

Chapter 20

Moving Toward the Food Guide Pyramid

Implications for U.S. Agriculture

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Many consumers and health officials have looked to the agricultural and food industries, with their capacity to manipulate the quantity and nutrient content of foods offered in the marketplace, to help consumers improve their diets. This chapter quantifies some of the potential adjustments in agricultural production, trade, nonfood uses, and prices that might occur as the average U.S. diet moves toward the dietary recommendations specified in the Food Guide Pyramid.

Introduction

Recent studies show that average diets differ considerably from Federal dietary recommendations outlined in the *Dietary Guidelines for Americans* and *Food Guide Pyramid* (see chapters 3, 4, and 5). These differences are quite large for some food groups, and for others in which consumption trends are moving in the right direction, growth rates are far short of those needed to meet recommendations within 10 years (see chapter 4).

Many consumers and health officials have looked to the agricultural and food industries, with their capacity to manipulate the quantity and nutrient content of foods offered in the marketplace, to help consumers improve their diets (Frazao and Allshouse, 1996). In his pioneering paper on the implications of more healthful diets for U.S. agriculture, (O'Brien, 1995) speculates on "the adjustments American

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Food Guide Pyramid Recommendations

The *Food Guide Pyramid* recommends the type and quantity of foods to eat from five major food groups—bread, cereals, rice, and pasta; vegetables; fruit; milk, yogurt, and cheese; and meat, poultry, fish, dry beans, eggs, and nuts. The number of servings that are right for any one person varies depending on age, sex, and physiological status.

Food Guide Pyramid serving recommendations for sample diets

Food group	1,600 cal.	2,200 cal.	2,800 cal.
	<i>Servings per day</i>		
Grain group	6	9	11
Vegetable group	3	4	5
Fruit group	2	3	4
Dairy group ¹	2-3	2-3	2-3
Meat group	5	6	7
Total fat ²	53	73	93
Added sugars ³	6	12	18

¹ Women who are pregnant or breastfeeding, teenagers, and young adults to age 24 need 3 servings.

² Recommendations for total fat are suggested upper limits in grams.

³ Recommendations for added sugars are suggested upper limits in teaspoons.

Source: USDA, CNPP, 1996.

Within major food groups, adherence to specific subgroup recommendations is implied by supporting documentation for the *Food Guide Pyramid* (USDA, CNPP, 1996; Cronin and others, 1987). Specifically, vegetable servings should be divided evenly between three subgroups, dark-green leafy and deep yellow vegetables; dry beans, peas, and lentils and other starchy vegetables; and other vegetables. Within these groups, deep yellow vegetables and other starchy vegetables should account for 4/7 of total servings. Fruit servings should be evenly split between two subgroups—citrus, melons, and berries, and other fruits. Several of a consumer's daily grain group servings should come from foods made from whole grains. Similarly, the *Dietary Guidelines* suggest that consumers choose low-fat milk products, lean meats, fish, poultry, beans, and peas often to get the essential nutrients provided by the dairy and meat groups without substantially increasing calorie and saturated fat intakes (USDA/DHHS, 1995).

The *Food Guide Pyramid* also suggests that consumers use fats, oils, and sweets sparingly (USDA, CNPP, 1996). The *Dietary Guidelines* recommend that consumers limit total fat intake to no more than 30 percent of calories to help reduce their chance of getting certain diseases and to maintain a healthy weight (USDA/DHHS, 1995). To avoid getting too many calories from sugars, the *Dietary Guidelines* suggest that consumers use sugars in moderation—and sparingly for persons with low caloric needs. To meet this objective, the *Food Guide Pyramid* bulletin suggests limiting consumption of added sugars (USDA, CNPP, 1996).

agriculture would face if called upon to respond to—and hopefully, to facilitate—a large-scale move toward healthier diets” as defined by Federal dietary recommendations. This chapter builds on that research by quantifying some of the potential adjustments in agricultural production, trade, nonfood uses, and prices that might occur if the average U.S. diet fully complied with the specific serving recommendations quantified in the Food Guide Pyramid (see box for details on Food Guide Pyramid recommendations). It summarizes a more detailed study on this topic that will be published by the Economic Research Service (ERS) early in 1999 (Young and Kantor, forthcoming).

