

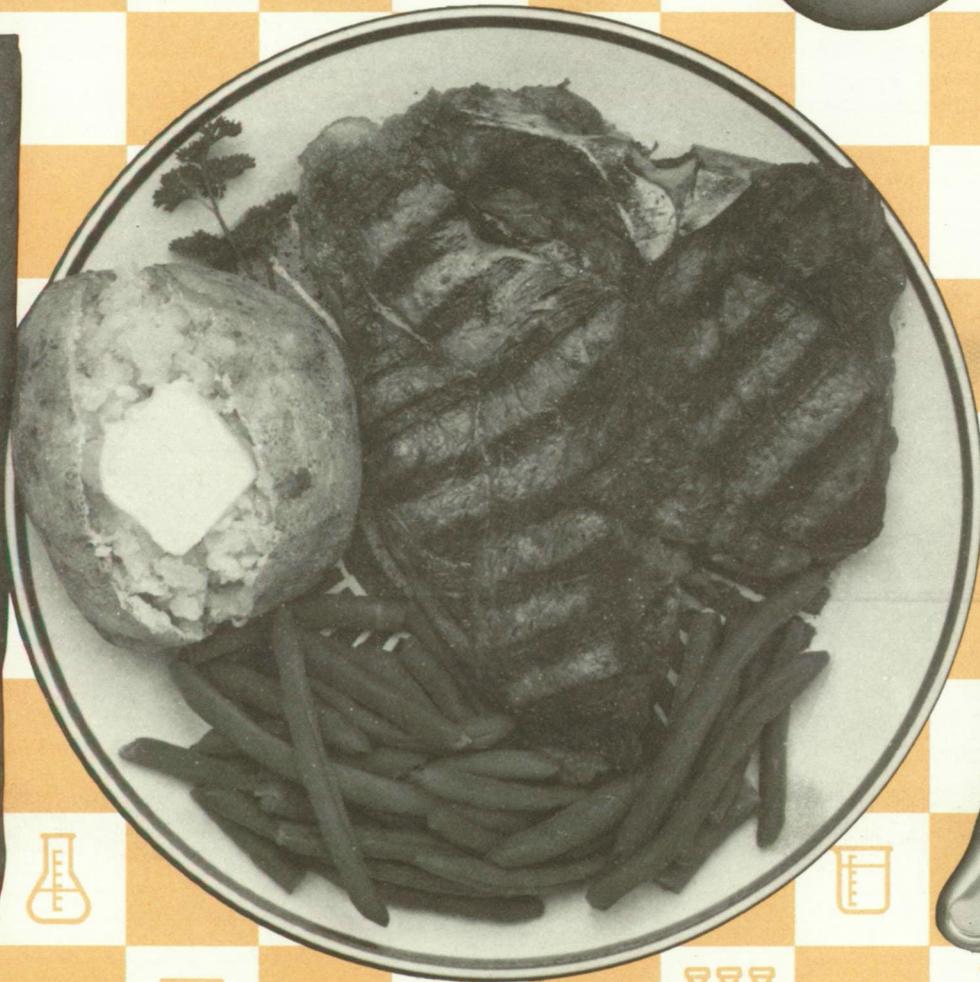
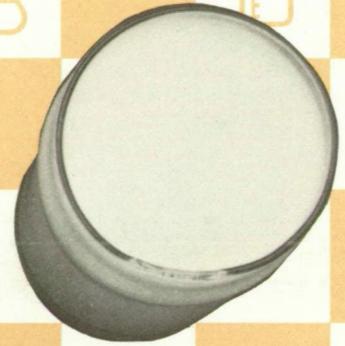
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Protecting and Preserving the Nation's Food



Contents

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Protecting and Preserving the Nation's Food



- 1 **Irradiation's Potential for Preserving Food**
Continued adoption of irradiation partly depends on its costs and benefits compared with existing preservatives.
- 7 **Irradiation's Promise: Fewer Foodborne Illnesses?**
One of irradiation's important benefits may be its use to destroy bacteria causing food-related diseases.
- 11 **Food Irradiation Policy Issues**
FDA's recent approval expanding the uses of irradiation raises questions about its impact on agriculture.
- 14 **Food Contamination: Consumer Reactions and Producer Losses**
After a contamination incident, producers face financial losses due to consumer avoidance of even safe foods.
- 17 **Food Safety Issues for the Eighties**
A look at the direction of the U.S. food sector for the rest of the decade.
- 21 **Food Safety: Consumers Report Their Concerns**
A Kansas State University survey of consumers finds some unexpected responses to food safety questions.
- 25 **When It's a Question of Meat and Poultry Safety...Call 800-535-4555**
Educating the public on proper food handling practices is a little easier because of USDA's toll-free hotline.

Consumer Research



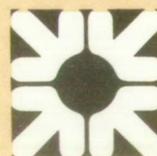
- 27 **Behind Revising the Dietary Guidelines**
The 1985 guidelines provide updates on healthy eating.

Legislation



- 28 **USDA Actions**
Regulatory changes affecting the food industry.
- 31 **Food and Nutrition Legislation**
Proposed legislation on food assistance for the elderly, food stamps, reduced-calorie labeling, and pesticides.
- 32 **Provisions of the Food Security Act Related to the Food Sector**
Details on dairy, beef, pork, and watermelons.

Food Situation and Review



- 36 **Recent Trends in Domestic Food Programs**
An update on participation in and spending for the Food Stamp and other food assistance programs.
- 39 **New Legislation Brings Changes in Food Assistance**
How the Food Security Act affects Federal food assistance programs.

Charting the Food Picture



- 42 **Changing Participants in U.S. Food Production and Consumption**
Data on U.S. agricultural production, farm size, fish catch, imports, and population change.

Irradiation's Potential for Preserving Food

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Scientists have known for many years that radiation can be used to kill insects or destroy microorganisms that cause food spoilage. The process, called irradiation, has been little used, however, largely because of the availability of other preservatives and fumigants and the lack of regulatory permission. The only irradiated foods currently available to U.S. consumers are spices and dried vegetable seasonings, most of which are used in processed foods.

Food irradiation is receiving renewed attention, partly, because of a recent Food and Drug Administration (FDA) action that expanded the list of foods that can be legally irradiated (*see sidebar box*) and because of continued concerns about the safety of chemical fumigants. Further adoption of the process will depend on its costs and benefits relative to existing preservatives and fumigants; the future of current alternative treatments, particularly those that rely on chemicals; FDA's approval of the process for more uses; and consumer acceptance of irradiated foods.

An ERS researcher recently took a close look at the cost of irradiating selected foods at various size plants. She found that costs varied from 8.5 cents per pound for a facility designed to irradiate small volumes of fish fillets to 0.2 cent per pound for an irradiator treating a large volume of pork. Costs, in general, varied with the dose of radiation absorbed by the product and the size of the irradiator. Furthermore, the ERS study revealed that the cost per pound declines as the volume irradiated annually increases. This suggests significant per unit cost reductions for small irradiators as they increase in size. Irradiators treating more than 50 million pounds a year, however, are not likely to realize such significant economies.

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A storage pool of water is used to protect scientists from radiation at the National Marine Fisheries Service's irradiator at Gloucester, Mass.

Irradiation Effects Depend on Dose

Irradiation sterilizes and preserves food by using gamma rays from radioactive isotopes, high-energy electrons, or X-rays. The energy levels of the radiation from these sources, used in accordance with FDA restrictions, will not make the food radioactive.

The effects of radiation depend on the dose absorbed, usually measured in kilorads (krads) (*table 1*). Low doses of 5 to 100 krads sterilize adult insects and kill insect eggs and larvae. This range also extends shelf life by delaying ripening of tropical fruits and sprouting in root crops, such as potatoes and onions. A low dose sterilizes the trichinosis-causing parasite so that it

does not pose a serious health threat. Irradiated pork does not need to be heated, refrigerated or frozen, or cured to kill this parasite.

Irradiation might replace potentially hazardous chemicals used to disinfest agricultural commodities when recontamination is not a problem, such as satisfying quarantine requirements. For example, growers in Hawaii are considering it as a substitute for the banned ethylene dibromide (EDB) previously used to rid papayas of fruit flies before shipment to the continental United States. Although FDA has approved irradiation of fresh fruits and vegetables, USDA's Animal and Plant Health Inspection Service must officially recognize irradiation as an effective quarantine treatment before it can be used for this purpose.

Medium doses of 100 to 1,000 krads extend the shelf life of treated foods by reducing the number of spoilage microorganisms. For example, radiation treatment can extend the refrigerated shelf life of fresh fish by 7 to 10 days. This dose range also inhibits postharvest fungi development in fruits and reduces microorganisms that pose public health threats, such as salmonellae (*see related article in this issue*). However, medium doses have not been approved by FDA.

Similarly, high doses of radiation—2,300 to 5,700 krads—are not allowed for commercial use. These doses, combined with heating, enable food to be stored in sealed containers at room temperature for years. Irradiation sterilizes food by killing microorganisms, including the organism that produces botulism toxin, while preheating kills viruses and other bacteria and inactivates enzymes that cause food to decompose during storage. Irradiation-sterilized meats and seafood have superior texture and nutritional content comparable to conventional canned foods.

Other improvements are possible: reduced nitrite levels in bacon; increased loaf size for bread made from irradiated wheat; ten-

Table 1. Irradiation Has Benefits and Limitations

Suggested dose in krads	Benefits	Limitations
5-75	Sterilize insects.	Reinfestation possible. Insects still able to feed.
5-15	Inhibit sprouting of root crops and elongation of asparagus.	Potatoes must cure before irradiation.
10-75	Delay ripening of some fruits.	Successful for limited number of fruits.
30-50	Inactivate parasites in meat.	Still need refrigeration.
100-200	Kill spoilage microorganisms in fish and fungi in fruits.	Recontamination possible for all foods. Foods still need refrigeration.
200-400	Reduce microorganisms causing public health problems in meat and poultry.	Above certain doses, softening, pitting, and other problems for fruits. Above certain doses, off-flavor and color problems for meats and poultry.
2,300-5,700	Sterilize food for unrefrigerated storage.	Must be irradiated frozen to minimize undesirable changes in quality.

derization of beef; shortened rehydration time for dehydrated vegetables; faster aging of red wines; and reduced gas-causing sugars in beans.

Is Irradiation Cost-Effective?

To be used widely as a food preservation technique, irradiation must compete with alternative treatments by achieving the same effect at a lower price or with fewer drawbacks. If the process costs more, it may still gain acceptance if processors or consumers value the benefits enough to pay the extra cost.

The beginning point in answering the question of irradiation's economic feasibility is to determine the cost of the process and then compare it with the value of the benefits, as well as the cost of substitute processes. The ERS study examined irradiation

costs to determine if the cost of the treatment per unit of output falls as plant size increases, a concept known as economies of scale.

Costs were estimated for irradiating fish fillets and strawberries to extend shelf life, papayas to satisfy quarantine requirements, chicken to kill food-poisoning microorganisms, and pork to sterilize the trichinosis-causing parasite. These applications were chosen to illustrate how unit costs vary with dosage and irradiator size. Costs were estimated for irradiators treating a single commodity for a specific purpose. Cobalt-60 was selected as the radiation source because it is used for irradiating foods in Europe, Japan, and South Africa. Facilities that use other radioactive isotopes, such as cesium-137, or machine-produced radiation would require a separate cost analysis.

Since very few commercial irradiators

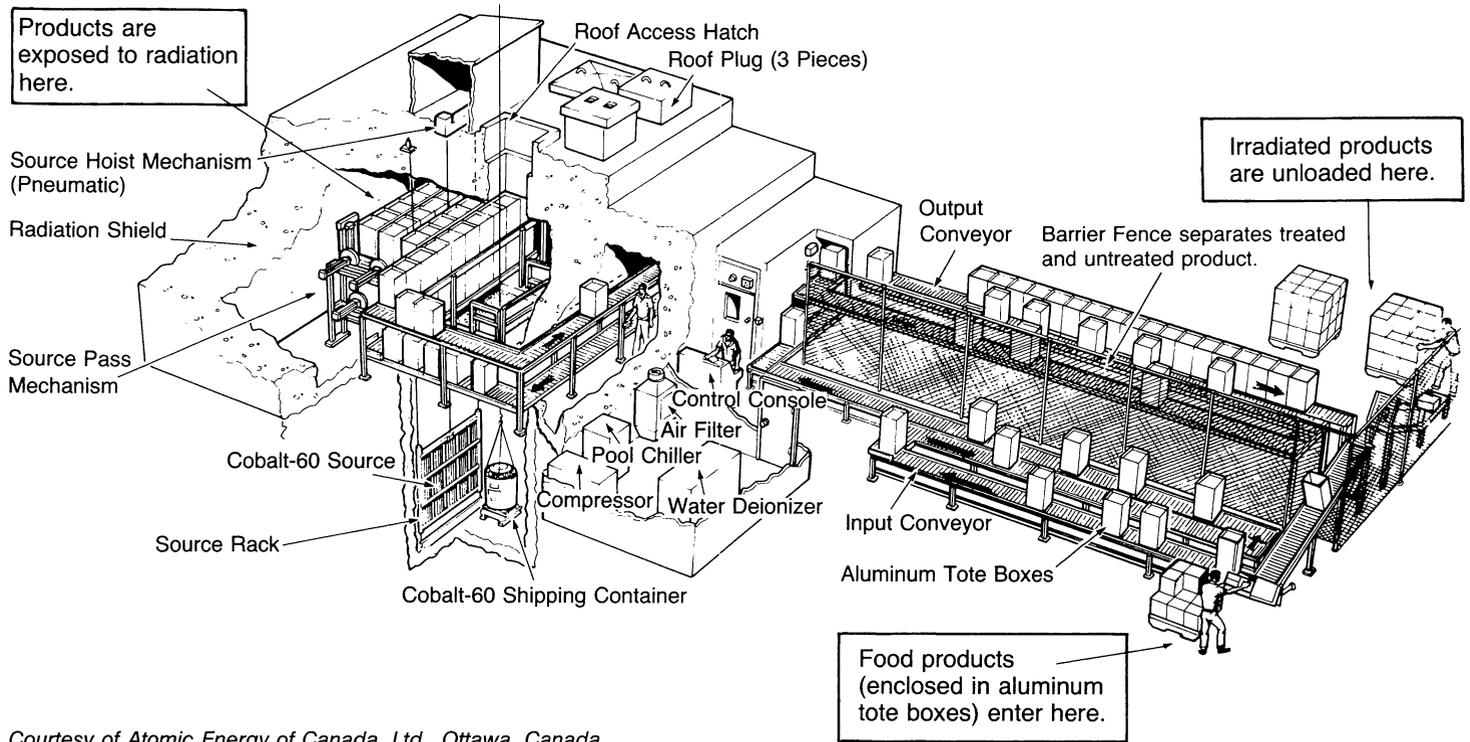
treat only food, the ERS study results represent estimates for hypothetical facilities of a range of sizes. Capital and operating costs were estimated for model irradiators based on information from builders and operators of commercial irradiation facilities used for industrial purposes, mostly to sterilize disposable medical supplies. The ERS estimates, therefore, provide an idea of the magnitude of irradiation treatment costs and how they might vary with plant size. The actual cost of irradiating a specific food will depend on the required dose, the food's tolerance of radiation, construction costs, land prices, wages, financing arrangements, and other variables which vary by locality.

The major components of a gamma irradiator include shielding to protect workers and the general public from exposure to radiation; a conveyor system to move the food past the radiation source; and various auxiliary systems to remove excess heat and vent out the ozone produced (*see diagram*). In addition, space is needed for an equipment room, a laboratory for quality control testing, and product loading and unloading areas. A free-standing irradiator that is not attached to a packing house or filleting plant would need to have refrigerated storage space to hold products before and after irradiation, unless trucking schedules could be coordinated with the irradiation timetable. In contrast, an irradiator that is integrated into a plant could use the existing storage space.

Unit costs for all five commodities decreased as the irradiator's capacity or size doubled, but the amount of the decline depended on the size of the irradiator. The per pound cost of irradiating fish fillets, for example, fell from 8.5 cents for a facility handling 6 million pounds annually to 4.5 cents for 12 million pounds, and 1.6 cents per pound for 48 million pounds annually (*table 2*). In contrast, increases in the annual capacity for large, integrated chicken irradiators, from 52 million to 104 million pounds, lowers per pound cost for irradiation from 1.6 cents to 1.2 cents, with cost dropping to 1.0 cent per pound for a facility handling 208 million pounds.

The ERS study results suggest that, considering only the treatment cost, larger ir-

Diagram of Cobalt-60 Irradiator



Courtesy of Atomic Energy of Canada, Ltd., Ottawa, Canada.

radiators would be able to treat products at a lower unit cost than small facilities. Potential economies of scale were substantial for irradiators with a capacity of less than 30 million pounds a year. Owners of this size irradiator or smaller would be at a distinct cost disadvantage when faced with direct competition from large, low-cost firms. However, potential unit cost reductions as size increased became less pronounced at annual capacities greater than 50 million pounds. For an industry such as papaya packing, reaching this production level would require consolidating the output of several firms. However, in the chicken-packing and hog-slaughtering industries, 80 percent of production is already handled by firms of this size or greater.

Irradiators are likely to operate at less than capacity part of the year if they are used for seasonal products such as fruits and vegetables. Even commodities grown

year-round, like papayas have definite seasonal harvest patterns. To accommodate seasonal peaks, irradiators would have excess capacity during off periods. Excess capacity results in higher unit cost because large irradiators treating small volumes of products would have less output over which to spread their high fixed costs.

For example, the ERS study found that if 50 million pounds of strawberries were treated in a facility designed for that annual volume, the unit cost would be close to 2 cents per pound. A plant built to handle 100 million pounds, but only treating 50 million pounds, would incur a unit cost of 3 cents per pound. If an irradiator designed for 200 million pounds only treated 50 million pounds of strawberries per year, unit cost would be above 5 cents per pound. Locating an irradiator in an area with sequential harvest times for different irradiation-compatible commodities, or irradiating nonagricultural items during off seasons,

would lessen this under-utilization problem.

The ERS study estimated only the costs for the radiation treatment. For free-standing facilities that combine production from several sources, shipping the commodity to the irradiator would be an added cost. As free-standing irradiators increase in size, they will have to draw on larger geographic areas for their annual volume. The transportation costs of getting the commodities to the larger irradiator may outweigh any gains in production economies. This may bring the total cost of using a small irradiator more closely in line with that of a large irradiator.

Competitiveness with Alternatives

For commercial success, irradiation must compete with alternative food treatments both in terms of cost and acceptability to food safety regulators, processors, retailers, and consumers. Irradiation must offer sig-

Table 2. Investment and Unit Costs for Selected Cobalt-60 Irradiators¹

Annual volume	Dose	Initial investment ²	Irradiation unit costs ³
Million pounds	krad	Million dollars	Cents per pound
Free-standing facility			
Fish fillets			
6	175	1.0	8.5
12		1.1	4.5
24		1.4	2.6
48		1.9	1.6
Papayas			
12	26	1.0	4.2
24		1.2	2.3
48		1.5	1.4
96		2.4	1.0
Strawberries⁴			
25	200	2.0	2.7
50		3.4	2.1
100		5.8	1.7
200		10.5	1.5
Integrated facility			
Young chicken			
52	250	2.0	1.6
104		3.3	1.2
208		6.0	1.0
416		11.2	0.9
Pork⁵			
66.5	30	.9	0.7
133		1.1	0.4
266		1.6	0.3
532		2.5	0.2

¹Costs in this study are based on a specific set of assumptions and input prices listed in "Economies of Scale in Single-Purpose Food Irradiators" (see references). ²Investment items include: cobalt-60, biological shielding and other building space, irradiator machinery and auxiliary systems, product-handling equipment, refrigerated warehouse space, design and engineering, land, and working capital. ³Treatment costs are for irradiators processing the hourly volumes for which they were designed and operating three shifts a day, 5 days per week. ⁴Irradiators operate 7 days a week for 4 months of year. Radiation safety officer, shift supervisors, and plant operators receive 30-percent bonus to compensate for part-time employment; plant manager is hired for full year to maintain irradiator when not in use. ⁵Split pork carcasses are assumed to move through the irradiator suspended from a monorail track. Therefore, machinery and product-handling costs are different than for the other foods.

nificant quality-enhancing benefits or cost savings for a firm to abandon existing, satisfactory processes. A 1984 USDA report for the U.S. House of Representatives' Committee on Agriculture estimated per pound costs for fumigating Hawaiian papayas. Chemical fumigation was estimated to cost less than 1 cent per pound, compared with ERS irradiation estimates of 1 to 4.2 cents (table 2). Just looking at treatment costs, however, can be misleading. Growers

must also consider any supplementary costs, such as marketing delays, damage to the fruit, or undesirable fruit quality.

In estimating the total cost of irradiation, the costs of additional handling need to be considered. For example, as long as chemical sprout inhibitors applied in the field are permitted, it is unlikely that irradiation will be used on potatoes because of the costly extra handling step needed to bring them out of storage for the radiation treatment.

Irradiation Has Limitations

While irradiation offers a range of benefits, it does have limitations. The dose needed to kill insects or microbial pests in agricultural products, for instance, often causes undesirable changes in treated foods. Irradiating fresh produce can cause softening, sensitivity to chilling injury, rot, and uneven ripening. For example, irradiation interferes with a potato's ability to heal cuts and bruises received during harvest, thus increasing rotting. Potatoes must be irradiated after a sufficient curing time.

Problems also arise when irradiation moves from laboratory conditions to the field or slaughterhouse to treat large quantities commodities that are less than perfect and not uniform in size, firmness, and other characteristics. Radiation tends to damage living cells and may accentuate any flaws or cause other undesirable changes. Radiation's exact effects on produce depend on a commodity's variety, rainfall and fertilizer received, maturity at harvest, postharvest handling, and other factors. Often, irradiation must be done shortly after harvest or slaughter before the microbial load is too large. And, in the case of low and medium dose treatments of meat, fish, and some fruits, the irradiated product still requires refrigeration to extend shelf life.

An important limitation is that radiation kills only those insects and microorganisms in the food during exposure. There are no residues to fight recontamination. Unless protective measures are taken, such as adequate packaging, the irradiated food can be reinfested.

