be used to promote economic development in other countries. Examples abound on all sides: give students free food, the main cost of subsistence, while they obtain education; provide food for workers who build roads, schools and factories—with their time freed from the retarded task of squeezing food for subsistence from paltry resources. Yet there are major economic and political hurdles to be overcome, within and between both recipient and extending nations as outlined in Chapter 17.

The extremely basic question before American society is not how farm products can be shipped to food deficit countries to rid the United States of its surpluses and maintain manpower on farms. It is one of optimum procedures and allocation of investment to speed economic development and true freedom of peoples, with use of farm commodities and productive power to conform to this end—large or small as the outlet may be. This framework promises to develop. But until it is more nearly clarified, the utilization of services from U.S. farms will follow the model: particular commodities in surplus will be used, to the extent allowed by U.S. public appropriations and political expediency within receiving countries, for shipment as gifts or low-priced contributions in alleviating food shortages where supply is small relative to population. Perhaps it can even be argued that surplus farm production has been beneficial to promotion of humanitarian goals by U.S. society. With surpluses on hand, and with investment already committed to them, the public has cast about looking for physical disposal alternatives—those which would not bother the public's value or creed of "waste avoidance." It has thus been possible to contribute modestly to elimination of hunger and economic development in more tardy world regions through foreign food disposal. Without surpluses and the pressure to eliminate their cumulative costs, persuasion of the public to invest in food shipments of equal magnitude might have been difficult, if not impossible.

One cannot say that world demand, in the "effective economic sense" of the term, for U.S. food has been growing rapidly. However, shipment of food under the framework mentioned above, has been growing at quite

rapid rate. Exports of wheat now approximate U.S. food uses of this commodity, with nearly three-fourths of exports attributable to special governmental disposal programs. The pattern for other commodities is included in Table 6.16. Johnson's projections to 1965, assuming extention of current structures of U.S. foreign and farm policy and world economic growth, also are included for comparison.[53] Foreign demand growth under current policy structure cannot absorb current productive power, or even current wheat stocks, at prospective growth rate. Johnson's estimates of production potential also provide negative expectation that export growth at this rate can absorb excess plant capacity in feed grains. His projections, consistent with those discussed previously, estimate feed

TABLE 6.16

U.S. FARM PRODUCT EXPORTS, 1955–59 AND 1959

| Item | Unit | 1955–59 | 1959 | Projected 1965 | Change 1959 to 1965 |
|---|---|---|---|---|---|
| | | | | | *(Percent)* |
| Wheat, including flour | Mil. bu. | 418 | 443 | 475 | 7 |
| Commercial exports | Mil. bu. | 131 | 123 | | |
| Special govt. programs | Mil. bu. | 287 | 320 | | |
| Rice | 1,000 MT | 695 | 698 | 750 | 7 |
| Commercial exports | 1,000 MT | 264 | 316 | | |
| Special govt. programs | 1,000 MT | 431 | 382 | | |
| Feed grains | 1,000 MT | 8,043 | 11,261 | 11,750 | 4 |
| Commercial exports | 1,000 MT | 5,010 | 8,703 | | |
| Special govt. programs | 1,000 MT | 3,033 | 2,558 | | |
| Cotton | 1,000 bales | 4,468 | 3,678 | 6,500 | 77 |
| Commercial exports | 1,000 bales | 2,560 | 2,229 | | |
| Special govt. programs | 1,000 bales | 1,908 | 1,449 | | |
| Fats and oils | 1,000 MT | 2,020 | 2,242 | 2,900 | 29 |
| Commercial exports | 1,000 MT | 1,405 | 1,769 | | |
| Special govt. programs | 1,000 MT | 615 | 473 | | |
| Total agricultural exports | Bil. dol. | 3.9 | 3.9 | 4.7 | 21 |

grain production potential at 176 million tons in 1965—against 128 million tons needed for livestock (1954–58 feed-livestock conversion rates of .83 ton) at the same point in time. Excesses this large are not great when diets of the masses of consumers the world over are examined. But opportunities and needs for U.S. agricultural production, in the context of optimum rate and extent of world development, need to be appraised in a larger economic framework.

[53] S. E. Johnson, *Agricultural Outlook in the 1960's*, 38th Annual USDA National Outlook Conference, November, 1960 (Mimeo). The changes shown are percent of 1959 exports, and not of production.

Other nations also have supply potential which is large relative to effective demand.[54] Disposal of U.S. surplus does not take place in a market vacuum, but must be evaluated against an interrelated network of supply and demand functions. Increased shipment of food to one nation decreases the demand and price for food from others where farm production potential is increasing at rates equal to or faster than those in the United States. It is not yet established that less developed nations can use food with greater marginal benefit than capital for industrial development, with the latter providing remunerative opportunity for masses now underemployed in agriculture. As a purely dumping activity, the impact of supplies from the United States which restrain internal market prices (a condition which, however, does not prevail in countries where food shortages are extreme and prices are controlled at ceiling level) also must be appraised. The shortage in some countries is not caloric, a low cost component of diet and nutrition, but of particular nutrients and variety which are not largely supplied in U.S. excesses. Finally, a surplus disposal program which itself creates uncertainty of supply source—to the extent that it is effective in removing surplus stocks, is not conducive to systematic planning by other nations; nor is it always consistent with the nation's broader foreign policy. Economic analysis in a broader developmental framework may even specify that export of fertilizer, or the machinery to produce fertilizer, is more desirable than export of food.

The elements within the matrix outlined above cause foreign disposal to be less a simple physical and economic alternative in space than first appears true. Hence, we need to postpone more complete analysis of this alternative in demand until a later point.

## SOLUTIONS IN SUPPLY AND RESOURCE STRUCTURE

Even were foreign disposal or exports to provide the means for enlarging demands, thus lifting commodity prices and resource returns of U.S. agriculture, the internal pull of economic development on resource reallocation would not be obviated. Modern technology which has boosted the marginal productivity of capital and land to the individual farmer would still press for firms of larger scale and for industry labor input of smaller magnitude. Increase in demand would not erase the conditions of technical and economic development giving rise to scale economies and factor prices favoring the substitution of capital for labor. Its immediate effect would be to allow farm prices to be maintained at government supported levels, without such large investment of the public in nonrecourse loans for commodity acquisition, in storage of public stocks and payments for sterilizing the productivity of resources.

Our analysis of demand has been significant in one respect: it illustrates

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[54] Colin Clark, *et al.*, *United Kingdom Projected Level of Demand and Supply of Farm Products*, ERS-F-19, USDA, 1962.

clearly that problems of price and resource return in agriculture must be solved on the side of commodity and resource supply structures of the industry. This would appear a negative perspective if fixation were in historic farm values and policy. In a broader context of economic development and human opportunity, the inability to push domestic demand functions to the speed of supply functions connotes attainments. Greater containment of human aspiration exists when the opposite prevails. Our conclusion in this chapter is that we can neither "export" nor "eat up" our food surplus and production capacity problems in present regime of international market, U.S. foreign policy and national population increase. The attack must be more fundamental and broader. Exports, and largely those subsidized under public policy, have represented the large, nonsecular demand increment of the 1950's. Whether this opportunity grows, maintains or declines will be determined by the nation's and world's political and humanitarian choices during the 1960's.