Estimating the Required Change in Food Supplies

The extent to which agriculture would have to adjust to provide the healthful diets specified in the *Food Guide Pyramid* (USDA, CNRP, 1996) can be quantified by measuring the gap between the number of per capita Pyramid servings provided by the food supply in 1995 and (Food Guide) Pyramid servings recommendations. The number of Pyramid servings provided by the food supply were generated from food supply and utilization data compiled and published annually by the U.S. Department of Agriculture’s (USDA) Economic Research Service (Putnam and Allshouse, 1997). (See chapter 4 for more information about the food supply data and per capita Pyramid servings estimates.)

Estimated per capita Pyramid servings were compared with the Pyramid recommendations for a sample diet of 2,200 calories, which approximates the daily Recommended Energy Allowance (REA) of 2,247 calories derived from a population-weighted average of REA’s for different age and sex groups of the U.S. population (see “Food Guide Pyramid” box and chapter 4).

The food supply servings estimates suggest that the average American diet is out of balance with Food Guide Pyramid recommendations (table 1). To meet these dietary targets, most Americans need to sharply reduce their consumption of added fats and sugars while increasing servings of fruits, vegetables, whole grains, lean meats and meat alternates, and low-fat dairy products. It is important to note that the ERS estimates of food supply servings for some food groups differ from servings estimates from USDA’s *Continuing*

Table 1—1995 food supply servings compared with Food Guide Pyramid recommendations

Food group	Food Guide Pyramid recommendation for a 2,200-calorie diet ¹	1995 food supply servings	Change needed to meet Pyramid recommendation
	<i>Servings</i>	<i>Servings</i>	<i>Percent</i>
Grains	9.0	9.4	—
Vegetables	4.0	3.7	8
Dark green leafy and deep yellow vegetables	1.3	0.3	333
Dry beans, peas, and lentils ²	0.6	0.2	200
White potatoes and other starchy vegetables	0.8	1.3	-38
Other vegetables	1.3	1.9	-32
Fruit	3.0	1.3	131
Citrus, melons, berries	1.5	.6	150
Other fruit	1.5	.7	114
Milk, yogurt, and cheese ³	2.2	1.8	22
	<i>Ounces</i>	<i>Ounces</i>	
Meat, poultry, fish, dry beans, eggs, and nuts ⁴	6.0	5.7	5
	<i>Grams</i>	<i>Grams</i>	
Added fats and oils ⁵	38	59	-36
	<i>Teaspoons</i>	<i>Teaspoons</i>	
Added sugars ⁶	12	32	-63

¹ USDA, CNPP, 1996; Cronin et al., 1987.

² Dry beans, peas, and lentils can be counted in either the vegetable or meat groups. Counting these foods toward "vegetable group" servings is consistent with other dietary assessment studies.

³ Recommendation based on a weighted average of recommended servings for different age groups of the U.S. population.

⁴ Food supply servings reflect both the lean and fat portion of meat and poultry.

⁵ The Food Guide Pyramid does not make a recommendation for added fats and oils. The upper limit reported here is based on the assumption that added fats and oils contribute the same 52 percent of total fat in the food supply as in 1994, and that total fat is to no more than 73 grams or 30 percent of total calories for a 2,200-calorie diet.

⁶ The recommendation for added sugars is a suggested upper limit based on caloric intake.

Source: USDA, Economic Research Service.

Survey of Food Intakes by Individuals (USDA, ARS, 1998). For some food groups, these differences are significant and could affect the magnitude of the adjustments detailed here (see chapter 4).