Doses of 175 to 200 krad are needed to inhibit postharvest fungi that can contaminate fruits and vegetables and lead to storage decay. However, 225 krad is near the maximum that can be used on most fresh produce without softening and other problems. Studies on 27 fruits indicate that irradiation can only be used to control storage decay (without damaging the fruit) in tomatoes, strawberries, and figs. For papayas, scientists have successfully lowered the dose to 75 krad by combining it with a hot water dip. This combination

Focus on the Status of Food Irradiation

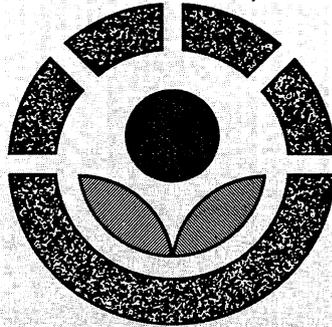
A 1958 amendment to the Federal Food, Drug, and Cosmetic Act specifically includes "any source of radiation" used in processing or packaging food in the definition of a food additive. Thus, processors must comply with the U.S. Food and Drug Administration (FDA) regulations prescribing safe use of radiation to treat foods or petition FDA for new uses.

Last summer, FDA added dried enzymes (food processing aids) and fresh pork to wheat, flour, and white potatoes approved in the early 1960's. FDA approved the treatment of pork carcasses and fresh cuts of pork at doses between 30 and 100 krad to control the parasite that causes the disease trichinosis in swine and humans.

USDA's Food Safety and Inspection Service (FSIS) is responsible for ensuring the safety and wholesomeness of meat and poultry products sold in the United States. Therefore, irradiation of pork, or any meat or poultry product, must also be approved by FSIS. In January 1986, FSIS amended the Federal meat inspection regulations to allow irradiation of fresh or previously frozen pork at the same dose level as FDA.

Until now, permission to irradiate specific foods has been granted or denied in response to individual petitions submitted to FDA. However, FDA can also grant permissions for broad categories of food at the Agency's own initiative. On April 18, 1986, FDA issued a final rule allowing processors to use doses up to 100 krad to inhibit growth and maturation of fresh foods and to disinfest foods. This rule also raises the level permissible to kill microorganisms in spices and dried vegetable seasonings from 1,000 to 3,000 krad.

FDA requires that retail packages of irradiated foods carry a logo (*see ac-*



companying illustration) and the statement "Treated with radiation" or "Treated by irradiation." For non-packaged foods, the required logo and phrase must be prominently displayed either on the bulk container or on a placard. The retail labeling requirement does not apply to foods that contain an irradiated ingredient but have not themselves been irradiated. For example, sausage containing irradiated spices would not need the irradiation label. Invoices for irradiated ingredients and products sold to food processors must contain the added phrase "—do not irradiate again." After 2 years, irradiated foods will be required to carry only the logo unless FDA extends the wording provision also.

While FDA has only approved irradiation of foods up to 100 krad (with the exception of spices), other countries allow the 1,000-krad maximum adopted by the Codex Alimentarius Commission in July 1983. The Commission is an international group set up by the Food and Agriculture Organization of the United Nations and the World Health Organization to develop voluntary global food standards. Worldwide approvals and commercial uses of food irradiation were discussed in a previous article (*see NFR-26*). Extending regulatory approval to the 1,000-krad level would permit irradiation to be used for shelf life extension and public health purposes. The higher doses needed to sterilize food have not been approved by FDA or any other governments.

treatment might hold promise for other fruits.

For meats and poultry, doses above 150 to 250 krad produce off-flavors. At the higher doses needed to sterilize meats and poultry, undesirable off-flavors and aromas are severe, requiring that the product be frozen during irradiation to reduce these changes.

Bacterial spores in meats, poultry, and fish are destroyed only at the high sterilizing doses of 2,300 to 5,700 krad. Thus, adequate safety procedures for handling, storing, and preparing foods exposed to sub-sterilizing doses must be maintained. Another public health concern is to avoid creating an environment where normal spoilage microorganisms are eliminated. Without these microorganisms, pathogens surviving the radiation, or introduced after irradiation, could grow out undetected during the extended storage. This concern has been raised in regard to irradiation of fresh fish at doses above 100 krad.

There is also the unanswered question of consumer acceptance. Consumer acceptance of irradiation in other countries has been mixed. Irradiated potatoes in Japan have met with opposition by consumer groups who question the safety of irradiation for food preservation. However, in South Africa, where irradiated food is not labeled at the retail level and the initial test marketing was accompanied by an extensive educational campaign, irradiated strawberries, herbal teas, and dried foods are successfully sold.

U.S. regulators have decided that irradiated foods must be labeled at retail (*see sidebar box*). However, the impact of the labeling rule on consumer acceptance is not known. U.S. food companies do not want to risk the good will of their brand names if irradiation is rejected by consumers. At the same time, there could be benefits from being the first to market trichinae-safe pork or salmonellae-free chicken.

Likely Uses and Potential for Preserving Foods

Irradiation has several industrial applications, including sterilizing medical supplies, treating the insulation on wire and cable, and cross-linking plastic food wrap. But

very few of the world's commercial irradiators treat just food. Food irradiation is expected to grow slowly for a variety of reasons and will be used where market conditions—structure of the industry and marketing chain, demand for the benefits, and value of the product—are conducive to its acceptance.

The large volumes needed to achieve low average treatment costs dictate a geographically centralized approach. Firms that do not have the volumes to justify an in-house irradiator may have to join with other firms and build a free-standing, centrally located irradiator to treat their combined volumes. Smaller firms could also use the services of a contract irradiator, if available, who would charge a fee for the irradiation treatment. For free standing and contract facilities, transportation to the irradiator is an added cost.

Along with large volumes, another desirable characteristic is steady, year-round production—not typically the case for most fruits and vegetables. Meat and poultry slaughter, however, have smoother and more controllable production cycles.

Irradiation is more likely to be used in industries where there is a consolidating point early in the marketing chain to avoid additional transportation costs. Products requiring disinfestation before export or shipment are generally assembled at a port or shipping point. For example, 87 percent of the Hawaiian papayas pass through Honolulu to market. This consolidation early in the export chain is one reason irradiation shows particular promise as a quarantine treatment. In addition, reinfestation is not a concern because the treated product is sent to an area free from the particular pest. With

the banning of ethylene dibromide (EDB), growers are looking for nonchemical alternatives.

Irradiation to lessen the incidence of foodborne diseases, such as salmonellosis and trichinosis, will depend on either the desire of the food industry to improve consumer acceptance of a product by lessening the potential for disease or the Government's decision to impose stricter standards for microbiological safety.

Radiation-sterilized meats sold in airtight cans or plastic pouches are likely to have a limited market in the United States because of high production costs and established consumer preferences for traditional fresh meats. Canned meats are not high-volume items in U.S. supermarkets. Irradiation costs are likely to be high because of the large dose, supplementary treatments needed to preserve quality, and protective packaging required. Radiation-sterilized meats were developed by the Army as a possible replacement for traditional canned C-rations and may be demanded for specialty uses, such as submarines, space shuttles, and camping trips, where space and weight are important considerations.

Irradiation is likely to continue to be used in the United States for foods that are small components of the diet, such as spices, and dried onion and garlic powders. These items are ingredients in processed food and are not disclosed on the retail label. Also, the small amount consumed may reduce any perceived risk by consumers and regulators. These items tolerate irradiation well (in fact, it preserves flavor and color better than conventional methods).

Spices are high-valued products and can easily fit into the current operating procedures of contract irradiators. By using the services of a contract irradiator, a food company can test technical feasibility and consumer acceptance without undertaking the large investment of an in-house irradiator. Irradiation's use on other products will depend on its technical desirability, cost

competitiveness with alternative techniques, and processor and consumer acceptance of the process. □

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Irradiation's Promise: Fewer Foodborne Illnesses?

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Irradiation offers several potential benefits to the food supply. It can substitute for chemical fumigants in disinfecting certain foods of insects. It can delay the ripening of fresh fruits and vegetables and give perishable products a longer shelf life. But one of the most important benefits may involve the use of irradiation to destroy microbial pathogens that enter the food supply.

Public health officials estimate that the Nation's two most common food-related illnesses—salmonellosis and campylobacteriosis—afflict more than 4 million Americans annually. A recent Economic Research Service (ERS) study put the annual cost of the illnesses and deaths associated with campylobacteriosis in chicken, salmonellosis in chicken and beef, and toxoplasmosis in pork at around \$1 billion just in medical treatment and lost wages. Canadian researchers found that significant costs were also incurred by food processors and restaurants because of lost sales, product recalls, plant closings, and liability suits during foodborne illness outbreaks. A complete accounting, including the value of lost leisure time, might bring total costs of these three illnesses in the United States to about \$2 billion.

Among food products, animal products are one of the primary carriers of pathogens. Irradiating red meats and poultry could significantly reduce the occurrence of five food-related illnesses—salmonellosis, campylobacteriosis, toxoplasmosis, trichinosis, and tapeworm. The Food and Drug Administration (FDA) recently approved the irradiation of pork to prevent trichinosis, and proposals to allow the irradiation of poultry and other meats may be considered within the next several years.

This article reviews available data on the public costs of these illnesses and provides estimates of the economic benefits of irradiating certain meats. The potential economic benefits of reducing food-related illnesses are compared to the costs of irradiating certain foods (see "Irradiation's Potential for

Preserving Food"). The analysis does not address the issues of consumer acceptance of irradiated foods or the safety of food irradiation technology.

Foodborne Illnesses on the Rise

Current food curing and processing practices fulfill a range of objectives, from enhancing taste and eye appeal to ensuring long shelf life and freedom from impurities and microbial hazards. Rapid and inexpensive testing methods are available to detect only a few microbial pathogens, and few food firms or government inspection systems use these tests for routine monitoring of food production lines. Instead, emphasis is placed on good manufacturing practices, including standard time and temperature guidelines.

Foodborne illnesses, nonetheless, are on the rise. The annual number of reported cases of salmonellosis has doubled in the last 16 years, for example. The causes of

this increase are diverse. The greater concentration of animals in larger production and slaughtering units permits easier transmission of disease. More geographic movement of animals means more risk of spreading disease across the countryside. Furthermore, the use in animal feeds of improperly processed animal byproducts and wastes can introduce and perpetuate disease cycles.

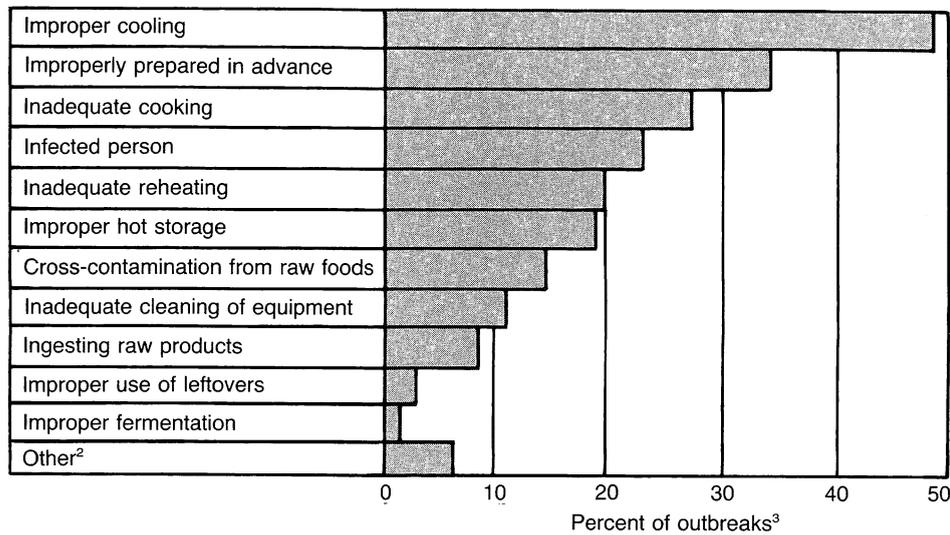
Other possible explanations include a greater number of distribution stages from farm to retail, along with the growth in away-from-home meals. These developments have meant more mass production of food and increased the possibility of improper heating and refrigeration—two of the most common contributors to food-related disease in meat and poultry. People are also traveling more and eating a greater variety of foods, increasing their chances of being exposed to more types of foodborne hazards. Finally, the organisms themselves are



The greater concentration of animals in larger production units permits easier transmission of disease.

The author is an agricultural economist with the Food and Agricultural Policy Branch of the National Economics Division.

U.S. Outbreaks of Meat- and Poultry-Borne Diseases Have a Multitude of Causes¹



¹ Average for 1968-77.
² Includes improper thawing, improper construction of equipment, inadequate preparation space, abscess on meat, feeding animals mercury-treated grain, and eating sick animals.
³ Some outbreaks may have had more than one cause.
 Source: Bryan, Frank L. "Foodborne Diseases in the United States Associated With Meat and Poultry." *Journal of Food Protection*, vol. 43, no. 2, 1980. pp. 140-50.

evolving by adapting to modern food processing and developing resistance to human drugs.

Salmonellosis and Campylobacteriosis

Two important intestinal diseases, salmonellosis and campylobacteriosis, are associated with chicken, beef, dairy products, turkey, and eggs. Each disease affects an estimated 2 million people annually. Cases are typically characterized by mild abdominal discomfort and diarrhea, but severe illness and even death can and do result.

Researchers at the Centers for Disease Control (CDC) surveyed individuals in a 1976 salmonellosis outbreak in Colorado to determine the costs of the disease. Those who responded listed medical costs and lost wages that averaged \$1,290 per person in 1985 dollars. Those who did not report their salmonellosis were assumed to have a milder case with an average cost of \$230 each (table 1).

Table 1. Cost Per Case of Foodborne Illness and Death

Illness	Cost per case ¹
Trichinosis	
Illness	\$2,485
Death	\$140,000- \$471,000
Congenital toxoplasmosis	
Average illness ²	\$130,303
Salmonellosis/ campylobacteriosis	
Mild illness	\$230
Moderate illness	\$1,290
Death	\$85,800- \$351,500
Tapeworm	
Illness	\$111

¹Updated to 1985 prices. ²Fetal deaths excluded.

Chicken was the direct cause of 9.5 percent of the outbreaks of salmonellosis reported to CDC in 1981. In recent years, salmonellosis attributable to beef has become more common. In 1981, 31 percent of the outbreaks reported to CDC were caused by beef. Although turkey is also a major source of salmonellosis, it was excluded from the ERS analysis because irradiation at doses required to kill the salmonellosis-causing bacteria causes off-flavors in the product.

Around 40,000 cases of salmonellosis are reported to CDC annually. At \$1,290 for each of the 3,800 chicken-related cases, the cost is \$4.9 million annually. However, add another \$42.8 million (\$230 per case in medical expenses and lost wages) based on the assumption that chicken is responsible for 9.5 percent of the total estimated 1.96 million mild cases annually not reported to the CDC.

The death rate from salmonellosis is one in 1,000 cases, or 2,000 persons annually. Again, chicken is assumed to be the source of 9.5 percent of these deaths. Various methods can be used to measure, in strictly economic terms, the costs of those deaths. Using the actual age distribution of deaths due to salmonellosis, estimates range from \$85,800 per life to \$351,500, depending on the method used. These estimates provide a total loss from chicken-caused salmonellosis of between \$64 and \$115 million annually (table 2).

Using the costs per case developed for chicken-related salmonellosis, the 31 percent of deaths and mild cases related to beef consumption are estimated to cause from \$209 million to \$374 million worth of medical expenditures and wages lost every year.

Data on the number of cases of campylobacteriosis are incomplete, but all recent studies indicate that it is a slightly more common cause of intestinal disease than salmonellosis. The CDC estimates there are 2.1 million cases annually in the United States and that the fatality rate is one per 1,000 cases. A study of campylobacteriosis in the Seattle area found that the treatment and total length of illness were similar to salmonellosis. Consequent-

Table 2. Health Costs and Wages Lost to Disease

	Low estimate	High estimate
Million dollars		
Pork		
Trichinosis	1.5	2.8
Congenital toxoplasmosis	215	323
Chicken		
Salmonellosis	64	115
Campylobacteriosis	362	699
Beef		
Salmonellosis	209	374
Tapeworm	0.1	0.1
Total ¹	850	1,500

¹May not add because of rounding.

ly, the costs of \$1,290 for moderate cases of salmonellosis and \$230 for mild ones are also applicable for campylobacteriosis.

Most commercially raised poultry have species of campylobacter in their intestines. Intestinal spillage during processing is considered to be the principal cause of contamination. Chicken was associated with about half of all cases of campylobacteriosis in the Seattle study. Thus, the ERS study assumes that chicken causes half of the cases, and half of the deaths, in the United States.

The Seattle incidence was 71.5 cases diagnosed per 100,000 population, compared with a Denver study citing 24.4 cases per 100,000. These rates of infection nationally would result in from 57,340 to 168,025 cases of moderate severity per year. Campylobacteriosis caused an estimated 2,100 deaths. The remainder of the estimated 2.1 million cases are assumed to be mild and evaluated at \$230 each. The total illness and death costs, thus, are estimated to range from \$362 to \$699 million for chicken-related campylobacteriosis.

Toxoplasmosis and Other Illnesses

Toxoplasmosis arises from eating undercooked pork or, in rare instances, from

handling raw pork. Soil contaminated with cat feces is another common source of the disease. Public health researchers suggest that pork causes half to three-quarters of the thousands of U.S. cases annually.

Toxoplasmosis can take a variety of forms, from mild to life-threatening. Healthy adults with normal immune systems typically fight off the disease with no symptoms. However, fetuses do not have well developed immune systems. If a pregnant woman becomes infected, there is a 20- to 40-percent probability that her child will be infected. Surviving babies are likely to suffer eye damage or mental retardation. An estimated 3,300 babies born every year in the United States are infected. Two Stanford University researchers estimate the lifetime medical, special schooling, and foster care costs for the children surviving toxoplasmosis at \$430 million each year (in 1985 prices). The medical costs and lost wages associated with mental retardation and eye problems in babies due to toxoplasmosis from pork are estimated at \$215 to \$323 million annually.

FSIS Meat and Poultry Hotline

On July 1, 1985, USDA's Food Safety and Inspection Service (FSIS) launched a nationwide toll-free Meat and Poultry Hotline (*see related article in this issue*). Specially trained home economists staff the hotline, and will answer questions on how to properly handle meat and poultry, how to tell if it's safe to eat, and how to better understand product labels. The hotline can also be called to report problems with meat and poultry products, such as foreign objects or a strange odor.

The toll-free number is 800-535-4555 (in the Washington, D.C., area, call 447-3333). These numbers are accessible by telecommunications devices for the deaf. The hotline operates from 10 a.m. to 4 p.m. (eastern time) Monday-Friday, except holidays.

Human cases of trichinosis have declined dramatically in the United States, although more than 100 cases a year are reported. The consequences of trichinosis vary from asymptomatic illness to death, depending largely on the number of live larvae ingested. Pork is responsible for the majority of cases, but ground beef can also become contaminated when the same grinders are used to process both beef and sausage. Data suggest pork causes about 560 cases a year, with most cases unreported.

To estimate medical costs and lost wages associated with trichinosis, ERS researchers used a 1975 outbreak affecting 17 people as a sample. In 1985 prices, the per patient expense was \$2,485. Using this figure for the estimated 560 annual cases results in \$1.4 million per year for pork-related cases of trichinosis. Deaths add another \$100,000 to \$800,000, depending on the measure used to assign an economic value to human life.

Tapeworm is carried in beef, pork, and lamb. Eating a live larvae that has not been killed by thorough cooking will infect a person. The CDC estimates that 1,000 beef tapeworm cases occur annually in the United States. Typically the symptoms are mild. The medical costs and lost work time for visits to the doctor are estimated at \$111 per case. Nationwide, the annual cost related to the beef tapeworm is estimated at slightly more than \$100,000.

Irradiation Could Reduce Illness

Irradiation is a process that could sharply reduce occurrences of—and costs relating to—these foodborne illnesses. In July 1985, FDA approved the treatment of pork carcasses and fresh cuts of pork at doses between 30 and 100 krad to control the organism that causes trichinosis. Irradiating pork carcasses at 50 kilorads (krads) would be sufficient to prevent human toxoplasmosis and trichinosis from pork.

A study reported in the *Journal of Food Safety* concluded that a dose of 200 krad (a level not yet approved by FDA or USDA's Food Safety and Inspection Service) would "essentially eliminate" campylobacter in chicken. Irradiation at 250 krad could eliminate an estimated 93 per-

Tracing the Path of One Food-Borne Disease:

Transmission of *Toxoplasma* to Human Beings

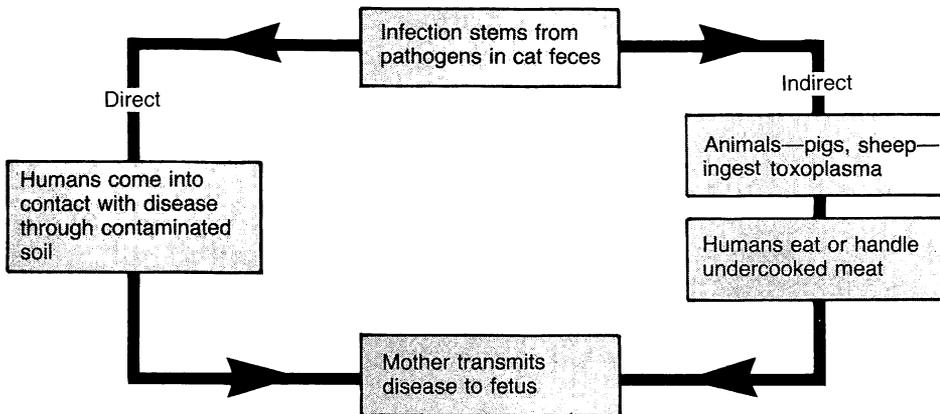


Table 3. Comparison of Annual Benefits Vs. Costs of Irradiation¹

	Benefits	Costs	Ratio of benefits to costs	Net benefits
Pork ²	\$186-280 mil.	\$ 80 mil.	2.3-3.5	\$106-200 mil.
Chicken ³	\$341-653 mil.	\$155 mil.	2.2-4.2	\$186-498 mil.

¹Based on Morrison and Roberts' 1985 study. Costs exclude transportation, promotion, and disposal of low-level radioactive waste. Also excluded are unforeseen adverse health effects of consuming irradiated foods. ²Assuming 86 percent of U.S. pork is irradiated at 50 krad, which is sufficient to prevent human trichinosis and toxoplasmosis. ³Assuming 81 percent of chicken is irradiated at 250 krad, which would eliminate campylobacteriosis and reduce salmonellosis cases by 93 percent.

cent of the salmonella-contaminated chicken carcasses. FDA is currently reviewing several toxicology studies on irradiated chicken to determine if they support the safety of irradiating chicken at 250 to 300 krad. If the data are sufficient, FSIS may petition FDA for approval of these higher irradiation doses.

Irradiation of beef at 250 krad to destroy salmonellae will also destroy beef tapeworm. In fact, as little as 40 krad will prevent tapeworms.

An ERS study (*see related article in this issue*) estimated the costs of using irradiation for medium and large chicken and hog plants which account for about 80 to 85 percent of total production. The study reveals that irradiation in the chicken plants to kill salmonellae and campylobacter would cost about 1.5 cents per pound, or about \$155 million for the 10.3 billion pounds processed annually. The corresponding benefits of reducing disease from chicken produced at these plants totals \$341 to \$653 million.

Medium and large hog-slaughtering plants would incur costs of about 0.7 cents a pound, totaling \$80 million annually for their 11.3 billion pounds of carcasses. The corresponding benefits of disease reduction from pork produced at these plants is \$186 to \$280 million. Both irradiation of chicken and pork appear to have favorable benefit-to-cost ratios of 2 or more (*table 3*).

However, other options not evaluated here may have even higher net benefits. These include educating food preparers on methods to prevent cross-contamination and sterilizing feed ingredients to destroy pathogenic organisms. Further economic analysis is needed to determine whether irradiation, some other methods, or combinations are the most cost effective for reducing the risk of foodborne disease. □

Food Irradiation Policy Issues

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The Food and Drug Administration's (FDA) recent approval of irradiation to inhibit sprouting and maturing of fresh foods and to rid foods of insects introduces a number of public policy questions. Using radioactive materials on food raises questions about the possible impacts on workers and the environment, the role of the Government in consumer education, and implications for international trade.

The following questions highlight some of the public policy issues in the food irradiation debate. Answers to many of these questions will require additional research and information. It will be up to the food industry, consumers, and policymakers to decide if irradiation has a place among other postharvest techniques.

Do regulators have a test available to identify irradiated foods and confirm that the proper dose was applied?

One of the major problems with regulating food irradiation and assuring its proper use is that there is no commercially available method to determine if an item has been irradiated and at what dose. Foods treated with chemical preservatives can be tested to see whether too much or too little was added. The only discernible difference between irradiated and nonirradiated foods may be the reduction of bacteria on the irradiated product.

Recently, scientists in West Germany have had partial success in developing a method for identifying irradiated spices. Japanese scientists have conducted experiments using ultraviolet light to identify irradiated fish. USDA's Food Safety and Inspection Service has contracted with the National Bureau of Standards (NBS) to de-

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velop a post-irradiation testing method for determining whether pork and poultry have been irradiated. NBS scientists are conducting radiochemistry analyses to determine the effects of radiation on the food's chemical constituents.

In developing a test, one problem is that chemical changes induced by irradiation sometimes dissipate over time. Also, many of these chemical changes are the same as those caused by other treatments. Until a reliable post-irradiation testing method is developed, regulators will have to depend on the records of processors to assure that irradiation is used properly.

Should the U.S. Government take the initiative in informing consumers about food irradiation?

Consumer acceptance of irradiated foods and willingness to purchase them are critical to the commercial success of the process. Consumers who are unfamiliar with the technology may erroneously conclude that irradiated food is radioactive and could lead to radiation poisoning. Therefore, proponents of irradiation have stressed the need for international agencies and governments, as well as food industry representatives, to disseminate information on the technology.

Governments of several countries, including South Africa, the Netherlands, Israel, and Hungary, have conducted market tests of various irradiated foods. In South Africa, the tests were accompanied by an educational campaign. To coordinate the marketing of irradiated foods, the South African Government also established a National Steering Committee for Radurised Foods, composed of representatives from the Department of Agriculture and Fisheries, the Atomic Energy Board, the radiation and food industries, and the Consumer Council.

The role of the U.S. Government in consumer education has not been decided. A few articles discussing food irradiation have appeared in consumer-oriented Government publications, but there has been no

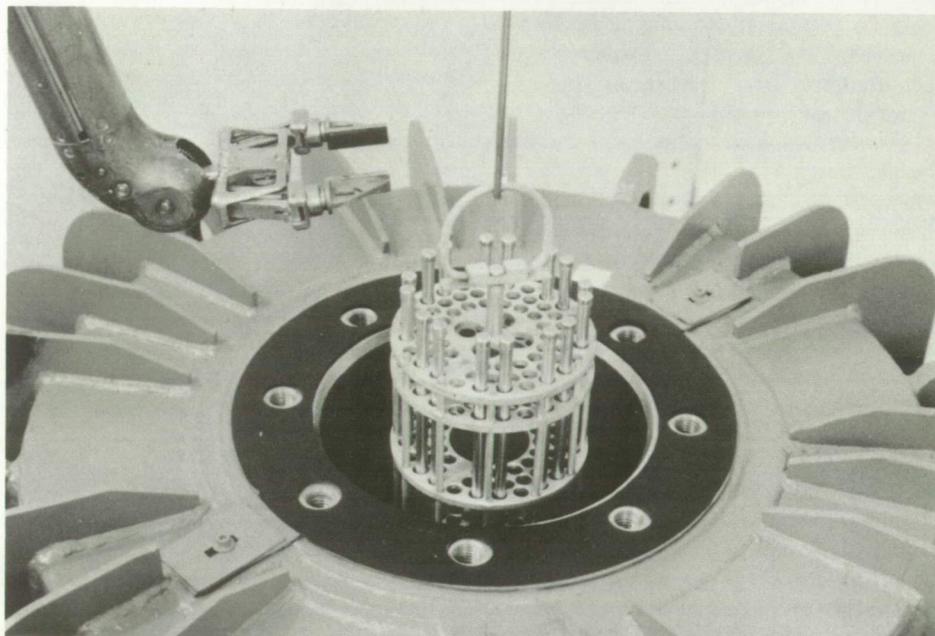
widespread effort to provide educational materials for either food companies or consumers. Some observers argue that it is up to the food industry to inform consumers, citing the introduction of microwave ovens as an example of a new technology that was widely accepted without a Government information campaign. Others say that the food industry knows the most effective way to reach consumers. However, some feel that, on such a sensitive topic, consumers may be more receptive to information from the Government, and industry may welcome such Government efforts.

Would food irradiation add to the amount of radioactive material traveling our highways?

Currently, radioactive materials are shipped across the United States for use by hospitals, laboratories, and industry. Widespread use of gamma irradiation for foods would increase the transportation of radioisotopes somewhat. During a year's time, about 12.5 percent of cobalt-60 and 2.3 percent of cesium-137 radioisotopes decay and new radioactive material must be added to the original material to maintain the amount of product able to be treated. Irradiators using large amounts of cobalt-60 may replenish supplies every year or two, while those treating small quantities or administering lower doses are likely to purchase extra cobalt initially, rather than incur the transportation and loading costs each year.

Getting the radioisotopes from the reactors to the final user requires shipment across highways. Special shipping casks for radioactive material have been tested and approved by the U.S. Department of Transportation.

Would food irradiation increase demands on facilities for storing and disposing radioactive materials?



Cobalt-60 pencils are loaded into licensed shield containers for shipment to irradiators. Photo courtesy of Atomic Energy of Canada, Ltd., Ottawa, Canada.

The cobalt-60 most commonly used in an irradiator is contained in "pencils" about a half-inch in diameter and 18 inches long. After 15 or 20 years of decaying, the energy level of the original cobalt-60 pencils becomes too low to be useful for large operations. It is likely that irradiation operators will want to remove the old pencils to make room for new source material. The old pencils emitting low levels of radiation are not likely to add significantly to storage volume of such waste because, in many cases, the decayed sources can be reactivated or recycled for other industrial uses.

The small size of the pencils means that any cobalt-60 that is not able to be recycled would be a minute portion of the approximately 2.68 million cubic feet of low-level radioactive waste disposed of in 1984. Also, older cobalt-60 from radiation therapy uses, which require intense doses, can be recycled to the lower level uses needed by a

food irradiator. Therefore, it is possible that low-level radioactive waste disposal of cobalt-60 could decline with use in food irradiation.

Like cobalt, the cesium-137 capsules used as a radiation source are relatively small, and net addition to low-level radioactive waste is not an issue. The slower decay rate of cesium-137 means a longer period between reloadings compared with cobalt. However, the cesium-137 in the capsule is in a water-soluble form, which means a leaking or ruptured capsule could contaminate any water around it. Thus, special precautions must be taken when using, transporting, and storing cesium. Cobalt-60 is not water soluble.

Critics of food irradiation question the adequacy of Department of Transportation and Nuclear Regulatory Commission (NRC) regulations covering the transportation and use of radioisotopes. They point to accidents in which radioactive materials have been lost or disposed of improperly. These opponents contend that the environmental

impacts and dangers from leaking sources or unauthorized disposal of spent radiation sources have not been sufficiently addressed.

Facilities using machine-produced ionizing radiation, as opposed to radioisotopes like cobalt-60 and cesium-137, would not add to the amount of radioactive materials being shipped across highways or to the disposal of low-level radioactive waste. In these facilities, radiation is produced by a machine powered by electricity.

Would workers in commercial food irradiators be at high risk?

Facilities using radioisotopes must satisfy the safety requirements of the NRC or a set of similar requirements enforced by 27 States. Users of machine-produced radiation must satisfy State regulations. The NRC and State regulations, covering irradiator design and operating procedures, are designed to protect both workers in the facility and the general public.

Radioisotopes have been used for commercial irradiation for about 20 years. Richard Cunningham, Director of NRC's Division of Fuel Cycle and Material Safety, reported that there were 35 commercial gamma irradiators licensed by the NRC or the 27 self-regulating States in 1984. Because two major radiation exposures occurred when workers failed to follow the proper operating procedures, NRC's regulations were amended to require automatic systems to ensure that a worker cannot enter the cell when the source is unshielded. Similar requirements exist for machine-produced radiation to prevent workers from walking into the cell when the machine is on.

Will irradiation enhance food exports or imports?

A technology that increases shelf life extends the geographic market for fresh products. A longer shelf life provides extra time to reach distant markets or the use of a

slower, and thus cheaper, mode of transportation. Irradiation may allow longer distance shipping of U.S. commodities abroad, assuming the recipient country will accept irradiated food. At the same time, FDA's approval of food irradiation may allow other countries to expand their exports to the United States. Researchers at the National Marine Fisheries Service point out that FDA approval of fish irradiation may allow Canada, Iceland, and Norway to increase the amount of fresh fish fillets they ship to the United States.

Another way irradiation could expand international trade is by disinfecting products prohibited from being imported because of quarantine restrictions. The importing country must also accept irradiated products, however.

Will irradiation affect the economic structure of the U.S. food sector?

The introduction of a new technology can lead to significant changes in the number and size of firms within the affected industry, particularly if that technology significantly reduces unit costs of production, creates a new product, or adds special appeal to an existing one. Firms that are quick to adopt such a technology enjoy an edge in profitability for existing products, or they may gain an opportunity to establish new markets or capture a larger market share.

For More Information...

Other policy issues raised by food irradiation are discussed in a report by the authors entitled *Food Irradiation: New Perspectives on a Controversial Technology. A Review of Technical, Public Health, and Economic Considerations*. The 160-page report contains the assumptions and methodologies behind the estimates of irradiation costs and public health benefits, as well as a further discussion of technical considerations, consumer acceptance, and international activities.

For information about obtaining the report, contact the authors at USDA-ERS, 1301 New York Avenue, N.W., Rm. 932, Washington, D.C. 20005-4788 or phone (202) 786-1787.

To the extent that irradiation might replace existing technologies to preserve food, it could affect the structure of some industries. Based on the ERS analysis of treatment costs (*see first article in this issue*), it does not appear that irradiation will dramatically alter food preservation practices. However, changes in consumer preferences or in food safety regulations could change that conclusion. For example, if new regulatory measures prohibited use of important chemical preservatives or fumigants, the competitive stance of irradiation would increase.

Food irradiation could also provide a competitive edge to adopting firms if consumers not only accept the technology, but

come to prefer it over other methods of food preservation. Irradiated foods may gain appeal on the grounds of health and safety, perhaps by reducing the risk of salmonella poisoning or by substituting for chemical preservatives.

The ERS analysis of average treatment costs as plant size or capacity increases (economies of scale), combined with information about current industry structure, provides some insight into the potential effects of irradiation on future industry structure. Average costs per unit of output were found to decrease as the size of the irradiator and the amount of product being treated increased. However, this relationship becomes less dramatic at annual capacities greater than 50 million pounds. Thus, an industry composed of fairly large firms would not have to fear that economies of scale for food irradiators would trigger rapid consolidation.

Other industries may be less concentrated, and individual plants may handle smaller capacities. For irradiators treating less than 50 million pounds a year, size has a greater effect on average treatment costs. However, individual growers often join together in cooperatives, which may have sufficient volume to justify an irradiator. Another option is to locate a contract irradiator at a port or in the center of a growing area, where it could treat appropriate agricultural products on a fee basis. □

Food Contamination: Consumer Reactions and Producer Losses

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Chemical contamination of food products has received a great deal of attention lately. Ethylene dibromide (EDB), polychlorinated biphenyls (PCBs), and heptachlor are strange chemical names that have become all too familiar in the last several years.

These and other contaminants have meant losses for producers as they incur costs for laboratory testing, veterinarian and legal fees, extra costs to hold contaminated animals that cannot be marketed, and in some cases, animal mortality costs.

Producers also face losses associated with consumer uncertainty about what foods to buy. Following a contamination, consumers may avoid foods even when they are safe. The authors' 1984 Michigan State University study assessed the losses associated with public confusion over product safety and lower sales of uncontaminated products in a 1982 contamination incident in Hawaii. The study concluded that losses due to consumer uncertainty may be minimized with proper government and industry response.

Contamination: A History of Losses

Documented incidences of chemical contamination in the U.S. food supply go back to the "Great Cranberry Scare of 1959." The Department of Health, Education, and Welfare announced shortly before Thanksgiving that year that cranberries might have contained residues of a herbicide, amino triazole, thought to be a potential carcinogen. A 1969 study found that sales of cranberries in Atlanta markets fell 26 percent in 1959, but revived the following 2 years.

In 1968, about 20 percent of Montana's milk supply was contaminated with the pesticide chlordane, which had been sprayed on alfalfa fed to dairy cattle. In Congressional hearings after that incident, a dairy producer noted that the publicity associated with the incident caused a large drop in sales and that it took months for markets in that State to return to normal.

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More recent incidents provide some indication of the losses associated with food contamination. The largest known incident of chemical contamination of food occurred in Michigan in 1973. Livestock feed sold in Michigan was accidentally mixed with polybrominated biphenyls (PBBs), a toxic chemical used in fire retardants. As a consequence, milk, beef, pork, lamb, and eggs were contaminated. The Congressional Office of Technology Assessment estimated in 1979 that the cost of food destroyed in this case approached \$215 million. According to press reports, sales of safe food were also affected, although the exact extent is unknown. The PBB incident also caused Canada to temporarily close its border to Michigan meat products. The State spent more than \$250,000 in a campaign to restore consumer confidence in Michigan agricultural products.

In 1979, another large-scale incident occurred, this time involving polychlorinated biphenyls (PCBs), widely used as a coolant. At a meat packing plant in Montana, PCBs leaked from a damaged electrical transformer into products used in animal feed and hu-



The cost of laboratory testing is one financial loss caused by food contamination.

man food. Ultimately, the incident affected 18 States and two foreign countries at an estimated cost of \$11 million to producers and State and Federal agencies.

In 1982, the pesticide heptachlor contaminated more than 80 percent of the milk supply on Oahu, Hawaii's most populated island. Over \$8.5 million worth of milk was condemned by public health officials. Milk sales were substantially below expected levels for more than a year. The authors estimated that poor sales of safe milk cost dairy producers an additional \$600,000—about \$39,000 per producer on Oahu over a 16-month period. Furthermore, an Hawaiian consumer group lodged suits totaling \$500 million against island milk processors. The suits remain unresolved.

Also because of this incident dairy producers in Hawaii lost their exclusive control of the State's milk market. Ever since 1984, mainland milk has competed with local milk on Oahu.

Other more recent incidents include EDB residues in grain products 2 years ago, pesticide contamination of California watermelons in 1985, and heptachlor in milk and milk products in Arkansas, Missouri, Kansas, and Tennessee earlier this year. Although there are as yet no published studies of consumer reactions to these incidents, newspaper accounts indicate that all three resulted in reduced sales.

Explaining Consumer Reactions

As consumers become aware of contamination, they are often unable to differentiate between those products that come from contaminated operations and those that do not. Consumers may be suspicious of all related products, and thus forgo consumption of even those that are safe. This loss to consumers is also a cost to producers.

The less differentiation, the greater the likelihood that that lost sales will affect producers of similar, but uncontaminated products. This may be particularly true of raw or slightly processed food products, such as red meat, milk, eggs, and vegetables.

The closing of oyster beds because of kepone contamination in Virginia's James River provides an example. A 1981 study

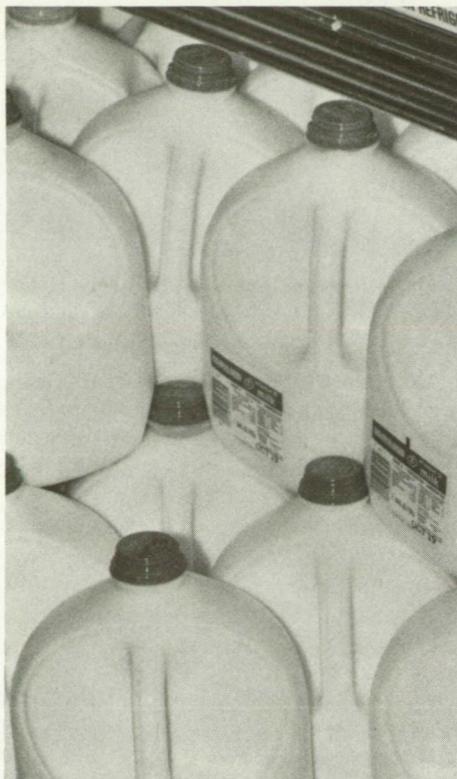
of oyster sales in Baltimore revealed that oyster demand in that area fell in response to the announcement, despite the fact that only uncontaminated oysters were sold in Baltimore. The study indicated that news coverage was an important factor in explaining the change in consumer behavior and that unnecessary losses to consumers and producers could have been avoided if the public had been properly informed of safe and unsafe sources.

The heptachlor incident in Hawaii provides another example. The majority of the milk on Oahu was contaminated. However, uncontaminated milk was brought from other islands to offset the reduced supplies. Local milk remaining on the shelves was also officially declared safe. Nonetheless, sales were significantly below what would have been expected.

The Michigan State University study of the incident indicated that media coverage of the health hazards of the contamination, and hence public awareness of the hazard, was associated with depressed milk sales. Furthermore, reports that milk was safe appeared to have a negative effect on sales. Any media attention—good or bad—the study suggests, may have simply maintained consumer awareness of the contamination incident, further depressing sales.

The study results underscore the importance of source credibility in dealing with a contamination incident. In Hawaii, government officials issued recalls of specific products as they were found to be contaminated, declaring that unrecalled products were safe. Six official recalls over a 5-week period were issued, leading some in the media to question whether government officials were more interested in producer than consumer welfare.

Consumers of different ages, sex, or race reacted differently to the incident. A random sample survey conducted by one of the Hawaiian dairy processors 3 weeks after the first recall but before the last two recalls revealed that 99.5 percent of those sampled were aware of the contamination. Across age groups, younger consumers reported that they reduced their milk consumption more than other groups. Females were also more likely to report reduced milk con-



Although milk remaining on store shelves in Hawaii was proven safe after the heptachlor incident, sales were below what would have been expected.

sumption. Caucasian consumers reported a larger decline in milk purchases than did Orientals. Furthermore, households with children altered their purchase patterns much more than those without children.

A 1983 study similarly examined the demographics of consumer reactions to the 1977 announcement of the potential carcinogenicity of saccharin. The results further illustrate differences in consumer responses to news of a potentially harmful element in the food supply. The study showed that college-educated consumers were among the first to reduce their consumption of soft drinks containing saccharin, followed by households with young children. The elderly and consumers without a high school education did not reduce their intake, despite public health warnings and media attention. This suggests that different types of products—which appeal to different segments of the population—should be treated differently in educating consumers about their safety.

Aftereffects Can Be Far Reaching

Although lost sales may be evident immediately following a contamination incident, the effects may also be long term. When consumers reduce their purchases of a particular product they may turn to substi-

tutes. This change could become a permanent part of purchasing habits and consumption patterns, depending on the product and the type of substitutes available.

Losses will be higher and long-term implications greater in markets with many substitutes. Oahu customers who grew tired of fruit nectar or powdered milk had few alternatives but to buy island milk. (Mainland milk was not allowed for public sale until months after the recall.) Estimated losses of milk sales in Oahu, therefore, were low compared with incidents in which contaminated products had many substitutes. An example of this: After a man died of botulism poisoning from Bon Vivant vichyssoise in 1971, the company soon filed for bankruptcy.

Competitors may attempt to capitalize on a contamination incident by entering the market and permanently changing purchasing behavior. Prior to the heptachlor incident, for example, milk sold in Hawaii was produced locally. After the incident, Safeway stores in Hawaii were allowed to import mainland milk, changing the structure of the Hawaiian milk market.

Public and Company Policy Can Help Cut Needless Costs

Once a contamination incident is known, losses to the industry are certain to occur. While there is probably little that can be done to reduce such losses due to product recalls, liability suits, and testing costs, other types of losses may be avoided. For instance, sales losses because consumers are uncertain of food safety may be avoided.

Producers' ability to regain their standing in the market after a contamination incident may be greatly affected by the producers' response to the contamination. The 1982 Tylenol case provides a good example of how proper producer response can minimize lost sales in the long term. After seven people died from the first case of Tylenol capsules laced with cyanide, Johnson and Johnson's share of the pain reliever market plummeted from 35.4 percent to 7 percent. Polls indicated that about half of Tylenol users thought they would be unlikely to use

Johnson and Johnson's product again, and sales were down 80 percent.

The company's response was to remove a potential threat to public health and recall its product at a cost of \$100 million. They invested heavily to become a leader in new tamper-resistant packaging in order to relieve consumer fears about the safety of their product. As a result, Tylenol once again became the Nation's leading non-prescription pain reliever. (After the newest Tylenol contamination, the company also acted quickly to minimize the public health threat.)

According to press reports, Johnson and Johnson was partly successful in restoring public confidence in Tylenol in 1982 because company officials had just completed an 18-month review of their company code of ethics before the incident occurred. Consequently, at least some consensus existed within the company on the appropriate approach to the problem. This example suggests the importance of developing consensus-building policies before a crisis occurs.

In industry-wide contamination incidents, like the one in Hawaii, there is no parent company to act quickly to reassure the public. That role falls to government, industry leaders, and trade associations. Therefore, ethics codes and policies for dealing with contamination are also vital at these levels.

The Hawaiian incident illustrates that the long-term interests of the industry may best be served by protecting the short-term interests of consumers. Government and industry can minimize sales losses by quickly removing the perceived health risk. By minimizing consumer exposure to suspected products, consumer uncertainty over product safety may be reduced. Disputing unfavorable test results through advertising when it is already known that a contamination

problem has occurred may only serve to maintain the prominence of an incident and increase uncertainty surrounding it.