Estimating Agricultural Sector Adjustments

Adjustment scenarios for the agricultural sector were developed by applying the percent change in food supply servings needed to meet recommendations to USDA supply, use, and trade data for 1991-95. Adjustments were first assumed to occur in the domestic production sector. Crop acreage adjustments were subsequently developed by evaluating potential changes in trade and other uses as well as cross-commodity effects. All adjustment scenarios assume that average diets would meet Pyramid recommendations regardless of price effects—essentially fixing demand across broad commodity sectors at the point where average consumption meets these targets. We also assumed that only U.S. consumers change their eating habits. If consumers in other countries were to make similar adjustments, many of the impacts discussed here would be magnified.

The scenarios presented here are not intended to be exhaustive. The scale and complexity of the U.S. food system presupposes that a diverse and almost infinite number of foods, production methods, end uses, and trade adjustments could achieve the desired outcome. Food consumption is just one of several components of demand for agricultural products along with animal feed, exports, and nonfood or industrial uses. While shifts in food demand due to increased compliance with Federal dietary recommendations may initially result in increased food prices for some foods, for example, these demand shifts would likely result in offsetting shifts in production, trade, and nonfood uses, which would tend to moderate food price impacts.

The analysis is further complicated by interactions among different agricultural commodity markets. Products can substitute for each other in consumers' diets depending on relative prices.

Increased prices for rice, for example, may prompt consumers to shift consumption to pasta or potatoes. Similarly, farmers can often shift production among commodities on the same piece of land depending on price changes. Wheat, corn, and vegetables are examples of such commodities. Also, producers and processors can alter the supply of

final food products depending on relative prices and changing technologies, for products produced jointly from the same agricultural commodity, like milk. Dairy manufacturers, for example, could meet increased consumer demand for low-fat milk products by producing more low-fat yogurt and skim milk and less ice cream, butter, and cheese.

Furthermore, consumption trends suggest that dietary change is a slow process for most consumers. Thus, the agricultural sector is likely to have a long lead time to respond to such demand shifts. Existing domestic farm legislation and U.S. commitments under global trade agreements, which may affect the pace of adjustment in some sectors, are also subject to change and will affect some commodity sectors much more than others.

How Much Would Agriculture Have To Adjust?

Table 2 summarizes estimated adjustments in crop acreage that may occur if food supply servings were to meet Food Guide Pyramid recommendations. The net adjustment of 5.6 million acres is relatively small in relation to total planted area—about 2 percent of average 1991-95 agricultural cropland, and well below the almost 22 million acres of cropland idled under Federal planting constraints during 1991-95.¹ However, this modest net adjustment masks more significant acreage changes anticipated for single commodity groups like sweeteners, fats and oils, fruits, and some vegetables. Also, because of land and climatic differences, adjustments for some commodities may be concentrated in certain regions.

Caloric Sweeteners

The estimated 63-percent decline in domestic caloric sweetener use (cane and beet sugar and corn sweeteners) (table 1) would sharply reduce domestic sweetener prices, resulting in reduced production of sugar and corn sweeteners and declining sugar imports (the United States imports negligible quantities of corn sweeteners) (table 3).

Without offsetting increases in sugar exports or nonfood uses or declining imports, domestic sugar production would decline by 4.5

¹ Authority for these programs expired in 1996 with the passage of the 1996 Farm Act.

Table 2—Maximum acreage adjustments implied by the Food Guide Pyramid serving recommendations

Crop	Average planted area 1991-95	Area adjustments
<i>Million acres</i>		
Fruits:		
Citrus	0.9	1.4
Melons and berries	0.6	0.7
Other noncitrus	1.9	2.1
Vegetables:		
Dark green and deep yellow	0.4	1.4
Starchy vegetables	2.4	-0.9
Other vegetables	1.6	-0.5
Dry beans, peas, and lentils	2.1	2.7
Peanuts	1.7	--
Tree nuts	0.7	--
Wheat	70.7	--
Rice	3.1	--
Feed grains	98.2	
From sweeteners	5.6	-3.5
From lower oilseed production	0	2.0
From meat and dairy	55.7	5.0
Soybeans	60.5	-3.0 ¹
Sugar		
Beet	1.4	-1.1
Cane	0.9	-0.7
Land used for food crops	247.1	5.6
Other cropland ²	108.7	--
Total cropland	355.8	5.6

Note: Maximum adjustment assumes all adjustments occur in domestic production without offsetting adjustments in trade or other uses.