Government contingency plans for quickly expanding laboratory capacity in the event of a contamination would be useful in preventing undue loss. Quickly discovering the cause and scope of a contamination problem may require analysis of many product samples, outstripping normal laboratory capacity. Delays in discovery may result in public confusion and unnecessary losses to both consumers and producers.

Furthermore, accurately determining and openly admitting the extent of the problem early can bode well for producers and consumers. A 1981 study on the effect of product recalls found that releasing the worst possible information first, followed by less alarming releases, resulted in more favorable consumer perceptions of a company than when information on possible health risks grew increasingly worse.

Government and industry officials should alert the public to potential hazards. Hence, the public will not be surprised should those hazards be confirmed. Should the hazards not be realized, the study indicates that consumer perceptions of the industry will be enhanced.

When officials have to retract their statements or are proven wrong, they lose credibility with the public and their ability to help restore consumer confidence is weakened. The Hawaiian milk contamination and Tylenol incidents are prime examples. One year after their respective contamination incidents, the Hawaiian milk producers were threatened with complete loss of their market, while Tylenol had regained its dominant market position.

The producer who takes actions to maintain consumer confidence is not totally shielded from the adverse effects of a contamination incident. Despite efforts by some producers to maintain product quality, they may still bear the costs created by another

producer who markets a contaminated product. Unless a method is found to impose the cost of marketing a contaminated product on those responsible, market forces alone will not ensure consumers of a safe food supply or producers of consumer confidence in their products. For the industry, this means working together with government to ensure the safety of the food supply. □

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Food Safety Issues for the Eighties

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Food safety can be a controversial issue. The authors present one perspective on this complex topic.

Concerns about antibiotics in meat, pesticide and herbicide residues in food, and chemical additives used in processing have brought the U.S. food safety system under scrutiny. Consumers, farmers, food processors, food technology innovators, and regulators alike have raised questions about the directions the U.S. food sector should be heading in the latter half of the 1980's.

Assessing Consumers' Concerns

Consumers, the largest group of participants in the food market, are particularly concerned about food safety. Today's consumers are better educated and more aware of the diverse health issues associated with the way foods are produced, processed, marketed, and prepared.

The types of foods we eat have also changed in response to growing concerns about diet and health and changing lifestyles. Smaller households, working mothers and singles, and more money to spend on food, for example, have increased the demand for more convenience foods. These foods, however, may be the source of additional health risks from the chemical additives needed to enhance preservation and increase appeal, and possibly from contaminants added unintentionally.

Over the years, surveys about food safety have revealed that consumers want more protection from and more information on food safety hazards. These concerns, in turn, raise questions about who should provide food safety protection and information and who should pay the additional costs.

A 1984 national survey of 1,008 American consumers by the Food Marketing Institute (FMI) indicates that many of them fear that some of the chemicals used in producing, processing, and preserving foods are

not safe. Of all respondents, 77 percent said that pesticide and herbicide residues in food are a serious health hazard. Thirty-two percent mentioned food additives and preservatives and 26 percent named coloring agents.

What's more, they claimed that they avoid buying products they believe to be risky. Chemical flavorings were identified as substances that were avoided by 25 percent of respondents; preservatives by 17 percent; sugar by 22 percent; and salt by 17 percent. Microorganisms known to spoil foods were indicated as a concern by 12 percent of the respondents and harmful disease-causing agents, such as salmonella, by 6 percent.

The FMI survey results also suggest that some consumers want foods offering more protection from possible hazards. This may range from wanting more stringent sanitation standards and increased use of tamper-resistant packaging to reduced use of chemicals. In fact, concerns about chemicals have meant a growing market for "natural" foods—those produced without pesticides, animal drugs, or chemical fertilizers, as well as foods processed without preservatives or other additives. Other markets exist for new formulations of foods with reduced amounts of specific additives, such as sugar, salt, or other ingredients suspected of contributing to certain diseases. On the



Today's consumers are more aware of the diverse health issues associated with the way foods are produced, processed, marketed, and prepared.

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other hand, some consumers appear to want foods enriched with nutrients that are beneficial, including calcium, iron, and certain vitamins.

While these consumers seem to want increased food protection services, others may choose to sacrifice some of these services for lower prices. For example, the recent return of bulk-product merchandising caters to those willing to forgo the protections and some of the label information provided by individual product packaging.

Wanting More Information

Directly related to the concern about more protection services is a desire for more food safety information. The 1984 FMI survey showed a sharp increase in consumer self-reliance to determine the safety of food. However, consumers need reliable information about the risks involved and their potential severity to make valid food safety judgments. Reliable information may be difficult to obtain for a number of reasons, including insufficient data for determining risk, the prevalence of conflicting or unfounded claims in the popular press, and the problems of translating complex laboratory data into practical guidelines for consumers.

Surveys suggest that consumers want two major types of food safety information. One type is purely descriptive information about the product itself, such as ingredients, nutrient composition, chemical substances used to produce the raw commodities used to make the product, processing technology, and type of packaging material. Some of this information is required by law to be declared on food labels.

The second type of information requested is a professional safety judgment, such as a warning statement on the label that consumption of the item may cause some illness or disease. Currently, soft drinks with saccharin must carry warning labels indicating the link between the sweetener and cancer in laboratory animals. Consumers are confronted with an unquantified probability of this hazard and left to choose whether to purchase the product, depending

on their perception of the risk involved. It is important to realize, however, that this selective use of warning labels relies upon a regulatory process of some type to identify and quantify important hazards and make professional judgments about them.

Food Industry Views

Enactment of food safety laws and their enforcement by regulatory agencies have removed much of the opportunity, risk, and uncertainty that firms would have in the marketplace if they were left on their own to develop acceptable safety standards and compliance procedures by which to compete with one another. Food safety regulations establish a floor below which food safety performance cannot fall.

Some government safety standards, such as good manufacturing practices and the use of approved equipment or packaging materials, specify the processes used to produce a food product (process standards). Other government safety standards specify the purity or composition of the final product (product standards). These include product standards of identity and composition as well as tolerance levels for pesticide and animal drug residues and environmental contaminants.

Beyond this minimum level of safety, however, the food industry seems to have been reluctant to respond to demands for more food safety services for several reasons. First, there is little incentive for a firm to adopt safety services that increase costs, except to differentiate a product and obtain either higher prices or greater sales than the competition. In many cases, competitors cannot be prohibited from emulating safety services or information, so there is little opportunity for the initiating firm to recover development costs. Shelf-life or freshness dates printed on packages provide just one example. Competitors can easily copy this information with no fear of reprisal and at no cost for the experimentation leading to the information.

Secondly, no comprehensive market research results available from the public or private sectors indicate the extent of the market for many of the new food safety services proposed by consumers. Firms will

have to engage in expensive and time-consuming experimentation to determine the demand for new services and how much consumers would be willing to pay for them.

Firms are concerned about the safety of products purchased as ingredients for processed foods. Potential hazards, such as chemical residues and microbial pathogens, are often neither visible nor readily detectable and are sold to unsuspecting buyers. Ownership identity is frequently lost during marketing, as commodities and ingredients are assembled or blended into new lots for resale. In the event of a loss, such as a product recall, the party actually responsible may remain undetermined and may never pay any more than a small fraction of the loss.

Lack of assurance about the safety of purchased commodities used as ingredients encourages food firms to vertically coordinate production and marketing. Then a firm can impose safety performance and process standards, as well as monitor for compliance at each step in the process. Furthermore, larger firms can capture any economies that might result from applying new, more efficient hazard-detection techniques to large-volume operations. High investment and operating costs might prevent smaller firms from owning and leasing such systems. This leaves them exposed to potential economic losses from the use and sale of less safe inputs and products.

Regulation and Innovation

While the safety of chemicals in the food supply is often in question, pesticides, food additives, animal drugs, and packaging materials have been some of the most important cost-reducing innovations of the last several decades. They have expanded the number and types of foods available to the consumer and helped assure a bountiful food supply. Also important or promising for the future are: vacuum packing, ultra-high temperature processing, mechanical deboning, irradiation, microwave cookery, genetically engineered drugs, food additives, and animal growth stimulants, to name only a few of the new processes.

The innovators of many of these substances and processes, chemical and pharmaceutical firms, are concerned that too many costly licensing and registration approval procedures discourage the rapid development of new methods or products. In the past, these innovations have helped the United States maintain its present technological lead in food production and marketing. This is a lead being challenged by Japan and European countries that are pursuing advancements in biotechnology and encouraging high-tech firms to relocate in their countries.

Most food innovators feel that animal drug, food additive, and pesticide registration procedures are unnecessarily complex and time-consuming for both industry and for regulators. Insufficient technical information to assure safety may be provided by the firm, or the regulator may be uncertain about what information to request. Sometimes the scientific issues are so complex that professional differences in the opinions of petitioner and reviewer require additional technical information or withdrawal of the petition altogether. The lack of specific procedures to follow for testing and analyzing substances for safety is a frequent source of difficulty. Yet there is no single set of procedures that apply, or possibly should apply, to safety testing for all pesticides, animal drugs, additives, or other substances, such as packaging materials.

The increasing complexity of the registration procedure is evidenced by the drop in the rates of approval for new substances during the past decade: from 4.2 new animal drugs per year during 1967-71 to an average of 1 per year during 1976-79. The time required for the approval of a food additive can take up to 10 years. The time for pesticide approval can range up to 6 years.

Even though the Reagan Administration took steps to cut time requirements by introducing "fast-track" approval procedures, innovating firms had already started to relocate research and development operations overseas. A U.S. pharmaceutical manufacturers' survey showed that 20 percent of the research was done abroad in 1979, com-

pared with 10 percent a decade before. Other companies are getting out of the research area altogether because of the unfavorable outlook.

Furthermore, food industries in many foreign countries can obtain nationally approved substances far in advance of their approval by U.S. regulatory agencies. For example, between 1970 and 1980, the European Community (EC) approved 24 new animal drugs that were not available in the United States during the same period. Moreover, EC approval times for some substances are only half those in the United States.

Molecular biologists are expected to produce many new substances for expanding food output and lowering production costs during the next decade. Continued faster approval of the use of such substances by foreign countries could seriously erode the United States' ability to produce efficiently at home and to compete effectively in international markets. The bottom line could be a smaller share of world markets for U.S. food products.

Reconfirmation Poses Another Problem

A further complication is the reconfirmation of previously approved substances. Many food innovators believe too much time and money must be spent on defensive research to reconfirm the safety of previously approved substances. Scarce research and development funds must be redirected away from developing new products.

Rapid advancements in bioassay procedures to test for safety fuel the reconfirmation problem. It is now possible to detect the presence of some contaminants at concentrations of parts per billion or trillion. Many substances still in use were approved years ago by far less sophisticated assay techniques. In 1979, the Food and Drug Administration (FDA) proposed procedures to test all new and old animal drugs for carcinogenicity. However, the proposal was judged excessively costly. The carcinogenicity tests for some old drugs might exceed their total annual revenue by one or more times, probably forcing their withdrawal

from the market. Producers relying on the use of these compounds might need to make cost-increasing production adjustments to compensate for the loss of withdrawn substances. Furthermore, committing scarce research funds to keep products without any evident adverse effects on the market might slow the development of new products.

Recently, the FDA offered a revised proposal that substantially modifies the earlier one. This new proposal, known as the "Human Food Safety Proposal," omits any mention of testing old drugs for carcinogenicity but does revise requirements for testing new drugs. This new version might extend the market life of some old compounds not currently suspected of being cancer-causing.

The capability to detect minute concentrations of potentially hazardous substances in food has stimulated interest in amending the anti-cancer Delaney clause of the Food, Drug, and Cosmetic Act. When it was enacted in 1958, the zero tolerance feature of the Delaney clause was defensible because the best assay method lacked the sophistication to detect small amounts of cancer-causing substances. But advancements that enable laboratory technicians to detect minute, and what many consider harmless, quantities of these substances support the adoption of a non-zero tolerance. Such a tolerance would enable the approval of foods and additives currently prohibited by the Delaney clause. The policy problem is trying to determine a socially acceptable and scientifically supportable level of risk.

Another area of concern in the food industry is that the patent protection term of 17 years is too short to provide firms the necessary incentives to invest in the costly development and approval of many needed substances. Controversy over the inadequate length of the patent protection term originates with the protracted delays experienced by petitioners who try to obtain registration approval for pesticides, animal drugs, and food additives from regulatory agencies. Innovators sometimes obtain a patent only to find that they may not be granted a registration petition to sell the product

for several years. The innovator is not granted any adjustment for obtaining registration approval. Recovery of a usually substantial investment must be made in whatever time is left on the patent. The Congress recently enacted legislation to extend patent terms for certain additives and pharmaceuticals but did not to enact companion legislation for animal drugs and chemicals.

Extending the patent protection term for substances that might need to be reviewed periodically with up-to-date procedures to verify their safety could provide the private sector with one incentive to test a product instead of withdrawing it from the market. A guarantee of an extended protection term would improve a firm's ability to recover its testing costs without fear of early competition from price-cutting competitors. Once the patent expires, these competitors can replicate the product without bearing any of the research and development costs.

Policy Considerations

Achieving the goal of increased food safety to satisfy domestic and international market needs will require both public and private sector involvement. Government may need to be active in sponsoring basic research and developing applied techniques in situations where an uncoordinated private sector approach would lead to duplicated efforts, excessive costs, and a high probability of failure in successfully completing the research. Public policies to fulfill informational and educational needs are appropriate for the same reasons.

Given the rapid changes in technology, new definitions of safety and new standards and enforcement strategies may need to be

developed, debated, and adopted by public policymakers. Protection of producer well-being and the need for extended patent protection also may need to be resolved by public policymakers because of the numerous legal issues involved. In addition, diplomatic protocol will probably continue to require extensive public involvement in negotiating and approving international definitions of safety and compliance standards for food and commodities sold in international markets.

Policymakers and regulatory agencies are concerned about determining the optimum level of enforcement. Too little can result in numerous violations and huge losses to society. But too much enforcement can lead to expensive protection with only marginal returns in terms of safety. Unfortunately, virtually no empirical evidence about the losses associated with different levels of enforcement expenditure is available. It is neither technically nor economically possible to eliminate all forms of food safety risk. Society needs to establish some reasonable goals and let the regulatory agencies develop cost-effective measures that would bring per dollar costs and benefits in line.

What about consumers? What does the evolving food system mean for their convenience, nourishment, and satisfaction? It is likely that the U.S. food supply, already one of the safest and most abundant in the world, will become more so. However, consumers may have more food safety choices as new products differ in degrees of safeness. This will mean consumers will have to make more decisions about safety and food costs.

It is also likely that the amount of safety-related information available to consumers

will continue to grow. To be valuable to consumers, this information must be factual and free of the sensationalism that often characterizes stories on food safety problems. Consumers of all ages will require intensive education on hazards, their consequences, and how to prevent them. Many of the most common and serious food safety hazards are found in the home. Finally, consumers need to understand that the food safety system acts best when it spends its limited resources on the most serious health hazard problems. It is not possible, either technically or economically, to eliminate all risks to human health from the food system.

As for industry, much of the market development and application of compliance methods will remain with the private sector. The private sector will continue to have a leading role in determining the structural arrangements by which producers and the food industry will coordinate production and food safety protection. And within the constraints imposed by public regulation, the private sector will test market potential for additional services. Such services will determine future courses of action for both public and private involvement in establishing new policies and programs. □

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Food Safety: Consumers Report Their Concerns

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Consumer concerns about food safety and the role of the Government in providing a safe food supply date back at least to the early 1900's, when Upton Sinclair graphically described the unsanitary and unwholesome conditions of the meat-packing industry in his book *The Jungle*. The book resulted in consumer pressures which led to the passage of the Meat Inspection Act of 1906.

In line with this long-standing issue, determining the food safety concerns of consumers in the 1980's was the goal of a 1983 Kansas State University survey. Researchers polled a representative sample of consumers in eight Kansas counties (*see sidebar box*). The questions focused on food safety in general and meats in particular. Among the questions consumers were asked:

- Which food safety hazards were of most concern to them?
- Which foods were most likely to harbor a hazard?
- At which point in the food production and marketing chain were hazards most likely to occur?
- Was the use of chemicals beneficial or harmful to the food supply?
- How active a role should Government play in food safety?
- How much were they willing to pay for increased food safety information?
- From whom did they receive their current food safety information?

When the survey results were compiled, researchers found, as might have been expected, that consumers were likely to underestimate how easily they could mishandle food prepared at home; that consumers differed from experts in their perceptions of the major sources of foodborne risk of ill-

ness; and that women were more concerned about food safety than men were.

However, there were some surprising results. For example, affluent consumers and the mothers of young children weren't the most concerned about food safety. Rather, the elderly and those of more moderate income were. The elderly were particularly concerned about food additives and hormone and animal drug residues.

Assessing the Concerns

Respondents were asked to rank a list of food safety hazards according to their perceived severity. Consumers ranked environmental contaminants, such as PCB's, dioxin, and mercury, first, followed by disease-causing organisms, such as salmonella and trichina; pesticides; animal drug or hormone residues; and finally, food additives. (In contrast, most experts in food safety put microbiological contaminants at the top of the list of foodborne hazards, followed by environmental contaminants.)

The relatively low ranking of food additives contrasts with previous studies. Consumers appear to have been concerned about food additives in the 1970's. Possibly, the educational efforts of universities, the food industry, cooperative extension, and Government have diminished consumer worries. Furthermore, environmental contamination is now a visible and newsworthy topic. The contamination of Times Beach, Missouri, by dioxin was much in the news before the survey was conducted. Similarly, there had been a controversy the preceding year in Kansas over illegal use of diethylstilbestrol (DES), a synthetic hormone once permitted as a growth stimulant in livestock production but banned in 1979.

With foodborne illnesses generally associated with perishable protein foods, it is not surprising that red meats, poultry, and dairy products (in that order) were cited as the food groups of greatest concern. In terms of contamination by animal drugs or hormones, the survey respondents ranked beef first, followed by pork, poultry, milk and cheese, and finally, lamb.

When asked where in the food chain contamination of livestock and meat products

occurred, those responding to the survey cited processing plants as the most likely site. This response seems to indicate consumers' lack of knowledge of, or confidence in, Federal or equivalent State inspection in meat processing plants.

Livestock feedlots were cited as the second most likely problem site, followed by feed manufacturing plants. If they mix medicated feed, the feed mills are inspected on an intermittent basis by the Food and Drug Administration. The farm was the eighth most likely site of contamination, suggesting that consumers may perceive the farm as a "family" operation, and therefore safer, while the feedlot is regarded as a business or industry. The home ranked last as a site of potential food contamination.

This confidence in the home is consistent with previous consumer surveys, but not necessarily reality. Time and temperature abuses of foods are likely to occur in the home and often lead to safety problems. In fact, responses to other questions in the survey revealed that a significant percentage of consumers unknowingly followed unsafe food handling, preparation, and storage practices. For example, 32 percent responded that they let cooked chicken cool to room temperature before placing it in the refrigerator—a practice that food scientists strongly discourage.

The misperception of the relative importance of the home is consistent, however, with psychologists' assessments of consumer risk perceptions in general. Consumers generally indicate greater concern about hazards they are unable to control, whose effects may occur far in the future, and which can lead to serious injury or death. Unknowingly ingesting environmental contaminants may seem more repugnant because of the uncertain promise of long-term consequences than gastrointestinal symptoms due to improper refrigeration of the evening meatloaf.

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Consumers saw the farm as one of the least likely sites for food contamination.

Use of Chemicals In Food Production: A Benefit or Bane?

To determine consumer views of the role of chemicals in the food supply, respondents were asked to assess the impact of pesticides, drugs and hormones, and feed additives on food prices, costs of production, availability, quality, and safety. In terms of prices, more than 50 percent felt that in general they were higher as a result of pesticide use. This is contrary to the views of most economists. In a similar misunderstanding, more than half of the respondents also felt that the use of hormones pushed up meat prices. On the other hand, about 24 percent thought meat was less expensive as a result of hormone use.

Nearly 60 percent believed pesticide use increased the cost of food production, with an additional 10 percent indicating the rise was sizable. Nearly 60 percent believed animal drugs increased the cost of meat production, while 25 percent perceived that the drugs would lower production costs.

About 65 percent believed food availability is greater because of pesticides. A smaller share, 57 percent, agreed that meat

supplies would increase with drug and hormone use, with an additional 12 percent believing a large increase would occur. Only 3 percent said that food supplies would decrease with pesticides or animal drugs and hormones, and less than 15 percent indicated there was no impact. The results of the food availability question seem to indicate that most consumers understand the role of chemicals in extending food output.

In addressing food quality, about 21 percent of the respondents indicated that animal drugs and hormones enhanced taste and appearance, while 34 percent felt pesticides did. Over 20 percent, however, indicated that they didn't know how these chemicals affect food quality.

How consumers feel about the safety of food products after pesticide and drug and hormone use is a key part of the residue avoidance issue. Survey responses help producers understand consumer concerns. Roughly 42 percent of the respondents believed that overall food safety is decreased with pesticide and drug and hormone use. About 31 percent thought the food supply was safer as a result of pesticide use and 21

percent saw drugs and hormones as beneficial. These consumers may assume that a healthier animal means safer meat. Over 20 percent of the respondents indicated they did not know how drugs and hormones affected food safety.

Should Government Make Food Safety a Top Priority?

In addition to collecting information regarding food safety problems, researchers polled consumers on one source of solutions: the Government's role in assuring food safety and providing information and services. About 90 percent of the respondents agreed that keeping food safe should be a high Government priority. When asked if the Government should try to eliminate all health risk from the food supply, 63 percent responded positively; 27 percent disagreed. Over 70 percent of those polled felt that the Government should not permit any cancer-causing chemicals in the food supply, while only 14 percent disagreed.

When asked whether the Government should require health risk information on food labels, the result was an overwhelmingly supportive majority of 80 percent. Over 65 percent of the respondents wanted the labels to indicate if meat products were free of animal drugs, hormones, additives, and other chemicals. Almost 45 percent felt labels should contain nutritional information, and 30 to 35 percent want to see the cholesterol content on labels, as well as details on how to cook, handle, and freeze meats. Rankings of the type of information of interest varied by age (table 1). The

Table 1. What Information Would You Like on Meat Labels?

	Age			
	19-28	29-37	38-55	Over 55
	Percent			
Additives	68.2	75.6	72.3	56.5
Nutrient content	56.9	47.4	50.4	35.1
Guaranteed free of animal drug and hormone residues	52.3	74.4	74.8	67.9

three oldest groups (encompassing ages 29 and up) had the highest percentages interested in animal drug and hormone information on the labels. Nutrient content information was of least interest to all age groups.

The survey respondents were asked to indicate how much they would be willing to pay to receive their chosen food safety information on meat labels. Most (67 percent) indicated that they would pay slightly more for additional safety information. The largest share (42 percent) said they would be willing to pay 1 to 2 cents per pound of beef for the information they want. Just over 22 percent indicated they would pay 3 to 5 cents more.

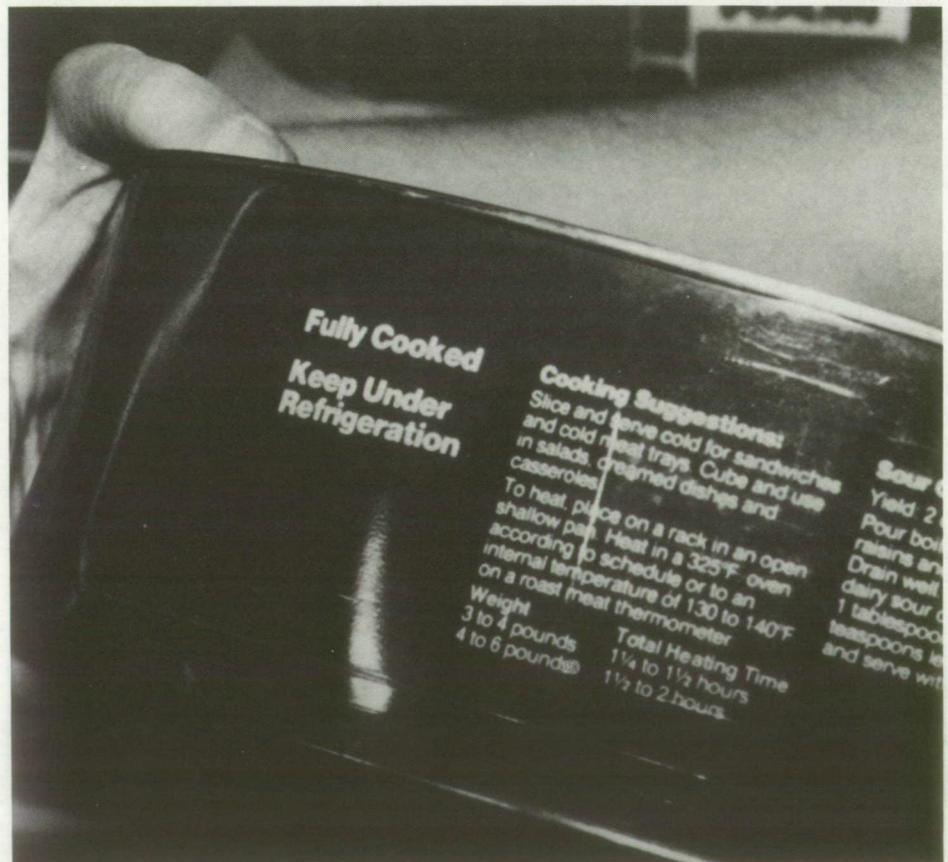
Where Consumers Go for Safety Information

As lifestyles continue to change, the methods of providing consumers with food safety information may need to adjust. Consumers in Kansas were asked to rank the most convenient way for them to receive information on food safety. Food labels ranked first. However, media tools that offer quick information were also preferred by the respondents. Newspapers ranked second overall, followed by television, radio, newsletters, and magazines. Several approaches traditionally used by the home economists of USDA's Extension Service, such as educational meetings and fact sheets or bulletins, ranked low. However, the Extension Service uses many other tools, including the media, that the consumer may not directly associate with them.

When asked how they currently received food additive information, 34 percent of the consumers surveyed answered Government literature or spokespersons, while another 19 percent received information from the food industry (table 2). The share citing the Government as the source of information on animal drugs and hormones was lower, 25 percent. The industry was not identified as a primary source of information on animal drugs and hormones. Twenty-six percent replied that they did not receive any information.

Table 2. What Sources of Information Are Used?

	Food additives	Animal drugs or hormones	Pesticides	Environmental contaminants
	Percent			
Government	34.1	25.4	20.1	32.9
University	2.4	8.6	6.5	1.5
Extension agent or home economist	3.8	7.4	14.5	4.2
Food industry	19.4	3.6	2.9	3.3
Consumer group	11.8	8.9	9.2	9.5
Popular media personality	7.9	10.9	13.3	19.0
Family or friend	1.2	1.8	1.5	0.0
Sources not listed	6.5	7.1	7.7	7.1
Don't receive information	12.9	26.3	24.3	22.5



Kansas consumers ranked labels as the most convenient way to receive information on food safety.

For those who received pesticide use information, Government sources provided the most consumer information. The Extension Service programs were the next most frequent source, possibly indicating recognition of its entomology programs that focus on safe use of chemical agents while teaching pest control.

The Government was also cited as the primary source of information on environmental contamination by almost 33 percent of the respondents. Nineteen percent cited popular media personalities, who ranged

from diet and exercise show hosts to news reporters, scientific experts, or Members of Congress. Almost 23 percent of consumers said they had not received any information on environmental contaminants.

Consumers were also asked how much confidence they had in their sources of food safety information. Over 90 percent indicated they had "some" to "high" confidence in information from the county extension agent or home economist (table 3). University personnel ranked second, with 84 percent of consumers expressing confidence in

the information they provide. Consumer groups were also an important source, followed by family and friends and Government spokespersons. Nearly 40 percent of the respondents reported little or no confidence in the information supplied by media personalities, despite their frequent use as a source. □

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Table 3. How Much Confidence Is There in Information Sources?

Source	None	Little	Level of confidence		
			Some	A lot	High
			Percent		
Government	5.8	22.1	50.5	17.1	4.5
University	6.2	10.0	45.7	28.4	9.7
Extension agent or home economist	1.6	5.3	24.8	48.3	20.0
Food industry	11.3	27.9	48.0	11.3	1.6
Consumer group	5.6	12.9	44.9	30.4	6.2
Popular media personality	14.0	24.7	47.3	12.9	1.1
Family or friend	4.5	17.1	47.2	24.0	7.2

The Survey Sample

Kansas consumers were polled by random sample in the summer of 1983. The response rate was 37 percent of the 1,100 questionnaires mailed. The survey was successful in soliciting a significant portion (40 percent) of male responses, unique to surveys of this type and important because of greater male involvement in shopping and food preparation.

Approximately 32 percent of the respondents were 19 to 37 years old. Another 32 percent were 38 to 55, and about 36 percent were over 55 years of age.

The men and women who responded

had similar education levels. More than two-thirds had completed high school, 21 percent had college degrees, and 14 percent had advanced degrees. The respondents had generally higher education and income levels than the State average. Fifty-one percent reported an annual income exceeding \$25,000, compared with 27 percent for the State.

The employment status of men and women respondents differed significantly. Seventy-two percent of the men indicated that they were employed, while only 38 percent of females reported employment outside the home. The sample was approximately 75 percent urban and 25 percent rural.

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Educating the public on proper food handling practices to avoid food poisoning is a little easier because of a permanent toll-free Meat and Poultry Hotline begun last July by the U.S. Department of Agriculture. By calling 800-535-4555, consumers, businesses, and others nationwide can now get immediate answers to questions about the safe handling of meat and poultry and report any problems with these products.

An extensive system of State and Federal inspection helps assure a safe and wholesome meat and poultry supply. However, consumers and those involved in professional food preparation need to ensure that the meat and poultry they buy is properly handled. Improper thawing and cooling, inadequate cooking, and cross-contamination from raw foods can present serious problems. In fact, most of the several million reported cases of food poisoning that occur each year are due to improper handling of food.

Based on data collected during the first 8 months of the toll-free hotline's operation, 82 percent of callers requested basic food safety information, which, if followed, could reduce the number of cases of food poisoning. Over the period, 20,038 calls were made to the hotline from all 50 States and Puerto Rico. This was more than three times the number made during the entire 3 years when the hotline was not toll-free. Hotline home economists advised 10,274 callers during business hours. Approximately 90 percent of these callers were consumers (table 1).

Another 1,732 persons also called during business hours but hung up when they were required to wait a short time (usually less than a minute) for a home economist to help them. The 8,032 who called after business hours and on weekends heard a recorded message on subjects ranging from safe brown bag lunches to selecting and storing

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Hotline home economists advise consumers on the safe handling of meat and poultry.

Table 1. Who's Calling the Hotline?

User	Percent of total ¹
Consumers	90
Business	4
Government	3
Professionals	1
Media	1
Students/teachers	1

¹Based on the 91 percent of callers who identified their "type."

turkeys for Thanksgiving. Callers were also urged to phone again weekdays from 10 a.m. to 4 p.m. eastern time.

Calling for Food Safety Answers

A review of the types of calls received during the 8-month period reveals the broad range of services provided by the hotline. During November, for example, more than half (1,270) of the questions concerned the

safe handling of turkey for Thanksgiving. Safe storage and handling of fresh turkey was the subject most frequently asked during the 10 days before Thanksgiving. The majority of these calls were from consumers who had already purchased fresh turkeys and were concerned about extended storage times, as well as those who were deciding when to purchase a turkey for optimal freshness and safety.

Other often-heard questions included: Is it safe to cook a turkey at 250 degrees all night? Can a fresh or frozen turkey be stuffed the day before it is cooked? Is it safe to roast a turkey in a brown paper bag? (For the answers to these important questions, see sidebar box.)

In fact, questions about turkey were high throughout the 8 months, and more questions were received on this topic (37 percent) than any other. The majority of these questions about turkey were on storage times in the refrigerator and freezer, thawing frozen turkey, stuffing the bird, and cooking time and temperature.

Hurricane Gloria's sweep across the northeastern coast last September presented a new challenge for the hotline—helping more than 125 victims deal with the addi-

Calling the Hotline About Turkey

Is it safe to cook a turkey at 250 degrees all night?

This method is not recommended. Because of the low temperature, the turkey (and stuffing) might take more than 4 hours to reach a high enough temperature to destroy bacteria and could, therefore, be unsafe. The quality of the turkey might suffer, too. During prolonged cooking, some parts of the turkey could become very dry.

Can a fresh or frozen turkey be stuffed the day before it is cooked?

Turkeys should be stuffed only right before cooking. It may seem like a good idea to save time by stuffing your turkey in advance, but that's inviting trouble, because harmful bacteria can

multiply in the stuffing and cause food poisoning. Dry stuffing ingredients may be prepared the day before, tightly covered, and left at room temperature. The perishables (butter or margarine, mushrooms, oysters, cooked celery and onions, and broth) should be refrigerated. The ingredients should then be combined just before stuffing the turkey.

Is it safe to roast a turkey in brown paper bag?

Using ordinary brown bags for roasting is not recommended because they may not be sanitary. Also, the glue and ink used on brown bags have not been approved for use as cooking materials and may give off unhealthy fumes. Finally, as the turkey cooks, the juices may saturate the bag, causing it to break during cooking. As a result, it may be difficult to remove the bird from the pan.

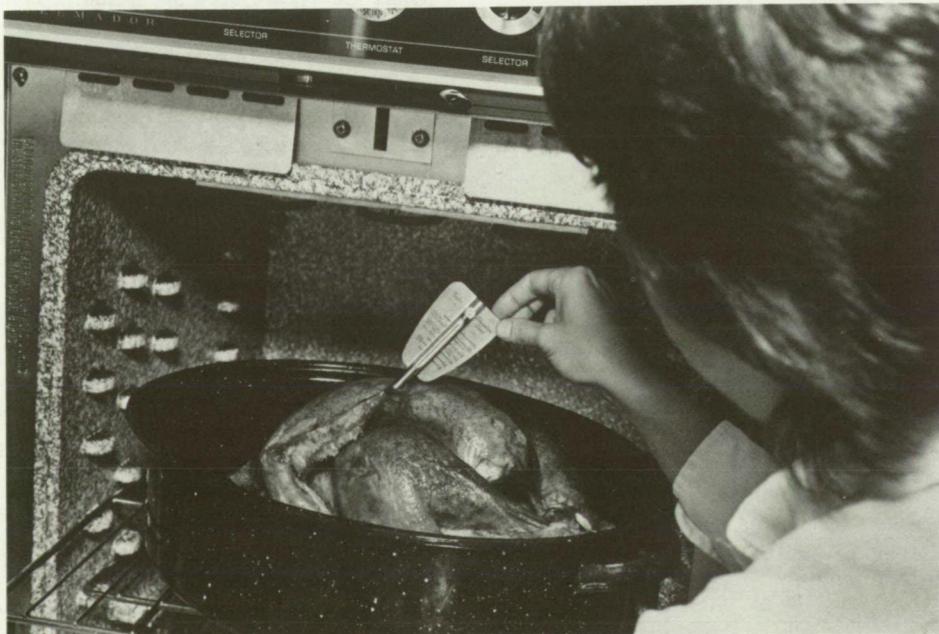
tional food safety problems caused by power outages. Callers were advised on foods that could be salvaged and those that should be discarded.

Another 65 calls were received following the airing in November of a New York television story on salmonella bacteria in poultry. Some who heard the story felt that poultry might be unsafe to eat. Hotline home economists discussed the safety and wholesomeness of USDA-inspected products while reinforcing the need for basic food safety in the home. Proper handling and cooking will destroy salmonella.

Hotline Also Handles Complaints

In addition to food safety questions, callers can phone the hotline to report problems with meat and poultry products, including glass or metal fragments or a strange look or smell. The hotline home economists screen complaints to ensure they meet certain standard criteria before referring them to the Food Safety and Inspection Service's epidemiology or compliance staffs.

Complaints accounted for only 1 percent of total calls and letters received from July 1985 through February 1986. One half of these complaint calls concerned suspected cases of food poisoning or foreign objects in food. Another third were complaints about product taste or appearance. The rest were distributed over several areas, from package-related issues such as dating, labeling, additives, and contents to inspections and other plant-related concerns. □



The hotline has received more calls on turkey than any other topic.

Behind Revising the Dietary Guidelines

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What should you eat to be healthy? In 1980, this question was addressed by nutrition scientists in the U.S. Departments of Agriculture (USDA) and Health and Human Services (DHHS) in a joint publication "Nutrition and Your Health: Dietary Guidelines for Americans." A second edition of that publication was released in 1985, incorporating recommendations of a nine-member Dietary Guidelines Advisory Committee.

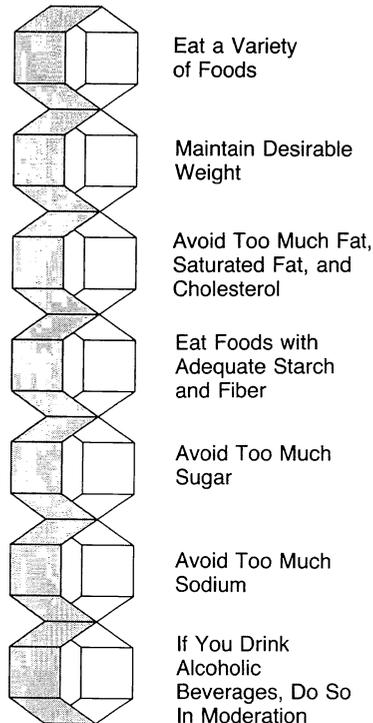
The guidelines in the second edition are similar to those in the 1980 edition in many ways. For example, the new guidelines are for the same audience, namely healthy Americans. The guidelines are especially appropriate for people who have risk factors for chronic diseases such as a family history of obesity, premature heart disease, diabetes, high blood pressure, and high blood cholesterol levels. Like the 1980 edition, the new guidelines do not apply to people who need special diets because of disease or conditions that interfere with normal nutritional requirements. These people may require special instructions from health professionals.

Looking at the 1980 Guidelines

After extensive review of the scientific literature, hundreds of solicited comments from the public, and discussion at four meetings, the Dietary Guidelines Advisory Committee suggested retaining the seven guidelines covering the same dietary issues as in the earlier edition. However, the committee changed the wording of two guidelines. "Maintain ideal weight" was changed to "Maintain desirable weight" because the word "ideal" seemed to imply an unduly precise understanding of what people should weigh. "If you drink alcohol..." was changed to the more correct wording, "If you drink alcoholic beverages..." (see figure for all seven guidelines).

Once again, in the new edition the seven guidelines emphasize variety, balance, and

The 1985 Dietary Guidelines for Americans



Second Edition, 1985
U.S. Department of Agriculture
U.S. Department of Health and Human Services

moderation in the total diet. The first two guidelines—on variety and weight maintenance—are the framework for a good diet, and the next five guidelines describe special characteristics of a good diet. The importance of integrating all of the guidelines into the diet is also stressed in the new edition. Because they refer to the total diet, the guidelines do not recommend eliminating any food or group of foods from the diet.

As in 1980, the new edition of the guidelines does not recommend specific amounts of vitamins, minerals, fat, sugar, sodium, alcohol, starch, or fiber. And except for nutrients for which there are Recommended Dietary Allowances, members of the Dietary Guidelines Advisory Committee believed that in order to recommend specific

goals they must await further research. However, they did suggest that the U.S. population as a whole choose diets that are reduced in calories (primarily from fats, sugars, and alcohol) and increased in dietary starch and fiber.

Some new cautions have been introduced in the latest edition of the dietary guidelines publication. For example, readers will find recommendations to avoid large-dose supplements of any nutrient, not to attempt to lose weight by inducing vomiting or by using laxatives, and to moderate their use of egg yolks (not eggs). The publication also warns that consuming excess calories, as well as extra saturated fat and high levels of dietary cholesterol, will increase blood cholesterol levels in many people.

The revised guidelines publication also points out that recent research suggests that calcium may play a role in preventing osteoporosis and that, while sodium intake is one of the factors known to affect high blood pressure, several other nutrients may be involved. Obesity plays a major role too. About one in four adults has elevated blood pressure, according to the 1985 edition.

Other examples of information in the revised Dietary Guidelines include: (1) that common table sugar (sucrose) is only one form of sugar, and (2) both sugars and starches appear to increase the risk of tooth decay when eaten between meals, but simple sugars appear to offer a higher risk.

In keeping with the goal of providing guidance for a healthier diet and lifestyle, the 1985 edition also includes advice from the National Institute of Alcohol Abuse and Alcoholism: Pregnant women should refrain from using alcohol because research has not established the level of consumption at which risks to the unborn occur; and if you drink, don't drive.

Getting the Word Out

The Dietary Guidelines Advisory Committee recommended that USDA and DHHS publish and widely distribute the revised guidelines; that these departments use the guidelines as the basis for their nutrition education and information programs; that USDA develop dietary guidance related to

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USDA Actions

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the guideline concepts for nutrition education programs; and that other advisory committees of nationally recognized nutrition authorities be convened on a 5- to 10-year cycle to review the guidelines for scientific accuracy and appropriateness.

A series of 14 short bulletins to help Americans put the guidelines into practice are being developed by USDA's Human Nutrition Information Service with advice from the Extension Service. The first set of seven bulletins, scheduled for release in mid-1986, will present information about each guideline and the dietary substances, such as vitamins, minerals, fat, starch, fiber, sodium, or sugar, featured in the guidelines. The next set of seven bulletins, scheduled for release later this year, will show how to integrate the guidelines while shopping for food, planning meals, preparing food, eating out, making bag lunches, preparing quick meals, and choosing snacks. □

Where To Get the Guidelines

A single free copy of "Nutrition and Your Health: Dietary Guidelines for Americans," Second Edition, Home and Garden Bulletin No. 232 is available by writing to the Consumer Information Center, Pueblo, Colorado 81009. The food industry and other groups are encouraged to reprint the guidelines bulletin for distribution, using copy available from USDA's Office of Governmental and Public Affairs, Washington, D.C. 20250.

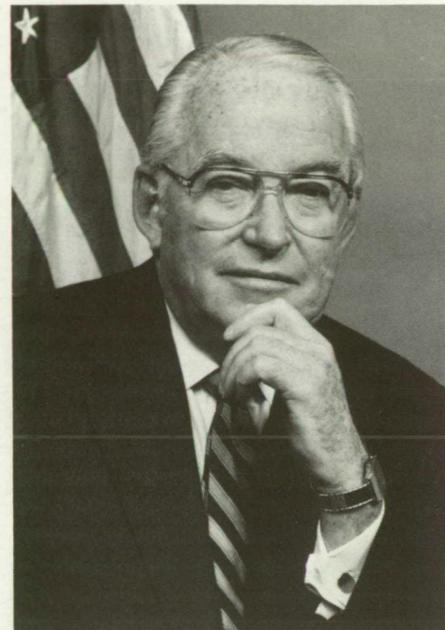
For a list of some of the Federal Government's materials that are related to dietary guideline issues and for information about the 14 new short bulletins, write to the Human Nutrition Information Service, U.S. Department of Agriculture, Room 364, Federal Building, Hyattsville, MD 20782.

USDA regularly implements operational and regulatory changes that affect the status of food and nutrition in the United States. Here are some actions relevant to the food situation.

New Agriculture Secretary: Richard E. Lyng was sworn in as the 22nd U.S. Secretary of Agriculture on March 6, 1986. Lyng was born June 29, 1918, in San Francisco, and graduated from the University of Notre Dame in 1940. From 1949 to 1967, Lyng served as president of the Ed. J. Lyng Company, a family-owned seed and bean production and processing company in Modesto, Calif. He was appointed director of the California State Department of Agriculture by Governor Reagan in 1967 and served in that post until 1969, when he was appointed USDA's Assistant Secretary for Marketing and Consumer Services. From 1973 to 1979, Lyng was president of the American Meat Institute. He also has served as a director of Tri-Valley Growers in San Francisco; the Chicago Mercantile Exchange; the Agribusiness Advisory Board, University of Santa Clara; and as a member of the Animal Health Committee of the National Academy of Sciences. Lyng was the transition team leader for USDA after Reagan's election in 1980 and then served as USDA's Deputy Secretary of Agriculture during the first term of the Reagan Administration.

Oriental Fruit Fly Quarantines: On November 21, 1985, USDA quarantined an area in Santa Clara County, Calif., to help prevent the spread of the oriental fruit fly, one of the world's most destructive fruit and vegetable pests. In October, USDA quarantined parts of California's Los Angeles and Orange Counties for oriental fruit fly. The quarantines restrict movement of around 100 kinds of fruits, nuts, vegetables, and berries from the quarantined areas. Before any of the regulated items can be

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Richard E. Lyng: new Secretary of Agriculture

moved interstate, a permit must be obtained from USDA.

Identification Devices on Cattle and Swine: Individual identification devices on cattle and swine moving in interstate commerce are now required to remain on the animals from point of origin through final destination. Formerly, the identification devices were required only at the time of actual movement across a State line. The purpose of identification devices, such as eartags, backtags, brands, and tattoos, is to provide a means of tracing an animal to its original source in case of disease outbreak, and to help identify any other animals that may have been exposed.