-- = less than 0.1 million acres.

¹ Direct estimation of the impact on soybean production implies a 12-million-acre decline. Demand for soybean meal would limit the overall decline.

² Includes idled land plus land planted to cotton, hay, silage, and miscellaneous crops, but excludes the Conservation Reserve Program.

Source: USDA, Economic Research Service.

Table 3—Caloric sweeteners: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Cane and beet sugar	Corn sweeteners
Demand:		
Food use	↓	↓
Exports	*	*
Industrial use	*	*
Prices		
	↓	↓
Supply:		
Domestic production	↓	↓
Imports	↓	*

*These uses are relatively small and were not evaluated.

Source: USDA, Economic Research Service.

million tons while corn sweetener production would drop by 6.5 million tons. Sugarcane and sugarbeet acreage would drop by up to 0.7 and 1.1 million acres (table 2). Some adjustments in sugar imports would also likely occur. If the adjustment were borne proportionately between domestic production and imports, sugar imports would decline to under 1 million tons from a 2.1-million-ton annual average during 1991-95. Domestic sugar acreage would decline by 0.6 million acres of sugarcane and 0.9 million acres of sugarbeets (assuming proportionate reductions in cane and beet sugar production).

Adjustments in the sugar sector would be complicated by U.S. sugar legislation under the 1996 Farm Act. Domestic sugar production is supported through a system of price supports and import restrictions or tariff-rate quotas (TRQ) administered by USDA (Lord, 1997). Under the raw sugar TRQ, quota-holding countries are each allocated a fixed amount of sugar that they may ship to the United States annually at zero or low duty. Any sugar above the quota pays a duty, which is generally high enough to prevent imports above the quota amount. The TRQ is established annually (and sometimes adjusted within a given year) to control supply and is set to fill the gap between forecasted domestic consumption and production.

The TRQ acts as a price support only so long as the gap between U.S. sugar consumption and production remains above 1.5 million tons. Were domestic consumption to fall by the estimated 63 percent to meet recommendations, the TRQ would likely drop below 1.5 mil-

lion tons, resulting in a suspension of the price support program. With the price support program suspended, farmlevel sugar prices would fall to world levels and production and imports would adjust to balance the domestic market.

Adjustments in the corn sweetener sector would include a 400-million-bushel decline in field corn used to produce corn sweeteners and a measurable reduction in supplies of high-value corn gluten meal and other byproducts of the wet-milling industry that produces corn sweeteners. Some of these adjustments may be mitigated by increased corn sweetener exports (see “Grains” section). However, the United States exported less than 3 percent of total high-fructose corn syrup (HFCS) output during 1991-95, suggesting that export opportunities for HFCS may be limited, at least in the short term.

Fats and Oils

Adjustments in the fats and oils sector are the most complex that the agricultural sector is likely to face. Reducing total fat intake to no more than 30 percent of total calories (as suggested by Federal dietary guidance) implies sharp reductions in the consumption of both naturally occurring fats—found in meats and dairy products—and added edible fats and oils like butter, vegetable oil, shortening, and other baking fats. Adjustments in naturally occurring fats are considered in the meat/poultry/fish and dairy sections of this chapter.

To meet dietary guidance, supplies of added fats and oils would need to decline by 36 percent (table 1). Soybean oil dominates the U.S. edible fats and oils industry, so this reduction would likely be concentrated in the soybean sector and its related industries (table 4).

Reduced demand for soybean and other vegetable oils could force large declines in vegetable oil prices and reduce the value of major oilseed crops like soybeans. For example, without offsetting market adjustments, a 36-percent reduction in soyoil consumption would imply about a 2-million-ton decline in soyoil output—the equivalent of 12 million acres of soybeans. Such a reduction would reduce soybean output to production levels of the mid-1970's.