Pseudorabies: USDA has amended its pseudorabies control regulations in an attempt to "establish a balance between adequate protection against the spread of pseudorabies in swine and needless interference in the movement of swine between States," according to Bert W. Hawkins, administrator of USDA's Animal and Plant Health Inspection Service. The changes clarify the regulations, remove inconsistencies, and bring the rules in line with current

industry practices. Specifically, the changes provide an alternative method for removing swine herds from the "known infected" classification, an alternate method for attaining or regaining herd "qualified pseudorabies-negative" status, an improved method for monitoring herds vaccinated for pseudorabies, and an alternate way for shippers to move swine interstate to approved livestock markets, feedlots, and quarantined herds.

Citrus Canker: Regulations have been changed to allow Florida citrus seed to move to other States, Florida citrus fruit to move to northern Louisiana, and citrus fruit from other areas to move through Florida to other States. Citrus previously eligible may continue to be shipped. Movement of Florida citrus has been restricted since September 1984, shortly after a strain of citrus canker, a destructive foreign citrus disease, was found in a Florida citrus nursery. To be eligible for interstate movement, citrus must come from a grove free of citrus canker and must undergo disinfection. Also, canker-free citrus must be accompanied by a permit and be moving to a noncitrus-producing area.

Hops: USDA terminated Marketing Order 991 governing the marketing of domestically produced hops on December 31, 1985. The decision to terminate the order was reached after analysis of the industry's problems and a review of the record of a public hearing held to consider amendments to the order. The marketing order had been in operation since 1966.

WIC Study: On January 10, 1986, USDA released the results of a 5-year study assessing the effectiveness of the Special Supplemental Food Program for Women, Infants, and Children (WIC). Objectives of the study included an assessment of the effect of the WIC program on pregnant women in terms of pregnancy outcomes, nutrition and diet, and utilization of professional health care. The study also examined the effect of WIC on children, including growth, dietary intake, and health care.

The study showed that the WIC program increases the use of infant formula instead

of cow's milk, improves some dietary factors associated with pregnant women's weight gain, and encourages use of prenatal care. The study's findings on length of pregnancy and pregnancy outcomes were mixed. While results from one portion of the evaluation indicate WIC is effective in increasing the length of pregnancy by 1 day, and in reducing the likelihood of both premature delivery and fetal death, these results could not be confirmed by another portion of the evaluation. Contrary to expectations, the study did not find consistent evidence that WIC increases the birth weight of infants.

WIC program recipients receive a monthly package of food tailored to their nutritional needs, as well as nutrition education and referral to health care. In fiscal 1985, the WIC program cost approximately \$1.5 billion and served more than 3.1 million people a month.

Egg Marketing Order: USDA held public hearings in Atlanta, Little Rock, San Francisco, Philadelphia, and Chicago during January and February 1986 to consider a proposal to establish a Federal marketing order for eggs. The proposed order would: establish an egg research and promotion program, including the use of paid advertising; authorize regulations to take fowl out of production during periods of extreme egg surpluses; and establish a national board of producers and handlers to execute the order. The provisions of the proposed order were submitted to USDA by an egg industry task force. Based on testimony presented at the hearings, the Secretary of Agriculture will issue a recommended decision on the marketing order.

Poultry Inspection: USDA continued its inspection modernization program by implementing a new, lower cost inspection method in poultry slaughter plants. The new procedure is mandatory in poultry plants that operate under the Modified Traditional Inspection System. The vast majority of plants that slaughter young chickens use this system. The traditional inspection procedure divided the inspection process among three inspectors. The first inspector, using a mirror, checked the outside of each carcass.

The other two inspectors checked the inside cavity and the internal organs. The trimming of bruises and other defects was done by plant employees under the direction of an inspector. The new procedure, called the Streamlined Inspection System, eliminates the first inspector. Instead one or two inspectors are used, depending on the size of the plant, and each is responsible for checking a whole bird. Plant employees identify and trim bruises and other defects, allowing USDA inspectors to concentrate on detecting disease and other abnormalities.

Flavor Enhancer: USDA now permits processors to use monoammonium glutamate as an alternative flavor enhancer in various meat and poultry products. Monoammonium glutamate is classified as a multiple-purpose food substance that is generally recognized as safe by the Food and Drug Administration. Monoammonium glutamate has the same effect as monosodium glutamate in food, but it does not contain sodium.

Meat Grading and Certification Fees: USDA has increased the hourly fee it charges for meat grading and certification services and has established separate fee rates for different types of service. Meat grading and certification services are provided to meatpackers and processors at their request. By law, the fee must be about equal to the cost of providing the service. A higher fee was needed to offset substantial losses from operating the program in fiscal 1985. The establishment of separate fee rates for different types of service will distribute more equitably the program's operating expenses to meatpackers and processors.

There are two types of applicants: commitment and noncommitment. Commitment applicants agree to guarantee 40 hours of revenue for service per week. Noncommitment applicants request service for a particular day and for the amount of time necessary to complete a specific task. The cost of providing service to noncommitment applicants is higher than the cost of providing service to commitment applicants. Under the new fee schedule, the base rate for commitment applicants will be \$27.40 per hour, and the base rate for noncommitment applicants will be \$29.80. All applicants



USDA continued its inspection modernization program by implementing a new, lower cost inspection method in poultry slaughter plants.

will be charged \$54.80 per hour for services performed on Federal holidays and \$35.40 during premium hours (time in excess of 8 hours per day between 6:00 a.m. and 6:00 p.m.; hours worked before 6:00 a.m. and after 6:00 p.m., Monday through Friday; and any hours worked on Saturday and Sunday).

Mango Imports: USDA is again allowing mangoes from Central America, the West Indies, Brazil, and Mexico to be imported into the United States. Mangoes from these areas had been prohibited entry since September 17, 1985, when the Environmental Protection Agency ruled that residues of ethylene dibromide (EDB) on mangoes would no longer be allowed. Prior to September 17, treatment of mangoes with EDB in the country of origin was required to

destroy tropical fruit fly larvae before they could be imported. The ban of EDB effectively eliminated importation of mangoes from countries infested with tropical fruit flies, since no alternative treatments are available. On February 14, 1986, however, the Environmental Protection Agency reestablished a tolerance of .03 parts per million of EDB for mangoes, which made it possible for USDA to reissue the regulations. These regulations describe proper fumigation standards and how the required USDA import certificates should be obtained. Fumigation must be done under USDA supervision in facilities approved by USDA.

Sugar Import Quota: The 1986 quota year for sugar imports will end on December 31, 1986, instead of September 30. The

quota year began on December 1, 1985. The 3-month extension was necessary to comply with the provisions of the Food Security Act of 1985. The 1986 base quota amount of 1.72 million short tons will now enter the United States over a 13-month period, rather than 10 months. This effectively reduces by more than 20 percent the amount of quota sugar that will be imported during the period ending September 30, 1986, since shipping patterns will be adjusted to assure that sugar arrives evenly during the extended period.

Milk Marketing Orders: USDA held four regional hearings to consider proposals to amend the location adjustment provisions in Federal milk marketing orders. The proposals, submitted by cooperative associations and dairy processors, would modify the plant location adjustments to prices under the orders to conform with the Class I price differentials mandated by the Food Security Act of 1985. The hearings were held on February 25, March 4, 12, and April 8 in Atlanta, Ga.; Irving, Tex.; Indianapolis, Ind.; and Minneapolis, Minn., respectively.

Fresh Fruit and Vegetable Grading Fees: USDA has increased the fees it charges to inspect and grade fresh fruits and vegetables at destination markets. The fees were raised to cover increased costs of providing the services. The new schedule raises fees for examining both the quality and condition of a product, or its condition only. Users of the service will be charged \$50 to inspect more than half a carlot of a product for quality and condition, \$42 for each half-carlot equivalent or less of an individual product, and \$100 maximum for each carlot equivalent when more than one kind of product is involved. A carlot equivalent is approximately 40,000 pounds.

For condition inspection only, producers will be charged \$42 when the volume of a product is in excess of one-half carlot and \$38 for each half-carlot or less of an individual product. A maximum of \$84 will be charged when more than one kind of product is involved. Rates for inspection on a per hour basis, small package inspection

Food and Nutrition Legislation

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fees, and the inspection charges for peanuts, pecans, and other nuts were also raised.

Meat and Poultry Labels: USDA has changed its definitions for the terms "lite," "lean," and other claims used on meat and poultry labels to reflect more accurately a product's fat content. USDA also is requiring specific labeling information on products using these terms. Processors will have 1 year to change their labels in accordance with the new requirements.

The new labeling requirements are designed to ensure that products labeled with terms indicating lower fat levels are naturally low in fat or that their fat content has actually been reduced. Processors must disclose the actual amount of fat (expressed as a percentage) on the product label. Under the new definitions, the term "extra lean" will be reserved for products containing no more than 5 percent fat. The terms "lean" and "low fat" can be used only on products containing less than 10 percent fat. The terms "light," "lite," "leaner," and "lower fat" can only be used on products containing at least 25 percent less fat than the majority of such products in the marketplace. A statement explaining the comparison must be included on the label. For example, the label for "Leaner Ground Beef" might include "This product contains 20 percent fat, which is 33 percent less fat than is in most ground beef."

The terms "lean," "lite," or other fat claims can be part of fanciful names, brand names, and trademarks only if the product meets the requirements for that claim and if the claim is explained on the label. This restriction, however, does not apply to the use of these terms on brand-name products like frozen dinners and entrees when the terms indicate a product's usefulness in calorie control. Labels on these products must carry nutrition labeling that includes the fat content. Previous labeling requirements allowed terms such as "lite," "lean," and "extra lean" to be used interchangeably on meat and poultry products containing 25 percent less fat than a comparable product and on products containing no more than 10 percent fat overall. □

Numerous food and nutrition bills have been introduced in Congress. One recently passed law and several proposals are briefly described below.

Food Assistance

P.L. 99-269

The Older Americans Amendment Act was passed by Congress on March 18, 1986, and was signed by the President on April 1. The Act continues the Surplus Commodities Program operated by the Department of Health and Human Services. The program provides all persons aged 60 and over, and their spouses, with nutritionally sound meals at little or no cost to participants. USDA provides commodities or cash in lieu of commodities to the program. Under this Act, USDA will pay no more than 56.76 cents per meal, whether it is provided by communal feeding operations or home delivered. Total program expenditures cannot exceed \$144 million each year for fiscal 1986 and 1987. The Act requires that the Secretaries of Agriculture and of Health and Human Services disseminate program operation and procedure information to all State and local agencies affected by any Federal programs that disperse commodities.

H.R. 4182—Rep. Bernard Dwyer (NJ)

The bill would amend the Food Stamp Act of 1977 to exclude the income received by the handicapped employed in sheltered workshops from food stamp eligibility and benefit calculations. The bill defines a sheltered workshop as a program established by a nonprofit organization that provides the handicapped with employment or other educational or therapeutic occupational activities.

H.R. 4405—Rep. Jerry Huckaby (LA)

The bill would give a State the right to collect State and local sales taxes on purchases made with food stamp coupons. Cur-

rent law, the Food Security Act of 1985, bars States from participating in the Food Stamp Program if State and local taxes are collected on such purchases.

S. 2182—Sen. Quentin Burdick (ND)

This bill would amend the Food Stamp Act of 1977 to allow households to reduce their countable income by the amount of self-employment losses when applying for the Food Stamp Program. A similar provision, applicable to farmers only, was added by the Food Security Act of 1985.

Food Safety and Quality

H.R. 4269—Rep. James Cooper (TN)

The Lite Food Labeling Act would require uniform minimum standards for the "lite" categories of foods, such as those that are advertised as less-fat, low-calorie, or reduced-sodium. This legislation would establish standards for the terms "lite" or "light" and "reduced." The terms "lite" or "light" could be used only if the actual calorie, fat, or sodium percentage changes that form the basis for the comparative claims are displayed prominently on the labels. Food products of not more than 40 percent meat or poultry, such as meat-topped pizza, can only use the term "reduced" if they contain at least one-third fewer calories, three-fourths less sodium, or one-half less fat than their regular counterparts. Foods with more than 40 percent meat or poultry, such as hotdogs, have identical calorie and sodium restrictions, but can use the term "reduced fat" only when there is at least one-third less fat than their unaltered counterparts.

H.R. 4277—Rep. Mel Levine (CA)

This bill would direct the Food and Drug Administration (FDA) to study and report on toxic contamination of fish in Santa Monica Bay. It would require the FDA to assess the level of contamination of edible fish from the bay, to determine the rate of consumption of the area's contaminated fish by surrounding communities, and to evaluate the health risks associated with such consumption.

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Provisions of the Food Security Act Related to the Food Sector

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H.R. 4364—Rep. Berkley Bedell (IA)
S. 2215—Sen. Richard Lugar (IN)

These identical bills are designed to better protect the public and environment from pesticides than is possible under the current law, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). These bills would require review and reregistration of pesticides currently used and increased public access to data resulting from the review. They would authorize:

- A schedule for the completion of reregistration (especially of those pesticides marketed prior to the passage of FIFRA in 1972).
- A one-time fee for reregistration to defray registration costs.
- Interim reviews of pesticides and coordinated inspection of laboratories.
- A review of imported pesticides to see that domestic health and safety regulations are applied.
- Increased employee protection against discharge or discrimination for participating in any way with reregistration hearings.
- Limited conditional registration of a pesticide, pending completed review of its health and safety data.
- A required, manufacturer-provided summary of an approved pesticide's health and safety data, available to the public upon request.
- Limited public access to similar data prior to the Environmental Protection Agency's approval of a pesticide.

Other Legislation

H.R. 4008—Rep. Arlan Stangeland (MN)

This bill is designed to help create new jobs and revitalize economically distressed rural areas. It would establish "rural enterprise zones" by streamlining government requirements within the area, reducing tax rates for local businesses, offering State or local income tax deductions to those who perform services formerly performed by government, and offering surplus land in the zone at a reduced price to neighborhood groups agreeing to operate a business on the land. Emphasis would be put on disadvantaged workers and long-term unemployed individuals. □

The Food Security Act of 1985 (P.L. 99-198) provides a 5-year framework for the Secretary of Agriculture to administer various agriculture and food programs. This article summarizes the dairy, marketing, and miscellaneous provisions that may be of interest to *National Food Review* readers. For a full summary of the 1985 Act see *Provisions of the Food Security Act of 1985*, Agricultural Information Bulletin-498.

The Food Security Act was passed by Congress on December 18 and signed by President Reagan on December 23, 1985. The Food Security Improvements Act of 1986 (P.L. 99-260), which made "technical corrections" in the 1985 Act, was passed by Congress on March 11 and signed by the President on March 20, 1986.

Dairy Provisions

Milk Production Termination Program: In an attempt to permanently reduce milk production, Congress included a milk production termination or "whole herd buy-out" program in the Food Security Act. The buyout program began April 1, 1986, and will run through September 30, 1987. Participating producers submitted bids based on milk marketings during July 1984 through June 1985, or their calendar 1985 marketings, whichever was smaller.

In return for payment of these bids, participating producers agreed to end all milk production, liquidate or export their herds, and stay out of dairying for 5 years. During this time, producers may not acquire interest in dairy cattle or milk production, or allow other dairy farmers to use their facilities.

Program participants must provide evidence of their milk marketing history and the past and present size and composition of their herds. A producer who began marketing milk in the 15-month period ending March 31, 1986, was ineligible to participate, except if the entire herd and facilities

were transferred to the producer as a gift or inheritance from a family member.

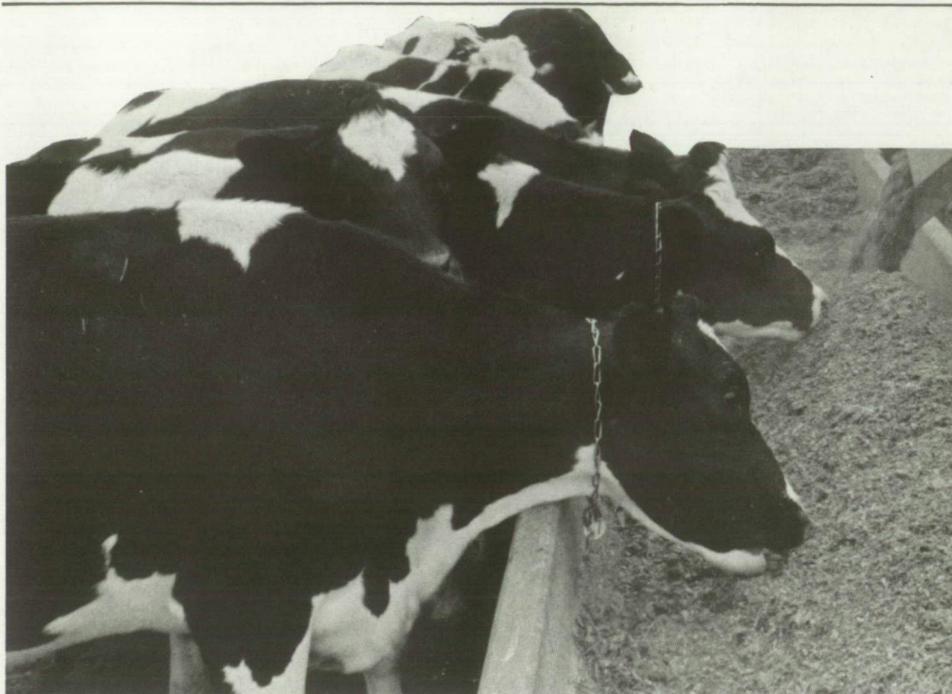
To help offset the cost of the milk production termination program, the price of milk received by producers will be reduced 40 cents per hundredweight (cwt) during April 1-December 31, 1986, and 25 cents per cwt during January 1-September 30, 1987. This deduction will be collected by handlers and remitted to the Commodity Credit Corporation (CCC). The deduction is applicable to all milk marketed for commercial use in the continental United States (excluding Alaska). The Food Security Improvements Act requires an additional deduction of as much as 12 cents per cwt during April 1-September 30, 1986, in lieu of the March 1 reductions in price support payments mandated by the Balanced Budget and Emergency Deficit Control Act of 1985 (popularly known as Gramm-Rudman-Hollings). The change was made so that the cuts required by Gramm-Rudman-Hollings would be borne by all producers; a decrease in price support payments would have affected only those selling surplus dairy products to the CCC.

The goal of the program is to reduce milk production by 12 billion pounds. However, the total number of dairy cattle marketed for slaughter under this program is limited to 7 percent of the national dairy herd in addition to the normal culling rate per calendar year. The Secretary of Agriculture may establish a milk diversion or a milk production termination program in 1988, 1989, or 1990, if it is deemed necessary to avoid burdensome excess stocks of milk or milk products.

To minimize the effect of the 18-month program on beef, pork, and lamb producers, the Secretary must purchase 400 million pounds of red meat in addition to those normally purchased and distributed. Two hundred million pounds will be distributed through domestic programs and 200 million through export programs and military commissaries located outside the United States.

Milk Marketing Orders: The Food Security Act specifies minimum Class I differentials for the 44 milk marketing orders administered by USDA's Agricultural Mar-

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In attempt to permanently reduce milk production, Congress included a milk production termination or "whole herd buyout" program in the Food Security Act of 1985.

keting Service (AMS). These differentials, which range from \$1.35 to \$4.18 per cwt of milk having 3.5 percent milk fat, are the dollar amounts added to the price of manufacturing grade milk in the Minnesota-Wisconsin marketing area to determine the minimum Class I (bottling) milk price that handlers must pay under each of the marketing orders. The minimum differentials will be in effect for the 2 years beginning May 1, 1986, and will continue in effect unless an order is amended by AMS.

The Minnesota-Wisconsin price is an estimate of the average price paid for manufacturing grade milk used to make butter, nonfat dry milk, and cheese at plants in most of Minnesota and Wisconsin. Under Federal milk marketing orders, milk is priced according to how it is used at processing plants. Milk sold for drinking is in the highest price class (Class I), while milk used in manufactured products is in lower price classes. Congress felt it necessary to adjust the differentials so that the minimum Class I prices would better cover the costs of supplying the markets.

National Commission on Dairy Policy: As part of the Food Security Act, Congress established a National Commission on Dairy Policy to study the future operations of the Federal milk price support program. The commission will have 18 members, appointed by the Secretary, who are engaged in

commercial milk production in the United States.

The commission will examine the current Federal price support program for milk, alternatives to the program, the effect that emerging dairy technologies will have on surplus milk production, and the future structure of the milk production industry.

The commission will be dissolved after submitting its findings and recommendations to the Secretary of Agriculture and Congress on or before March 31, 1987.

Research and Promotion Programs

The Food Security Act establishes procedures for carrying out research and promotion programs for beef, pork, and watermelons designed to strengthen these industries' positions in the marketplace and maintain and expand markets and uses of the products (table 1). Federally legislated research and promotion programs are one method producers have used to foster demand for their products. Of the promotion programs enacted by Congress in the last 30 years, six are still in effect (cotton, dairy, eggs, potatoes, wheat, and wool).

Beef: Provisions of the Food Security Act establishing a beef research and promotion order replace the Beef Research and Information Act of 1976. The 1985 Act establishes a Cattleman's Beef Promotion and Research Board composed of beef producers

and importers. Producer representation on the board will be based on one representative for each State with 500,000 or more cattle. Those States with fewer than 500,000 cattle will be combined into regional units containing at least 500,000 cattle, with one representative for the region. States with over 500,000 head will get one more representative for each additional million cattle. The Secretary of Agriculture will determine importer representation by converting the volume of imported beef and beef products into live-animal equivalents.

The board will administer the order, investigate violations of the order, and recommend order amendments to the Secretary. In addition, the board elects 10 members to serve on the Beef Promotion Operating Committee. Another 10 members of the committee are from recognized beef promotion organizations in the States. The committee is charged with developing the actual research and promotion projects.

Financing for the program will be provided through assessments collected from beef importers and persons buying cattle from producers. The assessment rate will be \$1 per head of cattle, or the equivalent thereof in the case of imported beef and beef products. Producers who participate in programs run by State beef councils will receive credit of up to 50 cents per head. Persons not supporting the program may receive a one-time refund. Funds collected by the board cannot be used to influence Government policy.

For the order to remain in effect, a referendum to continue the order must be conducted among producers and importers not later than 22 months after issuance of the order. Continuation of the order requires majority approval. The Secretary may also conduct a referendum concerning program continuation on request of 10 percent or more of producers. This order does not preempt or supersede other beef promotion programs operated in the United States.

Pork: The Food Security Act also requires an order establishing a pork research and promotion program. A National Pork Producers Delegate Body is established as

part of the order. It will consist of producers and importers appointed by the Secretary from nominees selected by State-recognized organizations of pork producers or a suitable substitute as defined in the legislation. At least two producer members must be appointed to the Delegate Body

from each State, with additional membership also allowed. For 1986, additional members will be assigned based on one share for each \$400,000 of hogs marketed. Shares assigned to importers for 1986 will be based on one share for each \$575,000 worth of hogs, pork, or pork products im-

ported. In subsequent years, shares for both domestic producers and importers will be based on the amount of assessments collected, minus refunds.

The order also provides for a 15-member National Pork Board composed of producers representing at least 12 States and importers. The Secretary of Agriculture will appoint the members from nominees submitted by the Delegate Body. The board must develop promotion, research, and consumer information projects; submit such projects to the Secretary for approval; administer the order; investigate alleged violations of the order; and recommend order amendments to the Secretary.

The assessment rate to finance the order will initially be the lesser of 0.25 percent of the market value of hogs, pork, or pork products sold or imported or an amount established by the Secretary based on a recommendation by the Delegate Body. The rate may be increased, but by not more than 0.1 percent per year, with an upper limit on the total assessment rate of 0.5 percent. Any increase in the rate above 0.5 percent must be approved by producers and importers in a referendum. Any person who paid the assessment but does not support the program may receive a refund.

For the order to remain in force, a referendum must be held between 24 and 30 months after the issuance of the order. Continuation of the order requires majority approval of producers and importers voting in the referendum. Further referenda, to determine termination or suspension of the order, may be conducted on request of 15 percent or more of producers and importers during a representative period. The Secretary need not conduct more than one referendum in a 2-year period.

States may not impose additional or different regulations relating to pork promotion, except regulations related to public health, during the time that assessments are collected.

Watermelons: The third promotion program (called a plan) will cover watermelons. When sufficient evidence, as determined by the Secretary of Agriculture, is presented by watermelon producers and handlers, or whenever the Secretary has

Table 1. Food Security Act Establishes Beef, Pork, and Watermelon Promotion Programs

Item	Beef order	Pork order	Watermelon plan
Implementation	Mandatory	Mandatory	Based on Secretary's findings
Effective date	120 days after publication of proposed order	90 days after issuance of final order	Not specified
Persons affected	Beef producers and importers	Pork producers and importers	Watermelon producers and handlers
Administrative organizations	Cattlemen's Beef Promotion and Research Board Beef Promotion Operating Committee	National Pork Producers Delegate Body National Pork Board	National Watermelon Promotion Board
Assessment rate	\$1 per head of cattle or the equivalent for beef and beef products	0.25-0.50 percent of the market value of hogs or pork	Equal amounts from producers and handlers
Referendum Date	Not later than 22 months after issuance of the order	24 to 30 months after issuance of the order	Not specified
Approval required for—			
Continuation	Majority of those voting	Majority of those voting	NA
Implementation	NA	NA	2/3 of those voting (or those voting who control 2/3 of the watermelons produced and handled during a specified period) and a majority of both producers and handlers voting.

NA = Not applicable.

reason to believe that a research and promotion plan is needed, hearings will be held on a proposed plan. Based on evidence presented at the hearing, a watermelon promotion plan must be issued if the Secretary finds it would carry out the purposes previously stated.

The plan would establish a National Watermelon Promotion Board composed of an equal number of producer and handler representatives and a public representative. Producers and handlers would submit nominations to the Secretary. If established, the board would develop research and promotion projects, which must be approved by the Secretary before they are implemented. The board will also administer the plan, investigate alleged violations, and recommend amendments to the Secretary.

Assessments, which would be set by the board, must be the same on a per unit basis for both producers and handlers. Handlers would be responsible for collecting assessments from producers and submitting them to the board. All watermelon producers or handlers who do not support the plan could request a refund. Assessments may not be used to advertise or promote private brand names, to make false or unwarranted claims of watermelons or uses of competing products, or to influence Government policy.

If a plan is issued, the Secretary must conduct a referendum at county extension offices among eligible producers and handlers to ascertain whether they favor the plan. For a plan to be implemented, it must be approved by two-thirds of those voting in the referendum (or by voting producers and handlers who have control of two-thirds of the watermelons produced and handled during a representative period) and by a majority of both producers and handlers voting. The Secretary may conduct further referenda at any time, at the request of the board, or at the request of at least 10 percent of the watermelon producers and handlers eligible to vote in a referendum. The Secretary must discontinue the plan when its termination or suspension is favored by a majority of those voting in the referendum and by those producers and handlers voting who control more than 50 percent of the to-

tal volume of watermelons produced and handled by those voting in the referendum.

New Requirements for Agricultural Imports

The Food Security Act also addresses U.S. imports of poultry, red meat, and live animals. The act requires that all edible poultry imported into the United States since May 23, 1986, be subject to the same inspection, sanitary, quality, species verification, and residue standards that apply to poultry produced in the United States. The poultry must also be processed in facilities with conditions comparable to U.S. plants. Poultry not meeting U.S. standards will be denied entry.

In addition, each foreign country that exports red meat to the United States must obtain a certificate issued by the Secretary of Agriculture stating that the country uses reliable analytical methods to ensure compliance with U.S. standards for residues in meat. The Food Security Act stipulates that no red meat will be permitted entry from a country that does not obtain a certificate. The Secretary may issue regulations under which cattle, sheep, hogs, goats, and other animals that have been administered an animal drug banned for use in the United States may be imported for human consumption.

The Comptroller General must study USDA's and the Department of Health and Human Services' current product purity and inspection regulations for imported food products. The study must evaluate the effectiveness of Federal regulations and inspection procedures to detect prohibited chemical residues and foreign matter in food or live animals. A report is due to Congress by December 23, 1986.

National Agricultural Policy Commission

Because of the poor health of the agricultural economy, Congress established a National Commission on Agricultural Policy in the Food Security Act. The Commission's purpose is to study the structure, procedures, and methods of formulating and administering U.S. agricultural policies, programs, and practices. Specifically, the Commission must examine the following:

- The effectiveness of existing agricultural programs in improving farm income.
- Possible program improvements to help retain the family farm.
- The effect of legislative and administrative changes to agricultural policy on planning and long-term profitability of farmers.
- The effect on farmers of the existing system of formulating and implementing agricultural policy.
- The effect of national and international economic trends on U.S. agricultural production.
- The means of adjusting U.S. agricultural policies and programs to meet changing economic conditions.
- The role of State and local governments in future agricultural policy.

The Commission must also study conditions in rural areas of the United States and how these conditions relate to the provision of public services by Federal, State, and local governments. The rural issues to be examined will include the following:

- An analysis of conditions that reflect the declining rural economy, including economic and demographic trends, and rural and agricultural income and debt.
- Trends and fiscal conditions of rural local governments.
- Trends of Federal, State, and local government financing, delivery, and regulation of public services in rural areas.

The Commission must submit annual reports of findings and recommendations to the President and Congress before December 23 each year of the Commission's existence. The Commission is scheduled to terminate on December 23, 1990.

The Commission will include the chairmen and ranking minority members of the House and Senate agriculture committees and 15 members appointed by the President. The appointed members will be selected from nominees representing producers, processors, exporters, transporters, shippers, input suppliers, credit institutions, and consumers. Each State Governor will nominate two to four potential members. The President may not appoint more than one individual from a particular State nor more than seven individuals of the same political party. □



Recent Trends in Domestic Food Programs

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Participation and program costs discussed in this article compare the October-December quarter of 1985 with the same 3 months of 1984. The data reported were compiled in February 1986 and are subject to revision.

An average of 19.4 million persons participated monthly in the Food Stamp Program during October-December 1985. This represented a 2.5-percent decline from 19.9 million participants in the fourth quarter of 1984. Reduced participation lowered total program costs from \$2.95 billion in 1984 to \$2.93 billion in 1985.

Federal expenditures for benefits declined by \$46 million, from \$2.70 billion in the fourth quarter of 1984 to \$2.66 billion in 1985, while average monthly food stamp benefits per person increased from \$45.19 to \$45.76. Administrative expenses in the same quarter increased from \$221 million to \$242 million. Other program costs rose from \$23 million to \$28 million.

Child Nutrition Programs

Average participation per school day in the National School Lunch Program rose 0.8 percent, from 23.9 million in the fourth quarter of 1984 to 24.1 million in 1985. The number of students receiving free lunches increased slightly from 10.0 million in 1984 to 10.1 million in 1985, and those receiving reduced-price lunches rose from 1.62 to 1.63 million. Students that paid full price for lunch increased from 12.2 to 12.4 million per day. During the last quarter of 1985, students receiving free lunches, reduced-priced lunches, and full-price lunches remained at approximately the same proportions as in 1984: 42, 7, and 51 percent, respectively.

Schools participating in the National School Lunch Program are entitled to receive per-meal cash payments which vary according to the type of lunch served. Par-

ticipating schools also receive 11.75 cents per meal in commodities. Federal cash expenditures for the program totaled \$833 million during the last quarter of 1985, up from \$801 million the previous year. The value of commodities distributed to schools dropped slightly from \$146.8 million to \$146.2 million.

In addition, schools also receive "bonus" commodities, such as dairy products, that benefit the lunch program and serve as an outlet for surplus commodities purchased by the Federal Government. The value of bonus commodities distributed to schools totaled \$127 million, up from \$95 million a year earlier.

Participation in the School Breakfast Program increased from 3.49 million to 3.57 million per day. Free, reduced-price, and full-price meals all increased, with full-price meal participants leading the gains. Approximately 88.4 percent of the participants received either a free or a reduced-price breakfast. Cash payments for the program

amounted to \$125.6 million, compared with \$118.5 million in the last quarter of 1984.

The number of meals served under the Child Care Food Program rose from 161.6 million to 169.7 million, an increase of 5 percent. Federal cash expenditures rose by nearly \$8.2 million, from \$98.5 million to \$106.7 million. Total expenditures (including commodities and administrative costs) were \$119.4 million, up from \$111.5 million.

About 42 million half-pints of milk were served under the Special Milk Program during the fourth quarter of 1985, compared with 44 million in 1984. The reduced volume lowered Federal expenditures from \$4.2 million to \$4.1 million.

Supplemental Food Programs

Participation in the Special Supplemental Food Program for Women, Infants, and Children (WIC) reached a record 3.3 million during October-December 1985, up from 3.1 million in the same quarter of



Participation in the WIC program reached a record 3.3 million during the last quarter of 1985.

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Who Accepts Food Stamps?

Where can Food Stamp Program participants purchase food with their

coupons? In a survey taken in April 1985, the following types of firms and organizations were authorized to accept food stamps. More than 98 percent of the outlets were retail food stores.

Type of establishment	Number	Percent of total
Retail food stores	230,344	98.22
Wholesale food dealers ¹	311	0.13
Meals on wheels	1,190	0.51
Communal dining ²	1,694	0.72
Alcohol/drug treatment centers	615	0.26
Private restaurants ³	352	0.15
Group living facilities ³	20	.01
Total	234,526	100.00

¹Under certain conditions, wholesalers servicing retailers or alcohol and drug treatment centers can be authorized to receive food stamps. ²Primarily elderly feeding programs where food stamps can be accepted. ³Organizations authorized to provide reduced-price meals to the elderly or needy.

1984. Participation by women and infants rose by 8 percent, while the number of children (ages 1 to 5 years) participating increased 7 percent. WIC monthly benefits averaged \$31.86 per person, about 50 cents higher than a year earlier. Food costs totaled \$317.0 million, up from \$289.8 million in 1984. Total costs rose from \$363 million to \$394 million.

The target population for the Commodity Supplemental Food Program (CSFP) is similar to WIC, except CSFP extends participation for children up to age 6. The two programs may operate in the same locality, but a person may not participate in both. CSFP operates 28 projects in 13 States and

the District of Columbia. Average participation increased slightly from 139,000 to 140,400. About 65.3 percent of the participants were children, 19.5 percent were women, and 15.2 percent were infants.

The total value of commodities distributed to CSFP participants fell from \$9.7 million to \$8.6 million because of a \$1.3-million reduction in bonus commodities. Average monthly benefits per person declined from \$23.27 to \$20.43. Participants receive juice, hot cereal, nonfat dry milk, egg mix, canned fruits and vegetables, canned meat and poultry, cheese, and infant formula.

An average of 19,338 persons participated in the Elderly Feeding Pilot Projects in the

fourth quarter of 1985, a small increase from the 19,313 persons served in 1984. These projects are operated under the auspices of the CSFP in Des Moines, Detroit, and New Orleans. Low-income elderly participants receive foods similar to those distributed under the CSFP program. Monthly benefits per person averaged \$8.95, a 14-percent decrease from \$10.45 in 1984. Food costs totaled \$519,221, down from \$605,947 in 1984.

Food Donation Programs

USDA donates food through the Food Distribution Program on Indian Reservations to assist low-income households on or near the reservations and in the Trust Territories of the Pacific Islands. Average program participation during the comparison period rose from 131,736 to 139,217. Food costs (including bonus commodities) totaled \$12.2 million, up from \$11.8 million in 1984.

The Nutrition Program for the Elderly is administered by the Department of Health and Human Services, although it receives USDA-donated food or cash-in-lieu of commodities. Approximately 55.9 million meals were served under this program in the fourth quarter of 1985, a 3.6-percent increase from 1984. Total USDA expenditures for the program rose from \$28.2 million to \$35.7 million, a 26-percent increase from 1984.

Food costs for the Temporary Emergency Food Assistance Program declined from \$271.6 million to \$205.7 million in 1985. Under this program, USDA donates surplus cheese, butter, nonfat dry milk, honey, rice, flour, and cornmeal to the needy. □

Table 1. Federal Cost of USDA Food Programs¹

Program	1983	1984	1985 ²	1984 (Quarters) ³				1985 ^{2 3}			
				I	II	III	IV	I	II	III	IV
Million dollars											
Family food											
Food Stamps	11,119	10,675	10,705	2,769	2,668	2,534	2,703	2,771	2,694	2,582	2,658
Nutr. Asst. Prog. in Puerto Rico	825	825	825	206	206	206	206	206	206	206	206
Food distribution											
Food distribution on Indian Reservations	36	43	48	10	10	12	12	12	12	12	12
Schools ⁴	819	826	850	274	161	148	243	270	157	148	275
Other ⁵	229	226	201	66	61	44	55	48	59	52	42
Temporary Emergency Assistance	1,130	1,059	914	269	269	249	272	265	254	189	206
Cash in lieu of commodities⁶	126	133	142	36	30	36	31	36	35	35	36
Child nutrition⁷											
School Lunch	2,443	2,552	2,611	827	606	318	801	807	644	327	833
School Breakfast	357	378	393	119	91	50	119	117	99	51	126
Child Care Food and Summer Food Serv. Prog.	407	454	498	93	107	155	98	101	119	171	107
Special Milk	17	16	16	5	4	4	4	4	4	4	4
WIC⁸	1,194	1,417	1,524	349	351	354	363	368	375	387	394
Total⁹	18,702	18,604	18,727	5,023	4,564	4,110	4,907	5,005	4,658	4,165	4,899

¹Calendar years. Administrative costs are excluded unless noted. ²Preliminary. ³Quarterly data may not add to annual total because of rounding. ⁴National School Lunch, Child Care Food, Summer Food Service programs, and commodity schools. ⁵Commodity Supplemental Food Program, Elderly Feeding Pilot Project, Nutrition Program for the Elderly, and donations to charitable institutions. ⁶Child nutrition programs and the Nutrition Program for the Elderly. ⁷Cash expenditures. ⁸Special Supplemental Food Program for Women, Infants, and Children. Includes administrative costs. ⁹Program data may not add to totals because of rounding.

Source: Compiled from monthly data from the Food and Nutrition Service, USDA.

New Legislation Brings Changes in Food Assistance

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The Food Security Act of 1985, popularly known as the 1985 farm bill, contains a number of provisions that affect Federal food assistance programs. The Act continues the Food Stamp Program (FSP) through September 30, 1990, increases the funding for Puerto Rico's Nutritional Assistance Program, and reauthorizes the Temporary Emergency Food Assistance Program for 2 years.

Changes prescribed by the Act are expected to boost costs for these and several other food programs by around 2 percent, or \$1 billion above projected costs, had the expiring legislation been extended without change for another 5 years. Economic Research Service (ERS) estimates indicate that roughly \$850 million of the increased costs between 1985 and 1990 will result from changes in two programs—the Food Stamp Program and the Nutritional Assistance Program in Puerto Rico.

Changes Affecting Food Stamp Eligibility and Benefits

Many of the provisions of Title XV of the Food Security Act are designed to increase benefits and encourage expanded participation in the FSP. Under the new law, for example, residents of publicly operated mental health centers are eligible for food stamps. Households in which all members receive payments under the Aid to Families with Dependent Children Program or the Supplemental Security Income Program (SSI) are automatically eligible to receive food stamps. In determining eligibility for the FSP, the definition of disabled persons is also expanded to include disabled veterans, selected retirees receiving public assistance, and recipients of State SSI aid to the blind and disabled. Households with disabled members are permitted a medical care deduction and an unlimited excess shelter-cost deduction in meeting income qualification requirements.

Up to 200,000 more households are able to participate in the FSP because of the in-



The Food Security Act of 1985 has a number of provisions that affect the Food Stamp Program.

creased limit on allowable financial resources. The asset limit for nonelderly households was increased on May 1 from \$1,500 to \$2,000. Assets include cash and resources that can easily be converted to cash, such as checking and savings accounts, stocks, and bonds. The asset limit for single elderly households was raised from \$1,500 to \$3,000. Under previous legislation, the \$3,000 limit only applied to households of two or more persons, when at least one was 60 or older.

Eligibility for the FSP is also expanded through changes in the deductions allowed from gross monthly income. To participate in the program, households must meet gross (except households with elderly and disabled members) and net income standards. The net income figure is determined by subtracting allowable deductions.

The earned income deduction is designed to compensate households for mandatory work-related expenses, such as taxes and union dues. Effective May 1, 1986, the deduction rose from 18 to 20 percent of earned income.

Separate deductions are allowed for actual dependent care and shelter costs in excess of 50 percent of the household's gross income. The maximum deduction for dependent care is \$160 a month, with no adjustments for inflation or geographic location. The maximum excess shelter deduction is \$147 a month in the 48 contiguous States

and the District of Columbia. Previously, the maximum monthly combined dependent care and excess shelter cost deduction was \$139.

The new definition of countable household income excludes the portion of an education grant, loan, or other educational assistance that is used to pay tuition and mandatory fees at a post-secondary educational institution. Educational loan origination fees and insurance premiums are also excluded when determining whether FSP income eligibility standards are met.

Farmers are entitled to subtract the losses incurred from self-employment from their countable income from outside jobs. Earnings from on-the-job training programs under the Job Training Partnership Act are counted as earned income, except for dependents under age 19.

The Food Security Act has new disqualification procedures for households and individuals. If a household head fails to meet certain work requirements, then the entire household is disqualified from receiving food stamps. However, if any member other than the household head does not comply with the work requirements, then only that person is barred from the FSP. Previously, failure of any household member to comply with the work requirements would have disqualified the entire household for 2 months.

Household heads between 16 and 18 years of age will no longer be automatically exempt from the work requirements. These persons must comply with the requirements if they are not attending school at least half-time or participating in an employment training program. Previously, the rule did not apply to persons under age 18.

Changes Affecting FSP Program Administration

The Food Security Act also addresses problems of error and fraud and establishes several pilot projects. The Act, for example, mandates verification of household income and household size, where questionable, and permits States to require verification of other information used in determining eligibility. If, because of error or fraud, participants receive more benefits

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than they are entitled to, States may collect the value of the excess payment through unemployment compensation agencies. Each adult member of a food stamp household will be held liable for repaying the value of the excess food stamps.

To prevent misuse of the stamps, the Secretary of Agriculture may require States to use photographic identification cards, if they are cost effective. States may allow households to use photo identification cards issued under other public assistance programs.

The Secretary may allow States to test simplified applications for food stamps and standardized benefits in five statewide and five local sites. States may also stagger issuance of food stamp benefits throughout the entire month as long as no household goes longer than 40 days without them. This provision is designed to distribute the workload of local issuance offices throughout the month.

The existing pilot projects that provide cash rather than food coupons to households composed entirely of persons 65 or older or those eligible for Supplemental Security Income may continue through September 30, 1990, at the request of the States.

Provisions Affecting Other Food Programs

In a major program change, States may operate the Food Stamp and Commodity Distribution programs in the same area. This was not allowed under previous legislation, except to victims of natural disasters or to participants in the Commodity Supplemental Food Program, the Food Distribution Program on Indian Reservations, or the Temporary Emergency Food Assistance Program.

Table 1. Food Security Act of 1985 Brings Changes in FSP and Other Programs

	Old Law	New Law
Food Stamp Program		
Program funding	Temporary legislation which continued FSP through fiscal 1985.	FSP is extended through fiscal 1990 at higher authorization levels.
Countable income		Grants, loans, etc. used for tuition and mandatory fees are excluded. Farmers can deduct self-employment losses.
Deductions from income		
Earned income	18 percent of earned income.	20 percent of earned income.
Dependent care and shelter costs	Together could not exceed \$139 a month.	Treated separately. Maximum for dependent care is \$160 per month; shelter costs, \$147.
Asset limitations		
Nonelderly households	\$1,500.	\$2,000.
Elderly households	\$1,500 for household with one elderly person; \$3,000 for two or more.	\$3,000 for households with one or more elderly.
Eligibility disqualifications	Failure of any household member to comply with work for 2 months.	If household head fails to meet work require other member, only he or she is disqualified.
Employment and training	None.	States required to implement program by April 1, 1987.
Sales tax on food	Sales tax collected on food bought with stamps.	States taxing food stamp purchases will be prohibited from participating in program.
Puerto Rico Nutrition Assistance Program	Grant set at \$825 million annually.	Authorizes funding at \$825 million in fiscal 1986, rising to \$937 million by fiscal 1990.
Temporary Emergency Food Assistance Program	Program expired in fiscal year 1985.	Extended program through September 30, 1987.

The Act reauthorizes the Secretary to purchase and distribute commodities for these programs and for the Food Distribution Program in the Trust Territory of the Pacific Islands, summer camps, charitable institutions, and declared disaster areas. Dairy products, wheat or wheat products, rice, honey, and corn meal will be distributed at no cost and not charged against program entitlements if they are available in Commodity Credit Corporation inventories.

To provide nutrition assistance to the needy, nonprofit organizations, such as schools receiving commodities under Section 32 of the Act of August 24, 1935, can transfer their commodities to other nonprofit organizations that can use them without waste or cost. School districts that participated in the pilot project study of cash-in-lieu of commodities and commodity letter of credit under the National School Lunch Program are allowed to continue receiving one of these alternative forms of assistance through June 30, 1987.