Market forces, however, would likely moderate such a sharp production drop. For example, reducing soyoil production would be complicated by the dual nature of soyoil production. The same soybeans that are crushed for soyoil also yield soybean meal, a high-protein

Table 4—Added fats and oils: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Soybeans	Soybean oil	Soybean meal	Other fats and oils
Demand:				
Food use**	*	↓	*	↓
Exports	↑	↑	↓	↑
Industrial use	↑		*	↑
Prices				
	↓	↓	↑	↑
Supply:				
Domestic production	↓	↓	↓	↓
Imports	*	*	↑	*

*These uses are relatively small and were not evaluated.

**Soybeans and soybean meal are used mainly for animal feed.

Source: USDA, Economic Research Service.

animal feed particularly important to poultry and hog production. In fact, soybean meal currently accounts for over 60 percent of the value of processed soybeans. As a result, any reduction in soybean acreage in response to lower soyoil prices would be largely offset by the livestock industry's bidding up soy meal prices to maintain supplies of soy meal feed.

Declining soyoil prices would increase export demand and industrial uses, which would also tend to moderate acreage declines for soybeans. Increasing soyoil exports by the entire 2-million-ton surplus implied by the Pyramid consumption targets would increase U.S. soyoil exports 3-fold. Exports of this magnitude would lower world soyoil prices. Lower soyoil prices would increase the competitiveness of U.S. soyoil with other fats and oils on the world market—presumably increasing U.S. market share. Such a decline in world soyoil prices may also stimulate additional export demand for U.S. soybeans, which has declined dramatically over the past 30 years.

Surplus soyoil and other edible fats may also be diverted to the industrial market. Animal and vegetable fats are used in a wide variety of industrial applications including printing inks, soaps, cosmetics, lubricants, paints, varnishes, solvents, resins, plastics, and fuel additives. While less than 3 percent of total edible fats and oils were

used in industrial applications in 1991-95 (Sanford, 1996), reduced food demand may increase the attractiveness of these fats for non-food purposes. Alternative food uses for soyoil include fat substitutes such as Olean. Meat analogs and other food products made from soybeans like tofu, particularly in the niche organics market, might represent a small but growing alternative market for soybean producers.

Food uses and prices of other edible fats and oils (corn, sunflower, palm, canola, etc.) would also decline substantially were average diets to meet the suggested upper limit on total fat consumption. A reduction or elimination of imports, which would mostly affect availability of tropical oils (palm, cottonseed, etc.), olive, and canola oils, could reduce adjustment pressures on the domestic fats and oils sector. Reducing imports of tropical oils, which are relatively high in saturated fat, may improve the nutrient profile of edible oil consumption; but reducing or eliminating imports of olive and canola oils would buck publicity surrounding the health benefits of those oils, which helped to more than double their consumption over the past 10 years.

Fruits and Vegetables

Increasing per capita consumption of fruits and vegetables to the Pyramid recommendations would require sharp adjustments in both the quantity and variety of fruits and vegetables supplied to the U.S. marketplace. Such adjustments could be complicated by the seasonal nature and limited geographic suitability of some fruit and vegetable production, increasing dependence on fruit and vegetable imports for year-round produce supplies, and the perishable nature and short shelf life of most fresh produce. Changes in the share of total fruit and vegetable consumption consumed in frozen, canned, or other processed form may help to ease adjustments in fresh produce sectors.

Vegetables

While the net increase in average per capita vegetable consumption needed to meet Pyramid recommendations is less than 10 percent, this aggregate adjustment masks larger changes in the types of vegetables that would be included in the new market basket. An average diet, for example, would include four times as many dark green leafy and dark yellow vegetables; three times as many dry beans, peas, and lentils; and fewer servings of starchy and other vegetables.

Table 5—Vegetables: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Dark green/ deep yellow	Dry beans, peas, lentils	Starchy	Other
Demand:				
Food use	↑	↑	↓	↓
Exports	*	↓	*	*
Industrial use	*	*	*	*
Prices				
	↑	↑	↓	↓
Supply:				
Domestic production	↑	↑	↓	↓
Imports	↑	*	*	*

*These uses are relatively small and were not evaluated.