States must encourage FSP participants to join the Expanded Food and Nutrition Education Program (EFNEP). State agencies should allow EFNEP officials, where practicable, to display information about EFNEP in food stamp offices.

The Secretary is directed to include a representative sample of low-income persons in the Department of Agriculture's continuing survey of food intake, the Household Food Consumption Survey, and Nationwide Food Consumption Survey. Data are to be collected on food purchases and other household expenditures by low-income persons.

Program Costs Could Rise

To determine the comparative cost of the new bill, ERS researchers developed baseline estimates of program expenditures for 1986-90 under the expiring legislation. The estimates were derived by using forecasts of USDA's Thrifty Food Plan (TFP) and Congressional Budget Office projections of the major economic indicators. (The TFP, the least costly of USDA's four food plans, is used with household income to calculate program benefits for a particular household size.) The baseline estimates were then compared with new spending levels authorized by the 1985 Act, which range from \$13.04 billion in fiscal year 1986 to \$15.97 billion in 1990.

Provisions of the 1985 Act increase the eligibility limit for assets and income deductions for work-related expenses. Shelter and dependent care costs are expected to boost FSP costs the most. Expenditures could increase more than \$600 million dollars above the baseline over the 5-year period as participation increases and benefits to households already in the program rise.

An increase in the block grant for Puerto Rico's Nutrition Assistance Program, to \$936 million by 1990, is intended to adjust benefits for expected food price inflation. Operated separately from the FSP since July 1982, the program has been funded at a constant level of \$825 million. The increase for the Nutritional Assistance Program will add approximately \$250 million above the baseline.

Another added Federal cost of as much as \$100 million annually may come in

response to a provision requiring States to implement employment and training programs by April 1, 1987. The Federal Government will assume 50 percent of the administrative costs associated with these programs, which will assist food stamp participants in obtaining skills, training, and experience to increase their chances of employment. If the programs are successful, however, the reduction in FSP participation may offer savings that nearly match the added administrative costs.

The reauthorization of the Temporary Emergency Food Assistance Program for 2 years will cost the Federal Government \$100 million for 1986 and 1987. Program funds will be used to assist States in meeting the costs of distributing approximately \$1 billion worth of surplus commodities each year. Beginning January 1, 1987, States are required to match Federal funds on a dollar-for-dollar basis.

Not all provisions of the 1985 Act will increase food program costs. Some savings will result from a provision to include Job Training Partnership Act earnings as part of income in determining eligibility for the FSP. This could reduce program costs over the next 5 years by \$150 to \$200 million.

The Food Security Act specifies that, after fiscal 1987, States can no longer impose sales tax on FSP purchases. Although there is no direct Federal cost involved in this provision, the amendment effectively increases benefits to FSP recipients in 17 States who presently pay about \$100 million a year in sales tax on food. □

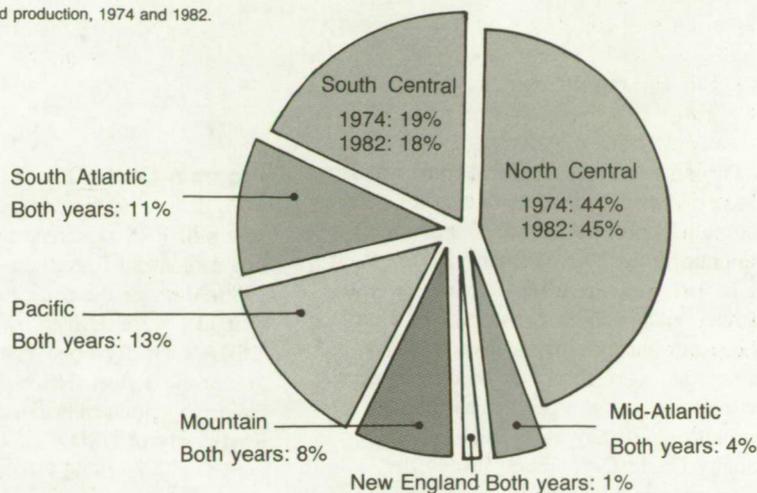
Changing Participants in U.S. Food Production and Consumption

U.S. Food Production

The North Central States produce the largest portion of America's food output—about 45 percent of the U.S. total in 1974 and 1982. Other large producers are the South Central States and the Pacific region. New England, with only 1 percent, is the smallest food producer.

North Central States Are America's Bread (and Corn, Milk, and Pork) Basket

Percent of U.S. food production, 1974 and 1982.

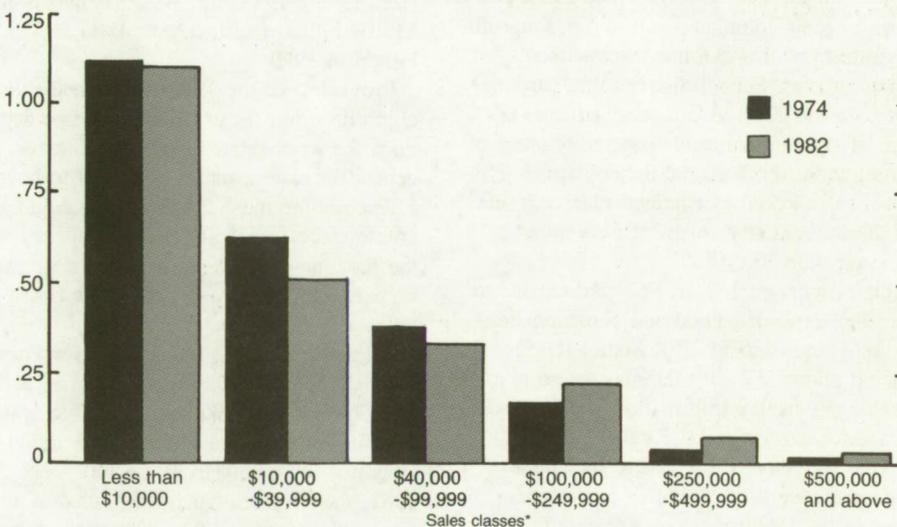


U.S. Farms by Sales Class

The distribution of farms by sales class shifted away from mid-sized commercial farms between 1974 and 1982. Measured in terms of the real (inflation-adjusted) value of farm products, "family farms" with sales between \$10,000 and \$99,999 decreased considerably, while those with sales exceeding \$100,000 increased. Very small farms, with those less than \$10,000 in farm product sales, remained fairly constant.

Farms in Larger Sales Classes Have Grown Rapidly

Million farms

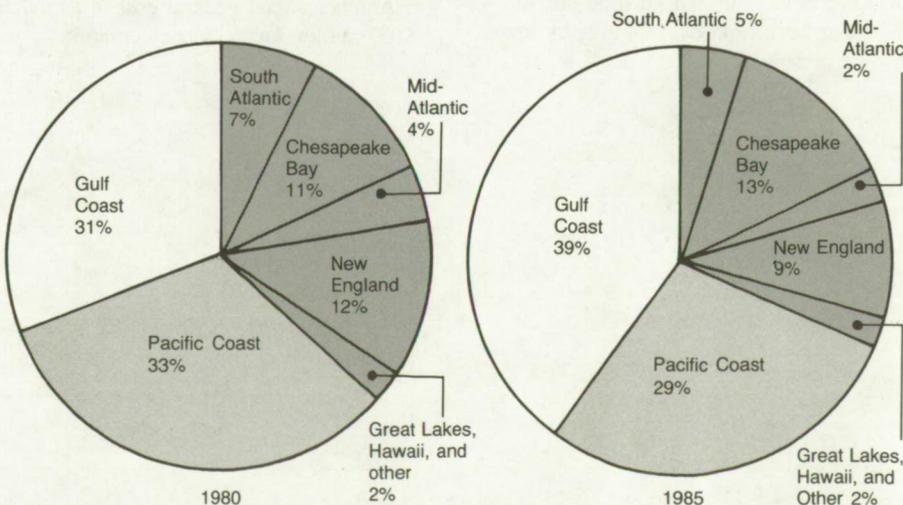


*1982 dollars

U.S. Fish Catch

The Gulf and Pacific Coasts account for the lion's share of the U.S. fish catch. However, between 1980 and 1985, the Pacific Coast's share decreased slightly, and the Gulf's share climbed 8 percentage points. The Chesapeake Bay and New England were also large contributors to the U.S. catch.

Gulf Coast's Share Gains While Pacific Coast's Declines*

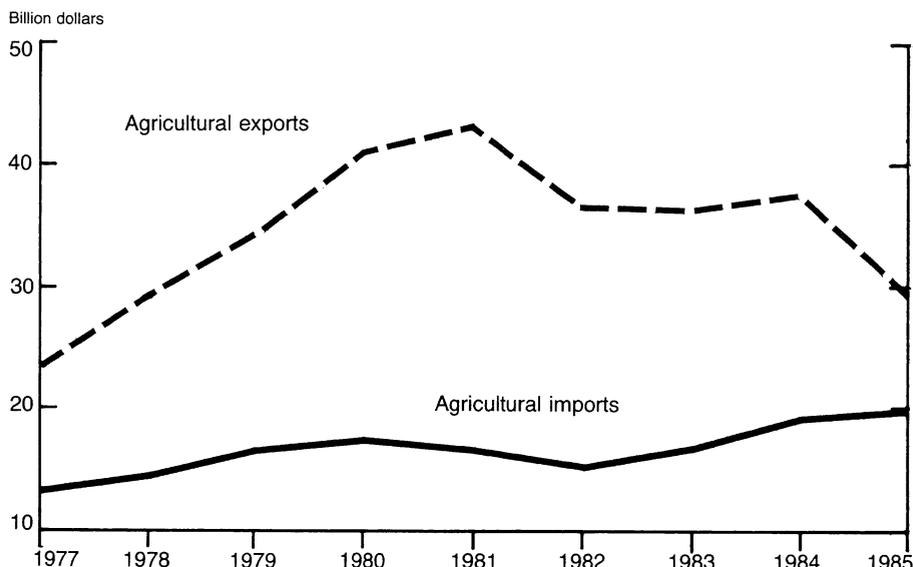


*Components may not add to 100% because of rounding.

U.S. Agricultural Trade

While U.S. agricultural trade continues clearly in surplus, imports have been closing the gap with exports since 1981. Data for 1985 show imports and exports the closest they've been since the early 1970's. However, the long-term outlook is better because some factors behind the worsening trade balance have improved. The U.S. dollar is down from its February 1985 peak; new farm legislation is expected to improve the U.S. market share of farm exports; and lower oil prices and interest rates will help purchases by developing nations.

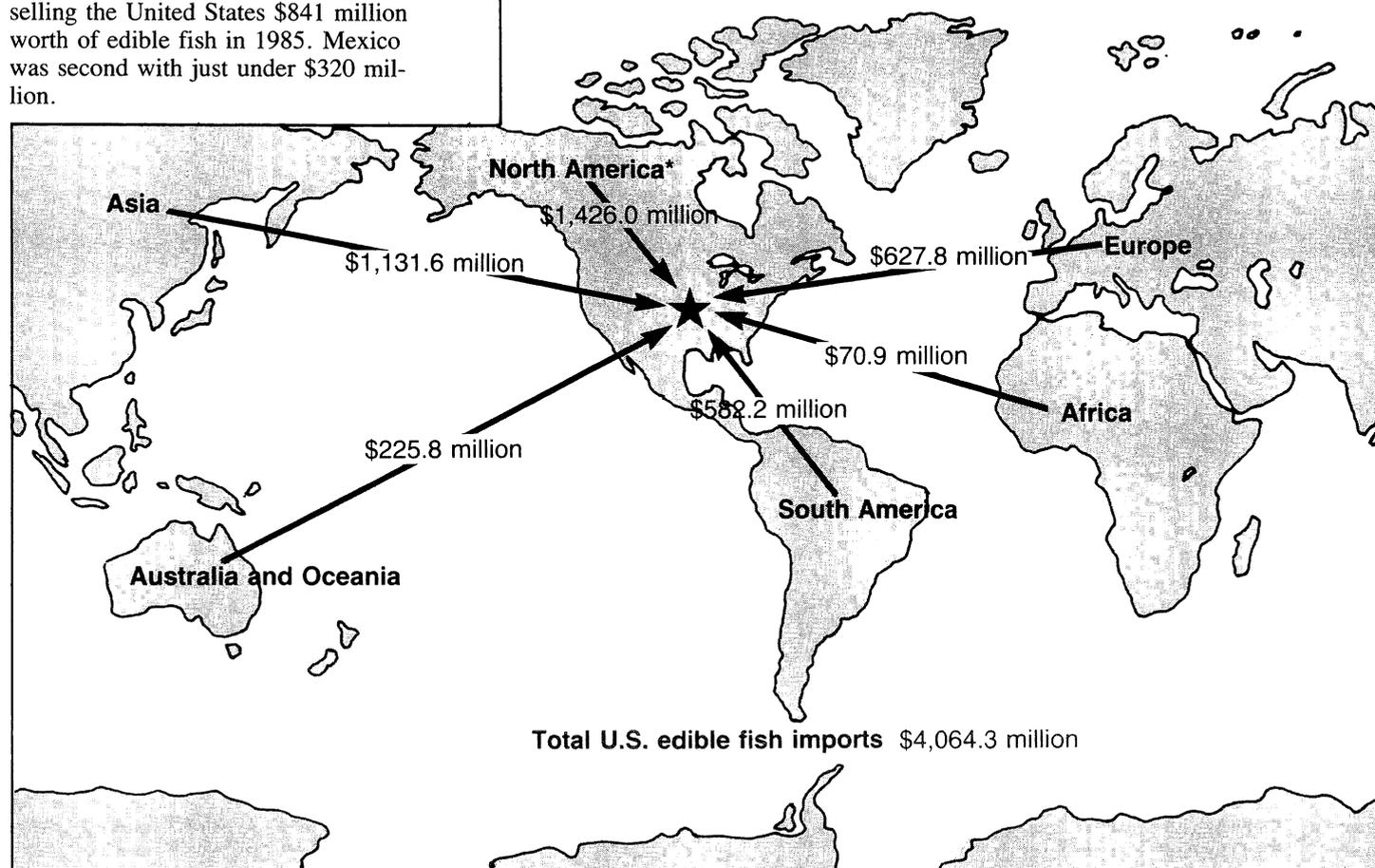
U.S. Agricultural Imports Narrow the Gap with Exports



U.S. Edible Fish Imports

Americans are eating more fish. Consequently, the value of edible fish imports grew 197 percent from the mid-1970's to the middle of this decade. Canada was our number one supplier, selling the United States \$841 million worth of edible fish in 1985. Mexico was second with just under \$320 million.

United States Buys Edible Fish From Around the World



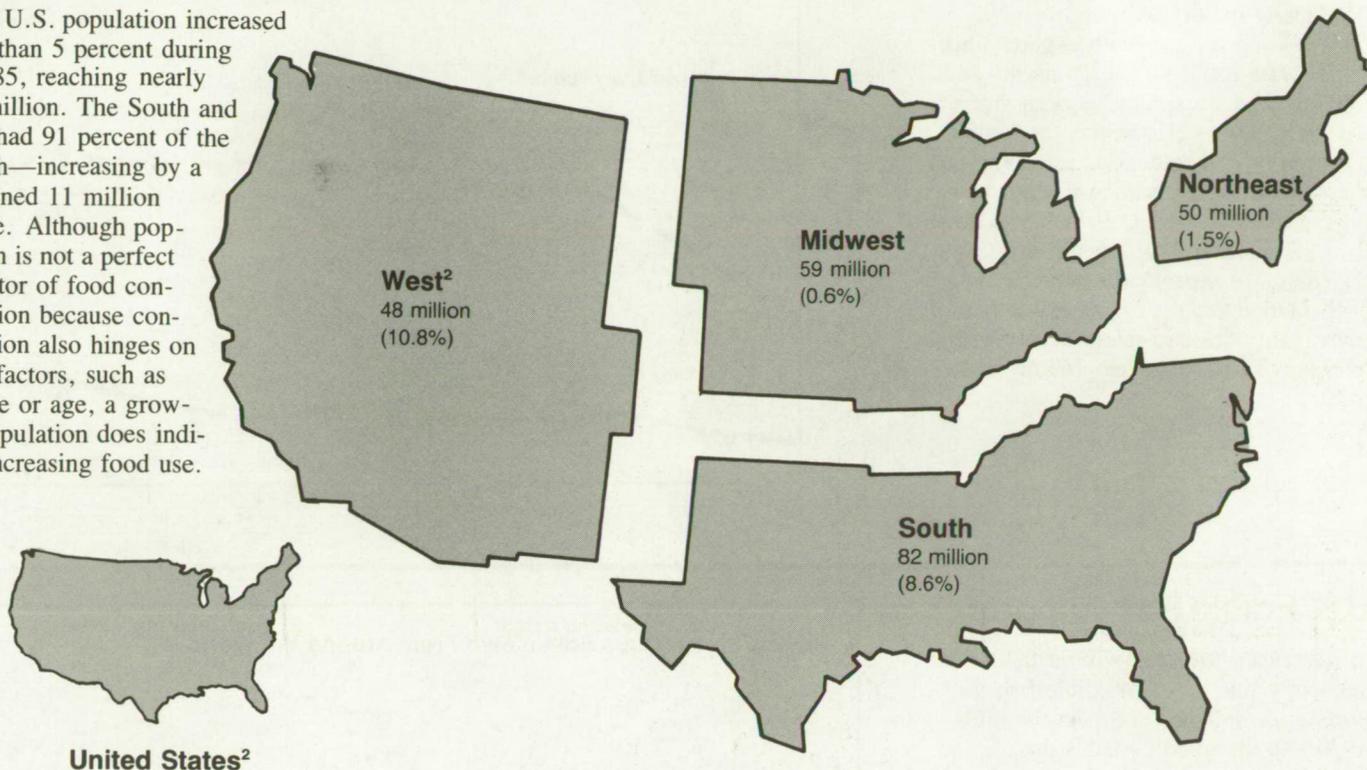
*Includes fish imports from Canada, Mexico, Central America, and the Caribbean.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *Fisheries of the United States, 1985*.

Population and Consumption Patterns

The U.S. population increased more than 5 percent during 1980-85, reaching nearly 239 million. The South and West had 91 percent of the growth—increasing by a combined 11 million people. Although population is not a perfect indicator of food consumption because consumption also hinges on other factors, such as income or age, a growing population does indicate increasing food use.

South Had the Largest Population in 1985, but West Saw the Greatest Growth¹



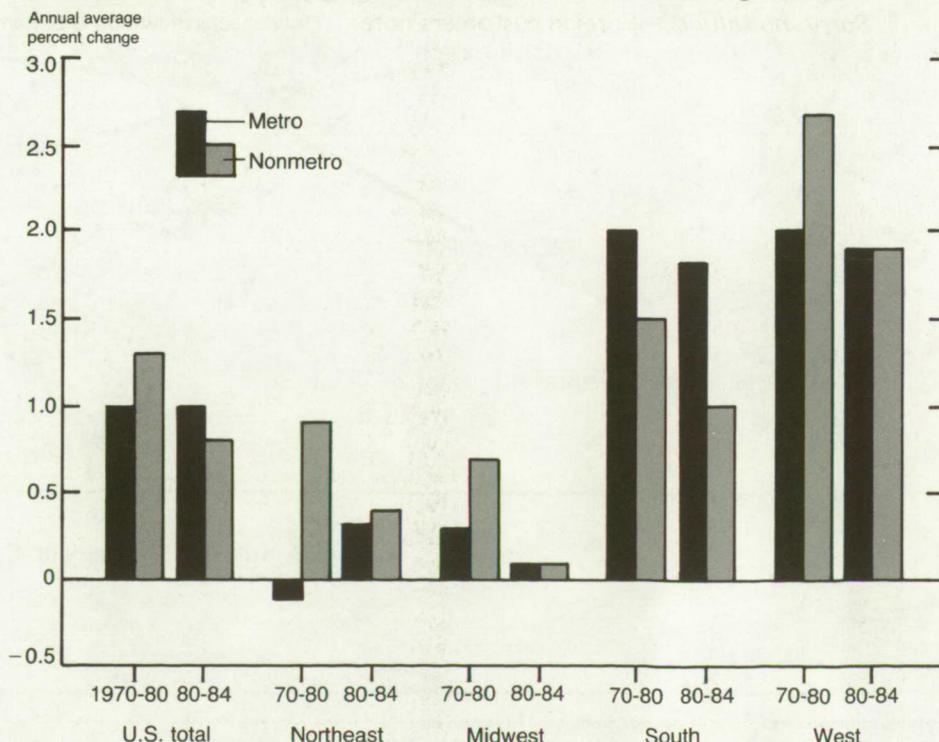
United States²
Total 1985 population: 239 million
Percent change, 1980-85: (5.4%)

¹ Estimated population as of July 1, 1985. Percent change from 1980 to 1985. Totals include Armed Forces residing in each State.
² West and U.S. totals include Alaska and Hawaii.
Source: Bureau of the Census.

Metro and Nonmetro Population

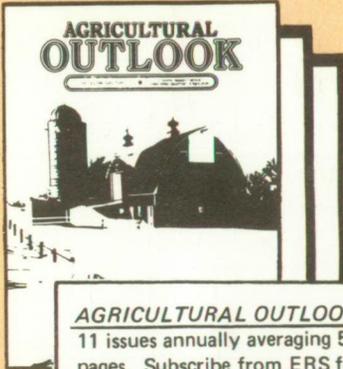
While the United States on the whole is shifting toward the metro areas, the proportion of metro to nonmetro population varies greatly by region. In the Northeast, both metro and nonmetro populations have grown during the 1980's, but the number of people in nonmetro areas has grown faster. Meanwhile, population growth in the Midwest has slowed in both categories. Ever since the 1970's, the South has seen a tremendous push in metro population, while nonmetro population growth in the West has fallen back to the metro level so far this decade.

Growth in Metro and Nonmetro Populations Varies Across Regions

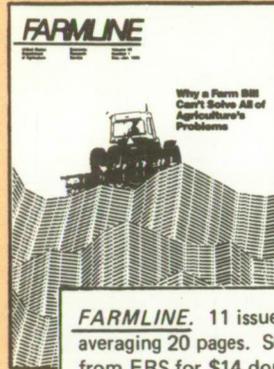


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U.S. FOOD MARKETING IS BIG BUSINESS

Sales in the U.S. food marketing system in 1985 reached an estimated half a trillion dollars and grew faster than the gross national product. The food marketing system comprises more than 1 million firms in food manufacturing, wholesaling, retailing, and service and employs more than 1 out of every 10 U.S. workers. The future of these firms, workers, and the food marketing system as a whole are examined in *FOOD MARKETING REVIEW, 1985*.

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