Source: USDA, Economic Research Service.

A net increase in domestic vegetable production of 2-3 million acres would be needed to yield the additional 9 billion pounds (farm-weight) of vegetables needed to bring average consumption up to Pyramid serving recommendations (table 2). This net acreage expansion would include an additional 1.4 million acres of dark green leafy and deep yellow vegetables, 2.7 million acres of dry beans, peas, and lentils, and a 1.4-million-acre decline in starchy and other vegetable production. Significant price adjustments would have to occur to induce these acreage adjustments (table 5).

Although some U.S. regions, such as California, have distinct climate and soil advantages for growing vegetables, vegetables are grown across the United States. Depending on the specific type of vegetables that made up the additional consumption, the anticipated adjustments would likely be spread across a wide geographic region. However, production of some tender-season vegetables like tomatoes, lettuce, peppers, and summer squash could be particularly constrained during the winter months, and high off-season prices would likely prompt additional imports.

Trade adjustments could also boost domestic supplies of vegetables, particularly fresh winter vegetables. Mexico is already the main import supplier of fresh winter vegetables for the United States, and low-cost imports would be likely to capture at least a portion of the increased vegetable consumption (O'Brien, 1995). Some U.S. pro-

Table 6—Fruit: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Citrus fruit	Melons/berries	Other
Demand:			
Food use	↑	↑	↑
Exports	↓	↓	↓
Industrial use	*	*	*
Prices			
	↑	↑	↑
Supply:			
Domestic production	↑	↑	↑
Imports	↑	↑	↑

*These uses are relatively small and were not evaluated.

Source: USDA, Economic Research Service.

ducers would probably invest in Mexico as a way of meeting U.S. demand. Some of this type of investment is already occurring. Higher domestic prices relative to the world market may also result in additional supplies of some vegetables diverted to domestic use from the export market.

Fruit

Fruit consumption would more than double under an average U.S. diet that met Pyramid recommendations. Consumption of citrus, melons, and berries would increase 150 percent, and other fruits 114 percent. These consumption targets contrast sharply with recent trends in which fruit servings increased a total of 11 percent between 1981-85 and 1991-95. In the aggregate, increased fruit demand would result in higher fruit prices and, in turn, increased domestic fruit production and fruit imports (table 6).

Meeting the projected consumption increase with domestic production alone would imply an increase of 3-4 million acres in total fruit area and lead times of 3-5 years for fruit trees to begin bearing. While melon and berry production could begin more quickly, additional domestic expansion would be particularly difficult for citrus crops where production is limited by susceptibility to freezes and other climate constraints. Thus, trade adjustments are likely to play an important role in meeting increased consumer demand. More than a quarter of U.S. fruit consumption came from imports in 1991-95.

Table 7—Dairy: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Low-fat milk products	Dairy fats
Demand:		
Food use	↑	↓
Exports	*	↑
Industrial use	*	↑
Prices		
	↑	↓
Supply:		
Domestic production	↑	↓
Imports	↑	*

* These uses are relatively small and were not evaluated.

Source: USDA, Economic Research Service.

Trade agreements, such as the North American Free Trade Agreement and the Uruguay Round Agreement, will be particularly important in lowering trade barriers and limiting price increases.

Higher prices would also be likely to induce U.S. producers to divert exports to the domestic market. However, any significant export diversion would be complicated by well-established trading relationships between the United States and foreign buyers, particularly Canada and Japan.

Dairy

Dairy product consumption would need to grow by more than one-fifth for average diets to meet recommendations for the milk, yogurt, and cheese group. However, because many dairy products are naturally high in fat, saturated fat, and cholesterol, consumers are likely to seek reduced-fat or nonfat versions of existing dairy foods to help meet dietary targets for these nutrients.

Since the United States produces most of its own dairy products, most of the increased dairy consumption would likely be met with domestic production (table 7). Increased yields have increased milk output about 8 percent over the past 10 years despite a decline in herd size.

Milk yields are projected to increase another 20 percent by 2005 (Westcott, 1997). This yield increase, combined with a 5- to 10-per-

Table 8—Meat, poultry, and fish: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Lean meats, poultry, and fish	Animal fats
Demand:		
Food use	↑	↓
Exports	↓	↑
Industrial use	*	↑
Prices		
	↑	↓
Supply:		
Domestic production	↑	↓
Imports	↑	*

* These uses are relatively small and were not evaluated.

Source: USDA, Economic Research Service.

cent increase in the dairy herd over 1991-95 levels, should be sufficient to meet the estimated increase in dairy product demand. Increased demand for low-fat products, however, would require the diversion of skimmed milkfats to other markets.

A portion of the surplus milkfat is likely to end up on the export market, either as butter or cheese or alone as an intermediate ingredient for other food products. While the United States has not historically been a major exporter of dairy products, a substantial fall in domestic prices for milkfats could create additional export opportunities by increasing U.S. competitiveness on the world market.

Meat, Poultry, and Fish

The *Food Guide Pyramid's* emphasis on lean meat products implies that consumers would need to meet the requisite 5-percent increase in meat group servings with increased consumption of lower-fat meat and meat alternates. Since the mid-1980's, increased consumer concerns about saturated fat and cholesterol and shifting relative prices for meat group products have reduced consumption of beef relative to pork and poultry, and increased the demand for reduced-fat meat products of all types. As consumers reduce their fat intake to meet dietary guidance, poultry production would likely increase its market share while the cattle and hog sectors would likely build on existing breeding and management techniques that have already reduced the fat content of their products (O'Brien, 1995) (table 8).

Increased demand for lean meats would tend to raise retail prices for these cuts, while higher fat products would move to nonfood industrial uses or export markets. Such a shift would also have a measurable effect on the feed grains sector. Given current fat-to-lean ratios in hogs and cattle, more animals would be needed to produce additional supplies of lean meats. More than a third of U.S. grain production is used domestically for animal feed. Increased lean meat production implies an equivalent increase in the demand for feed grains and high-protein supplements like soymeal. The magnitude of this adjustment would depend largely on the mix of products that make up the new consumption basket. Poultry production uses roughly half the feedgrains and oilseeds that pork production uses, and a quarter of the feedstuffs required to produce beef. Substantial increases in poultry consumption relative to beef or pork could reduce the magnitude of the feed grain and soybean sector adjustments (see “Grains” section).

Changes in meat trade could also help to ease the adjustments faced by domestic agriculture. Surpluses of fatty meat parts like organ meats, chicken legs, and meat trimmings, resulting from increased demand for lean meat, could be exported. Rising incomes in other regions, particularly Asia, Russia, and Mexico, have increased export markets for these foods. However, economic difficulties in Asia and Russia in 1998 slowed export demand in these markets.

Other commodity sectors in the meat group—including peanuts, tree nuts, and eggs—are unlikely to be significantly affected. Presumably, nut acreage, especially peanuts, could be reduced if consumers reduced nut consumption—especially peanut butter—as a means of reducing fat intake. However, since tree nuts and peanuts accounted for only 3 percent of total meat group servings and 4 percent of the food supply’s dietary fat, such a consumption change would not have a measurable impact on total food production.

Grains

Changes in food grain use (for flour, pasta, etc.) will be relatively minor. However, larger grain sector adjustments will result from adjustments in the feedgrains sector and will be closely linked to changes in the sweetener, oilseed, meat, and poultry industries. Increased planting flexibility under the 1996 Federal Agricultural Improvement and Reform Act (FAIR Act) could help to facilitate feed

Table 9—Grains: Changes in demand, price, and supply to meet Food Guide Pyramid recommendations

Component	Food grains	Feedgrains		
		From sweeteners	From lower oilseed prod.	From meat and dairy
Demand:				
Food use	↑	↓	*	*
Exports	--	↑	--	--
Industrial use	*	*	*	--
Prices				
	↑	↓	↑	↑
Supply:				
Domestic production	↑	↓	↑	↑
Imports	*	*	*	*

-- = unchanged.

* These uses are relatively small and were not evaluated.

Source: USDA, Economic Research Service.

sector adjustments by allowing producers to shift acreage among soybeans and feed grains in response to changing price incentives. There is some evidence that farmers are already exercising such flexibility (Westcott and Young, 1997).

Food Grain Use

With average consumption of wheat flour and other grain products close to recommended levels, adjustments in food grain use are likely to be relatively small compared with shifts in the feed grain and corn sweetener markets. Increased consumption of foods made from whole grains is likely to increase the share of grains, like wheat and rice, consumed in their whole-grain form, while decreasing production of less fiber-dense grain products like white rice and white flour. Such changes would largely occur at the milling, rather than production, level. However, because more product can be extracted per pound of grain—one pound of wheat, for example, yields 0.98 pound of whole-wheat flour compared with 0.74 pounds of white flour—increased consumption of whole-grain foods could lower food grain demand (table 9). Over 30 million acres of cropland are used to produce food grain; thus, even a 1- to 2-percent decline in food grain demand could reduce total grain area by 0.3-0.6 million acres.

Feed Use

With more than a third of total agricultural area in the United States devoted to feedgrain production for domestic use, even a small increase in demand for meat or poultry products implies measurable adjustments in the feedgrain sector. Increased poultry consumption relative to red meat, for example, would increase demand for both feedgrains (mostly corn) and oilseeds (mostly soymeal). To meet this shift in demand with domestic production would imply an increase of 2-5 million acres in feedgrain output. An additional 2 million acres could move into feedgrain production as soymeal increases in price relative to feedgrains and livestock and poultry producers substitute feedgrains for soymeal.

Corn Sweetener Use

Reduced prices for corn sweeteners relative to feed grains would also induce producers to shift corn production from corn sweeteners to feed use. About 660 million bushels of corn, or 8 percent of total field corn output, were used annually in 1991-95 to produce HFCS and other corn sweeteners. In the absence of offsetting market factors, reduced corn sweetener consumption would reduce demand for field corn by about 400 million bushels, or about 3 million harvested acres.

Depending on relative prices, strong world demand could bid surplus field corn out of domestic feed grain use and onto the world market. While it is unlikely that all of the surplus would end up on the export market, a 23-percent increase in U.S. corn exports implied by such a change is well within the bounds of the average annual variation in U.S. corn exports during 1991-95.

Conclusion

This chapter quantifies selected adjustments in agricultural production, trade, industrial uses, and prices that would be expected if the U.S. food supply were to meet Pyramid recommendations. While the net change in planted acreage is projected to be relatively small (less than 5 percent of total U.S. crop area), large adjustments are forecast for commodity groups like caloric sweeteners, fats and oils, fruits, and some vegetable subsectors. Also, for some commodities like sugarcane where production is concentrated in a few regions, the

large adjustments forecast nationally are likely to have significant regional impacts.

U.S. agriculture has a long history of successfully responding to changes in consumer demand—particularly when price signals are clear (O'Brien, 1995). However, many of the dietary adjustments will be large compared with previous changes. Cropland use, farm income, farm and retail prices, the environment, food safety risks, and world trade will be affected. Advances in agricultural production and food processing technologies will be helpful in mitigating the adjustments in some sectors. Trade adjustments are likely to play a pivotal role in balancing the market, particularly for commodities like citrus fruits where climatic constraints sharply limit additional domestic production.

Past consumption trends suggest that dietary change is a slow process for most consumers. Thus, the agricultural sector is likely to have a long lead time to respond to changing consumer preferences. Existing domestic farm legislation and U.S. commitments under global trade agreements, which may affect the pace of the adjustment in some sectors, are also subject to change over time and will affect some commodity sectors more than others. While our estimates of potential agricultural sector adjustments are inexact, and the adjustment scenarios limited, they identify important public policy issues that deserve closer attention.

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